LONGHORN ARMY AMMUNITION PLANT KARNACK, TEXAS

ADMINISTRATIVE RECORD

Volume 21

2019

Bate Stamp Numbers
00942727 – 00944492

Prepared for

Department of the Army
Longhorn Army Ammunition Plant

1976–2019

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

VOLUME 21

2019

A. Title: Report (cont'd) – Quarterly Evaluation Report, 2nd Quarter (April–June) 2019 Groundwater Treatment Plant, Longhorn Army Ammunition Plant, Karnack, Texas
Author(s): Bhate Environmental Associates, Inc.
Recipient: U.S. Army Corps of Engineers, Tulsa District
Date: November 4, 2019
Bate Stamp: 00942727 – 00942999

B. Title: Transmittal Letter – FY2019 Update of the Comprehensive Land Use Control (LUC) Management Plan, Longhorn Army Ammunition Plant, Karnack, Texas, October 4, 2019
Author(s): Department of the Army
Recipient: Environmental Protection Agency and Texas Commission on Environmental Quality
Date: November 14, 2019
Bate Stamp: 00943000 – 00943001

C. Title: Report – FY2019 Update of the Comprehensive Land Use Control (LUC) Management Plan, Longhorn Army Ammunition Plant, Karnack, Texas, October 4, 2019
Author(s): Department of the Army
Recipient: Environmental Protection Agency and Texas Commission on Environmental Quality
Date: November 14, 2019
Bate Stamp: 00943002 – 00943477

D. Title: Minutes – Final Minutes, Monthly Managers' Meeting (MMM), Longhorn Army Ammunition Plant (LHAAP) October 23, 2019
Author(s): Department of the Army
Recipient: All Parties
Date: November 19, 2019
Bate Stamp: 00943478 – 00943508

E. Title: Minutes – Draft Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting, Longhorn Army Ammunition Plant (LHAAP), October 23, 2019
Author(s): Bhate Environmental Associates, Inc.
Recipient: All Parties
Date: November 20, 2019
Bate Stamp: 00943509 – 00943550

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

VOLUME 21 (cont'd)

2019

F. Title: Report – Draft Final Year 5 Annual Remedial Action Operation Report (September 2018–August 2019), LHAAP-35A (58) Shops Area, Longhorn Army Ammunition Plant, Karnack, Texas
Author(s): Bhate Environmental Associates, Inc.
Recipient: Environmental Protection Agency and Texas Commission on Environmental Quality
Date: December 5, 2019
Bate Stamp: 00943551 – 00944492

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)

ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Raw Data

Batch Review Method:
C:\HPCHEM\1\METHODS\CLO4-DP2.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
	*	668344 CCV@25	Vial 71	1	Control	1	1.41705e6	7.940	23.98275
	*	668348 QC@4.0	Vial 72	1	Control	2	2.54232e5	7.968	4.00063
	*	668346 ICS@4.0	Vial 73	1	Control	3	1.69006e5	7.781	3.16133
	*	668347 LMB	Vial 74	1	Control	4	0.00000	0.000	0.00000
	*	1922027001	Vial 75	1	Sample	5	0.00000	0.000	0.00000
	*	668349 220271S	Vial 76	1	Sample	6	1.85325e5	7.618	3.68787
	*	668350 220271D	Vial 77	1	Sample	7	1.87103e5	7.610	3.62903
	*	1922715001	Vial 78	1	Sample	8	0.00000	0.000	0.00000
	*	1923027001	Vial 79	1	Sample	9	0.00000	0.000	0.00000
	*	1923027002	Vial 80	1	Sample	10	0.00000	0.000	0.00000
	*	668351 CCV@25	Vial 71	1	Control	11	1.38922e6	7.982	23.06424

#	*	Sample	Location	Inj	SampleType	Run	CLO4-85 Area	CLO4-85 RT	CLO4-85 Amount
	*	668344 CCV@25	Vial 71	1	Control	1	4.43367e5	7.960	25.20664
	*	668348 QC@4.0	Vial 72	1	Control	2	8.12716e4	7.989	4.15621
	*	668346 ICS@4.0	Vial 73	1	Control	3	6.47272e4	7.805	3.88663
	*	668347 LMB	Vial 74	1	Control	4	0.00000	0.000	0.00000
	*	1922027001	Vial 75	1	Sample	5	0.00000	0.000	0.00000
	*	668349 220271S	Vial 76	1	Sample	6	6.51794e4	7.628	4.19725
	*	668350 220271D	Vial 77	1	Sample	7	6.53175e4	7.615	4.09697
	*	1922715001	Vial 78	1	Sample	8	0.00000	0.000	0.00000
	*	1923027001	Vial 79	1	Sample	9	0.00000	0.000	0.00000
	*	1923027002	Vial 80	1	Sample	10	0.00000	0.000	0.00000
	*	668351 CCV@25	Vial 71	1	Control	11	4.40722e5	7.997	24.55800

#	*	Sample	Location	Inj	SampleType	Run	CLO4-89-ISTD Area	CLO4-89-IS RT	CLO4-89-ISTD Amount
	*	668344 CCV@25	Vial 71	1	Control	1	1.80205e5	7.960	5.00000
	*	668348 QC@4.0	Vial 72	1	Control	2	2.09396e5	7.994	5.00000
	*	668346 ICS@4.0	Vial 73	1	Control	3	1.78427e5	7.807	5.00000
	*	668347 LMB	Vial 74	1	Control	4	2.39409e5	8.172	5.00000
	*	1922027001	Vial 75	1	Sample	5	1.62744e5	7.641	5.00000
	*	668349 220271S	Vial 76	1	Sample	6	1.66279e5	7.631	5.00000
	*	668350 220271D	Vial 77	1	Sample	7	1.70743e5	7.634	5.00000
	*	1922715001	Vial 78	1	Sample	8	1.55455e5	7.625	5.00000
	*	1923027001	Vial 79	1	Sample	9	2.03712e5	7.859	5.00000
	*	1923027002	Vial 80	1	Sample	10	2.10021e5	7.856	5.00000
	*	668351 CCV@25	Vial 71	1	Control	11	1.84112e5	7.983	5.00000

*** End of Report ***

00942730

Sequence Table:

Method and Injection Info Part:

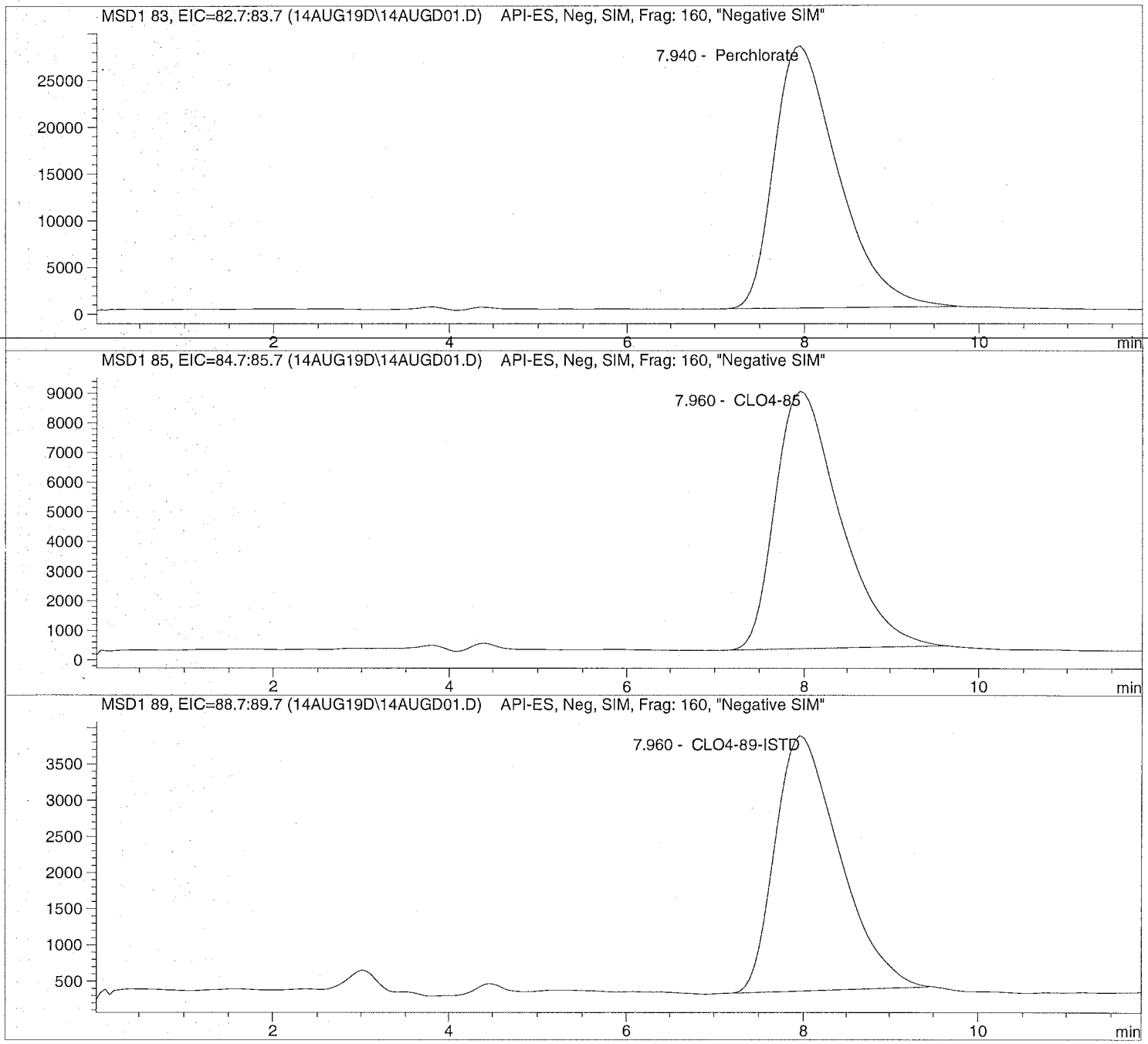
Line	Location	SampleName		Method	Inj	SampleType	InjVolume	DataFile
1	Vial 71	668344	CCV@25	CLO4-AQN	1	Ctrl Samp		
2	Vial 72	668348	QC@4.0	CLO4-AQN	1	Ctrl Samp		
3	Vial 73	668346	ICS@4.0	CLO4-AQN	1	Ctrl Samp		
4	Vial 74	668347	LMB	CLO4-AQN	1	Ctrl Samp		
5	Vial 75	1922027001		CLO4-AQN	1	Sample		
6	Vial 76	668349	220271S	CLO4-AQN	1	Sample		
7	Vial 77	668350	220271D	CLO4-AQN	1	Sample		
8	Vial 78	1922715001		CLO4-AQN	1	Sample		
9	Vial 79	1923027001		CLO4-AQN	1	Sample		
10	Vial 80	1923027002		CLO4-AQN	1	Sample		
11	Vial 71	668351	CCV@25	CLO4-AQN	1	Ctrl Samp		

Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD01.D Sample Name: 668344 CCV@25

Injection Date:	8/14/2019 08:28:02	Seq Line:	1
Sample Name:	668344 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD01.D Sample Name: 668344 CCV@25

Injection Date:	8/14/2019 08:28:02	Seq Line:	1
Sample Name:	668344 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Fri, 12. Apr. 2019,07:52:58 am
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
7.940	PBA	1417055.0	23.9827	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.960	PBA	443367.1	25.2066	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.960	PBA	180205.1	5.0000	CLO4-89-ISTD

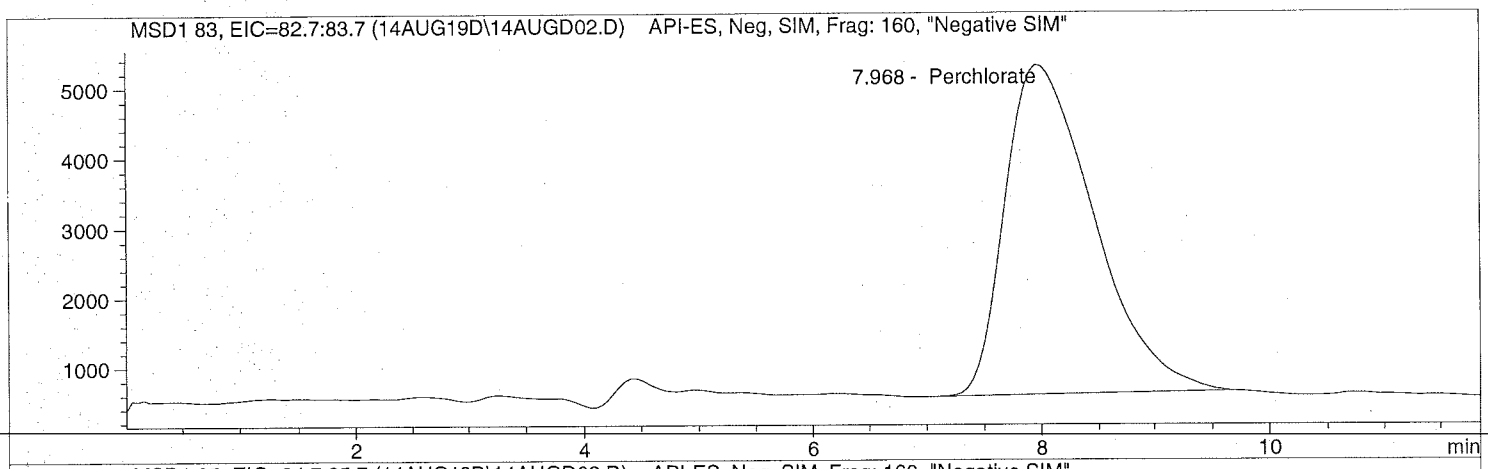
*** End of Report ***

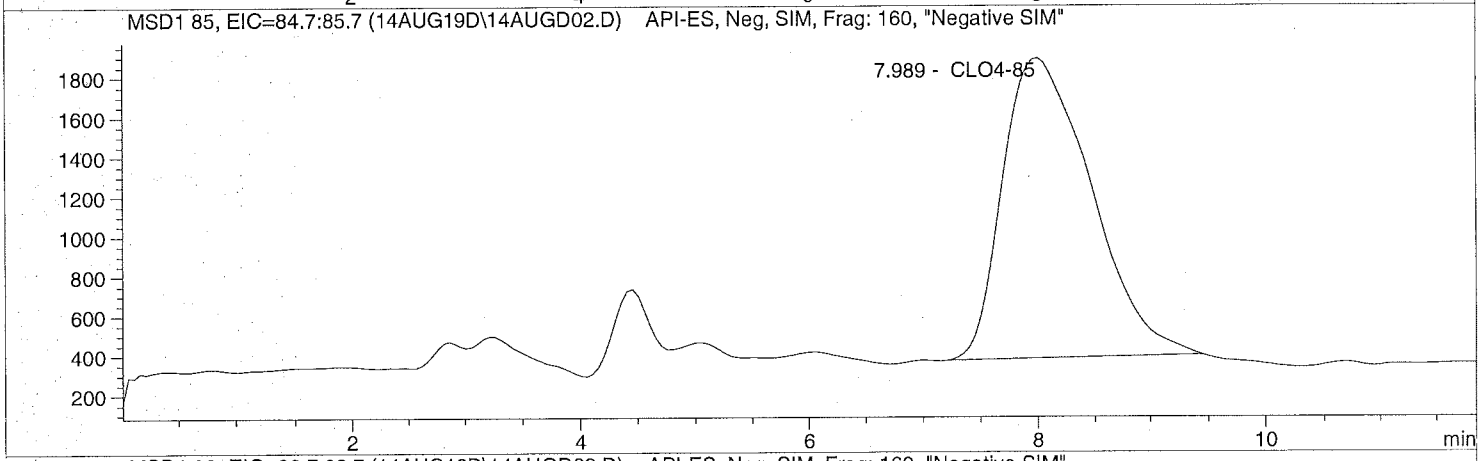
Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD02.D Sample Name: 668348 QC@4.0

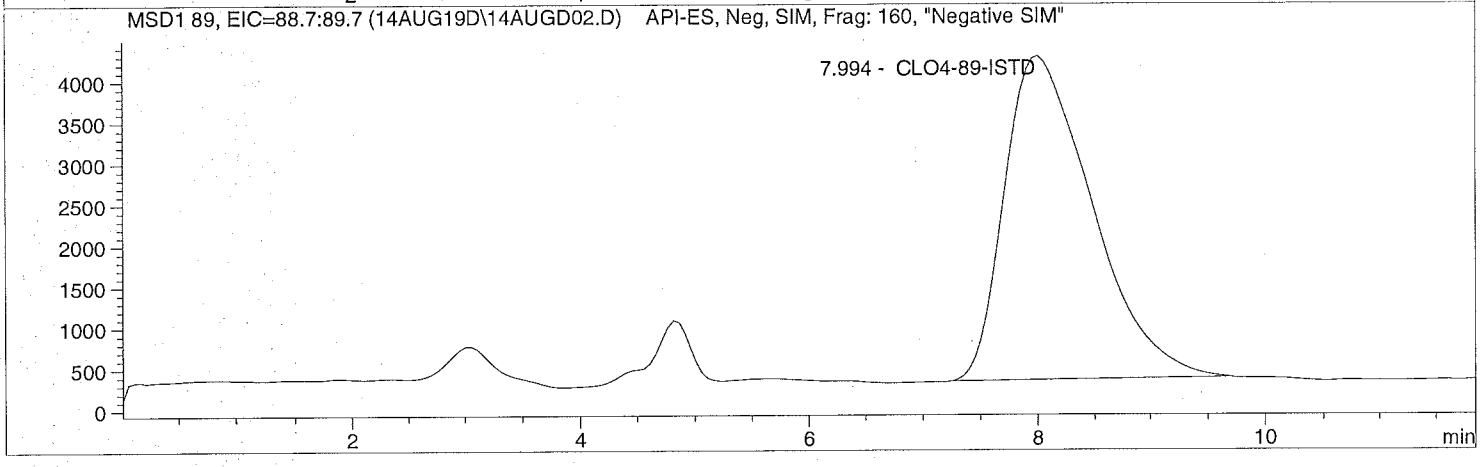
Injection Date:	8/14/2019 08:43:08	Seq Line:	2
Sample Name:	668348 QC@4.0	Location:	Vial 72
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD02.D Sample Name: 668348 QC@4.0

Injection Date:	8/14/2019 08:43:08	Seq Line:	2
Sample Name:	668348 QC@4.0	Location:	Vial 72
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Fri, 12. Apr. 2019,07:52:58 am
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	4.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.968	PBA	254232.1	4.0006	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.989	PBA	81271.6	4.1562	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.994	PBA	209395.8	5.0000	CLO4-89-ISTD

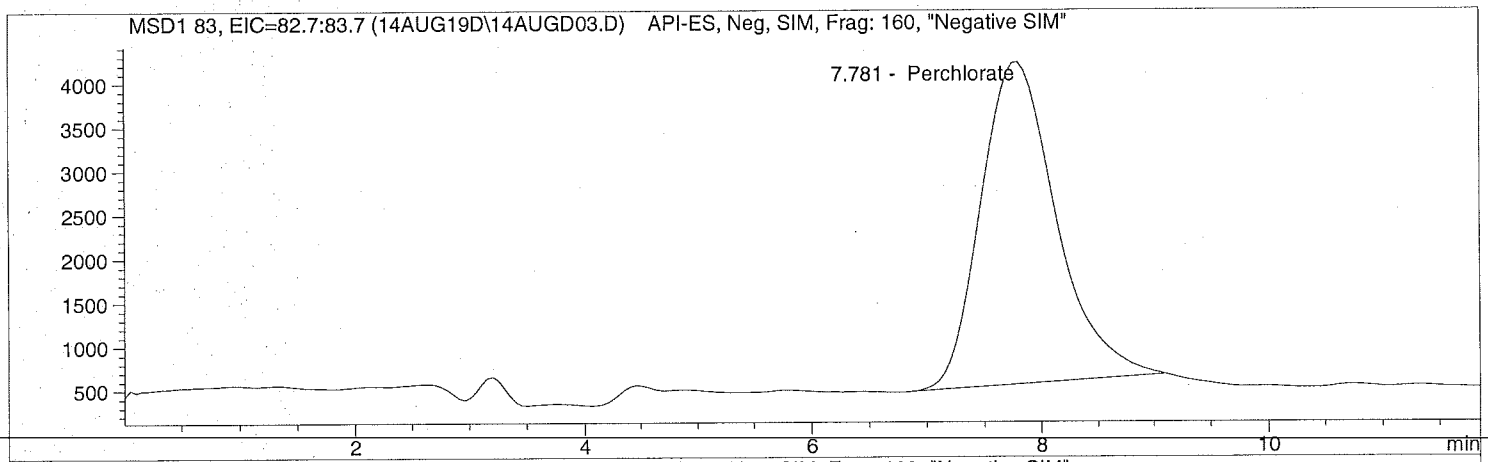
*** End of Report ***

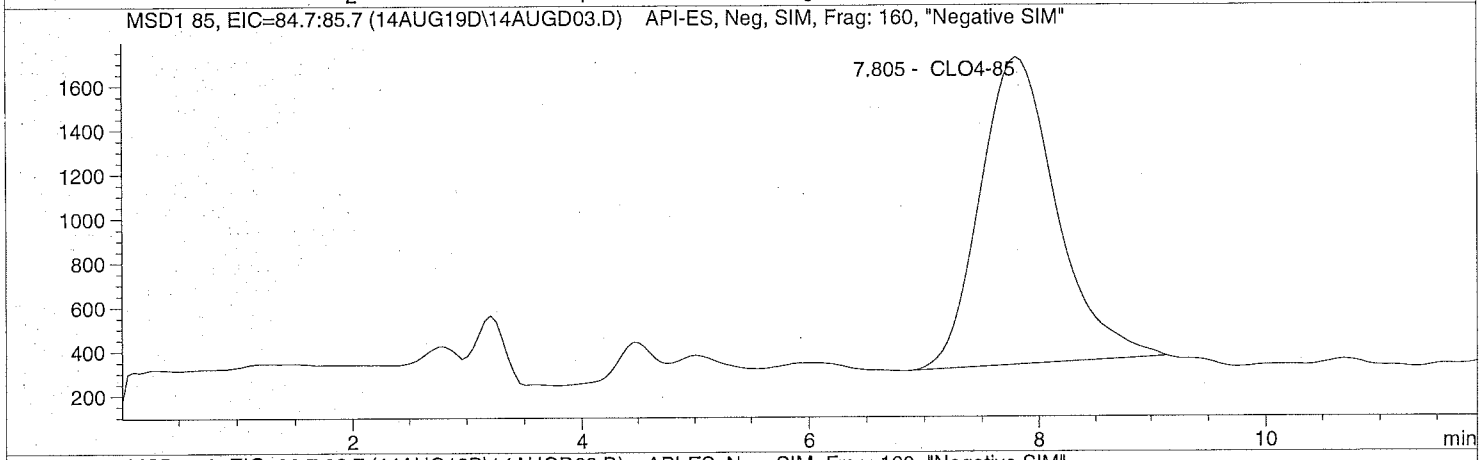
Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD03.D Sample Name: 668346 ICS@4.0

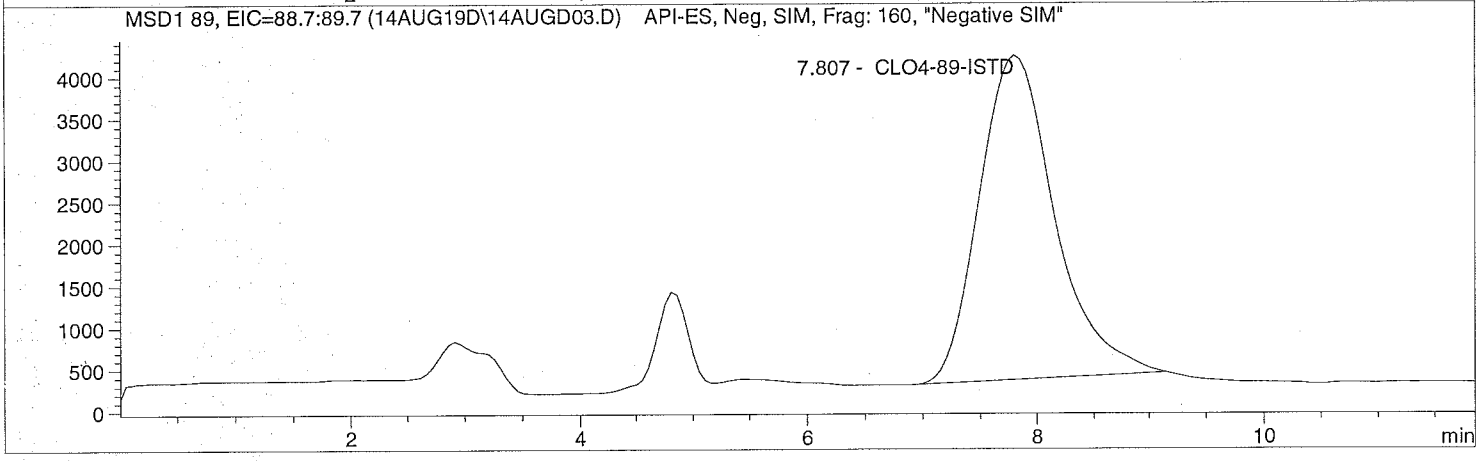
Injection Date:	8/14/2019 08:57:20	Seq Line:	3
Sample Name:	668346 ICS@4.0	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD03.D Sample Name: 668346 ICS@4.0

Injection Date:	8/14/2019 08:57:20	Seq Line:	3
Sample Name:	668346 ICS@4.0	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Fri, 12. Apr. 2019,07:52:58 am
Multiplier:	1.000000
Dilution:	1.000000
Sample Amount:	4.000

LCMS Results

Signal1: MSD1 83, EIC=82.7:83.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.781	PBA	169005.6	3.1613	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.805	PBA	64727.2	3.8866	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.807	PBA	178426.7	5.0000	CLO4-89-ISTD

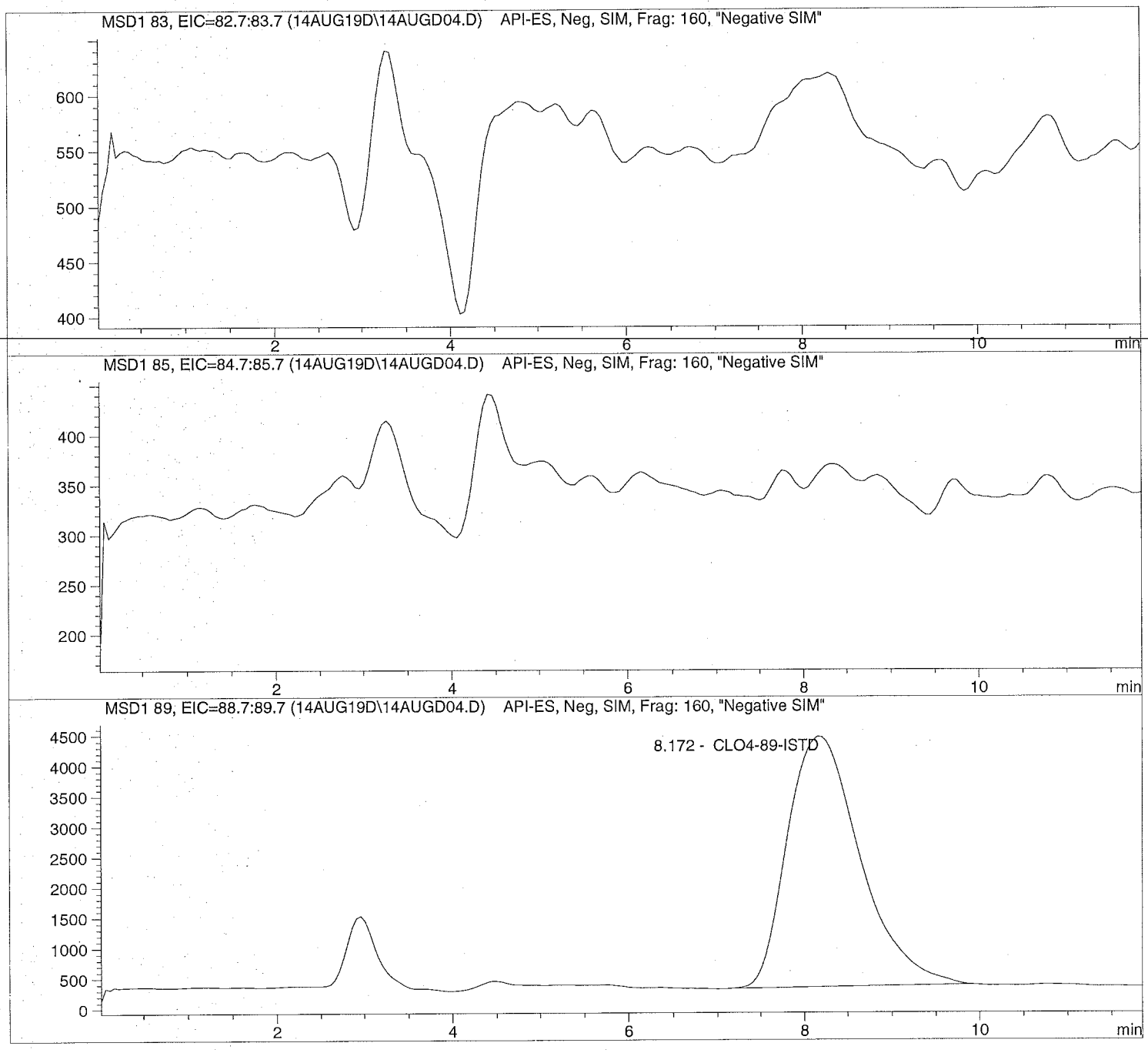
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD04.D Sample Name: 668347 LMB

Injection Date:	8/14/2019 09:11:36	Seq Line:	4
Sample Name:	668347 LMB	Location:	Vial 74
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD04.D Sample Name: 668347 LMB

Injection Date:	8/14/2019 09:11:36	Seq Line:	4
Sample Name:	668347 LMB	Location:	Vial 74
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Fri, 12. Apr. 2019,07:52:58 am
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
8.172	PBA	239408.7	5.0000	CLO4-89-ISTD

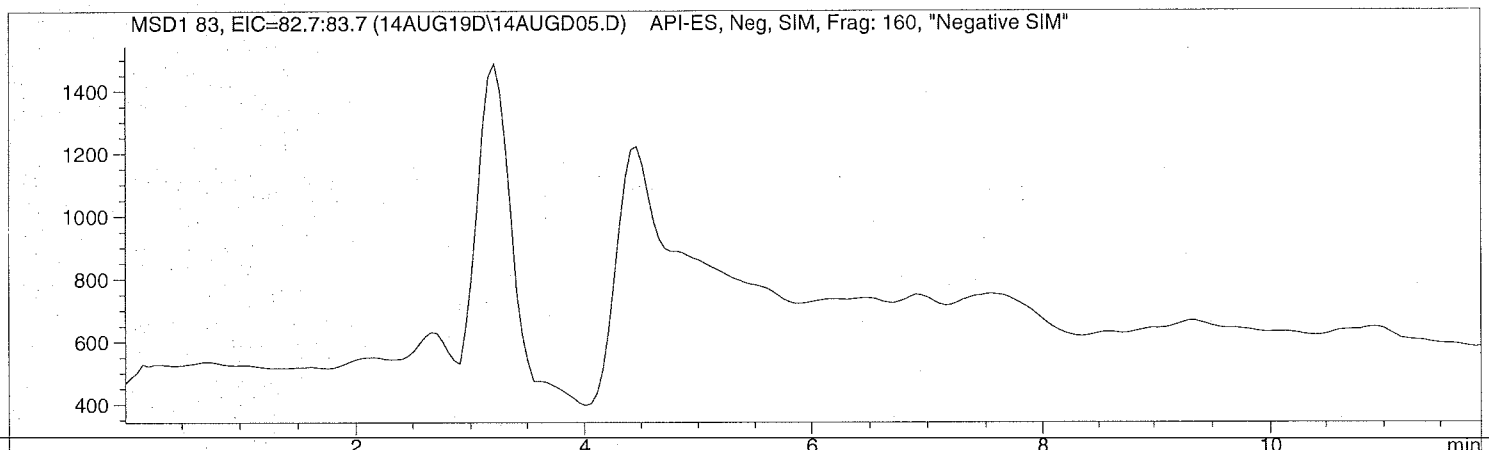
*** End of Report ***

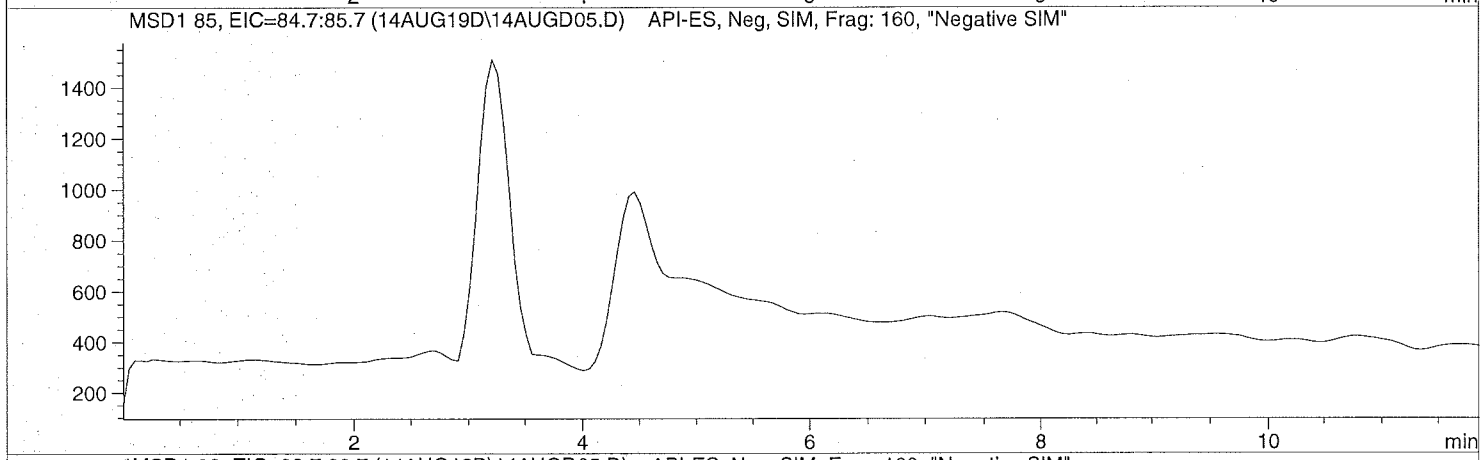
Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD05.D Sample Name: 1922027001

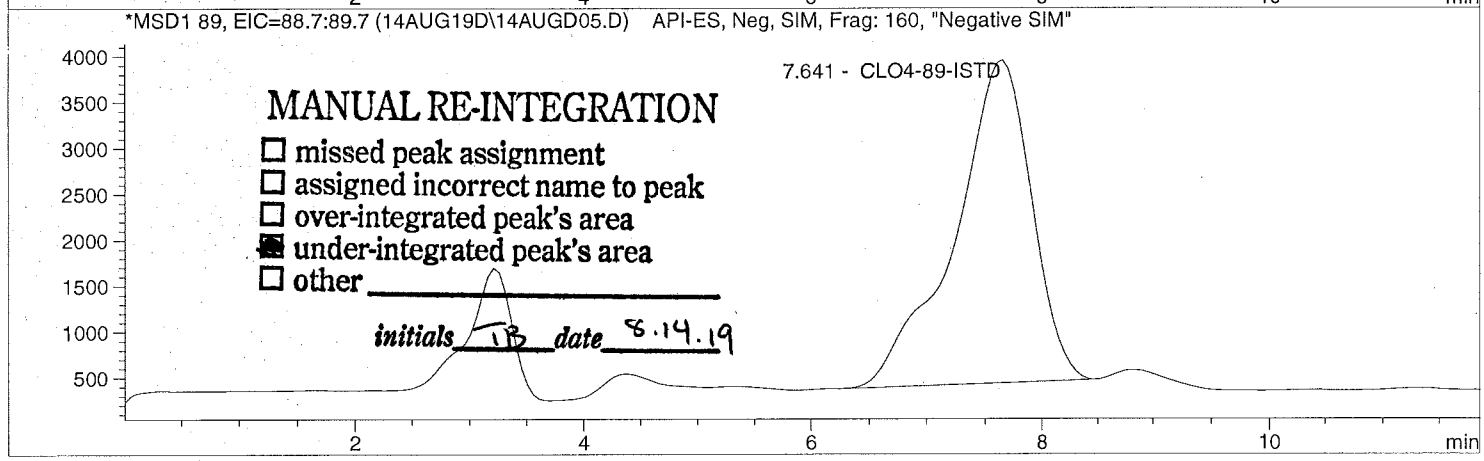
Injection Date:	8/14/2019 09:25:46	Seq Line:	5
Sample Name:	1922027001	Location:	Vial 75
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

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* 8.14.19

Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD05.D Sample Name: 1922027001

Injection Date:	8/14/2019 09:25:46	Seq Line:	5
Sample Name:	1922027001	Location:	Vial 75
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Fri, 12. Apr. 2019,07:52:58 am
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
7.641	MM	162744.4	5.0000	CLO4-89-ISTD

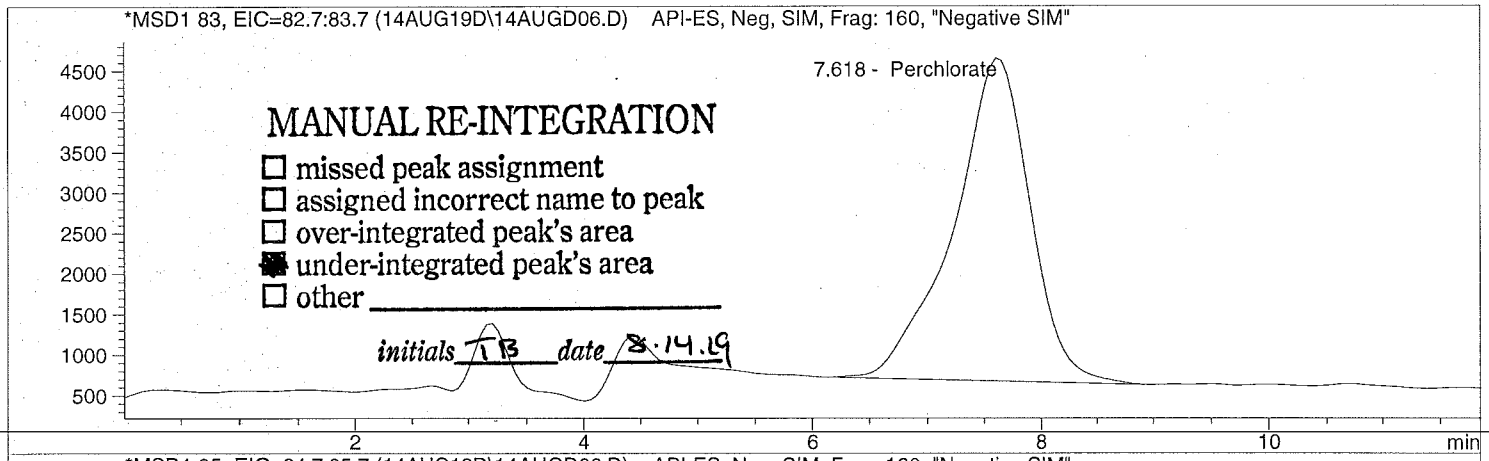
*** End of Report ***

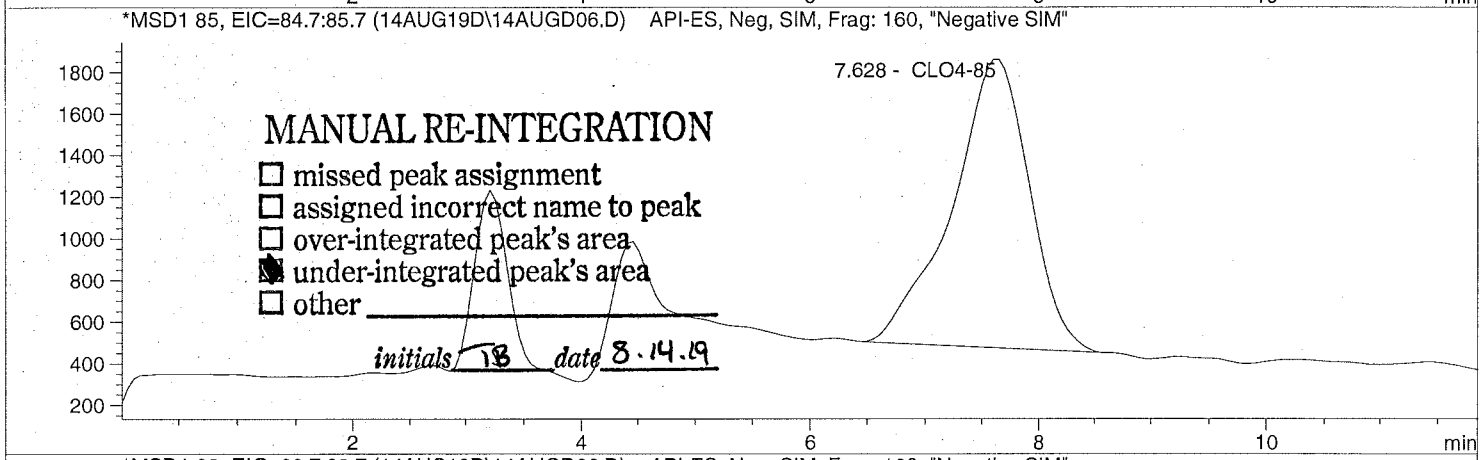
Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD06.D Sample Name: 668349 220271S

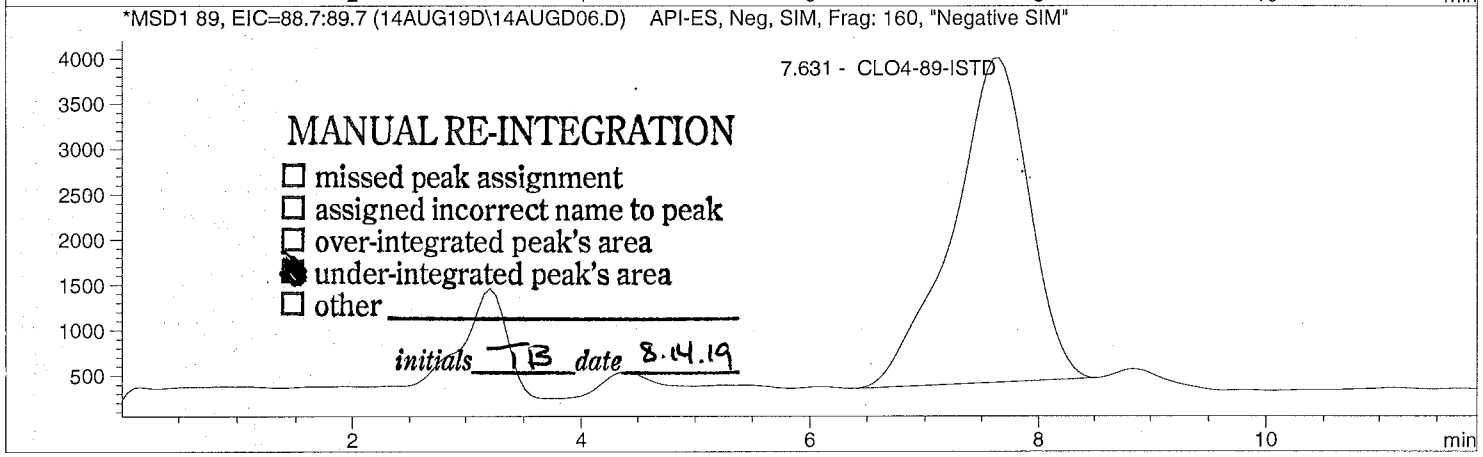
Injection Date:	8/14/2019 09:39:59	Seq Line:	6
Sample Name:	668349 220271S	Location:	Vial 76
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD06.D Sample Name: 668349 220271S

Injection Date:	8/14/2019 09:39:59	Seq Line:	6
Sample Name:	668349 220271S	Location:	Vial 76
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Fri, 12. Apr. 2019,07:52:58 am
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
7.618	MM	185324.7	3.6879	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.628	MM	65179.4	4.1973	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.631	MM	166279.3	5.0000	CLO4-89-ISTD

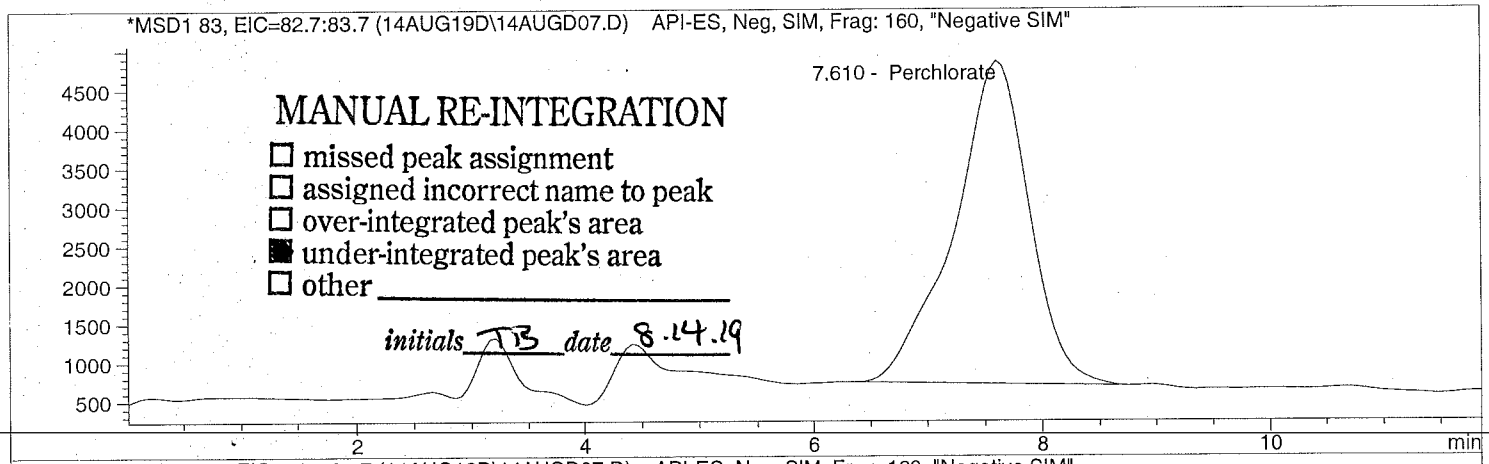
*** End of Report ***

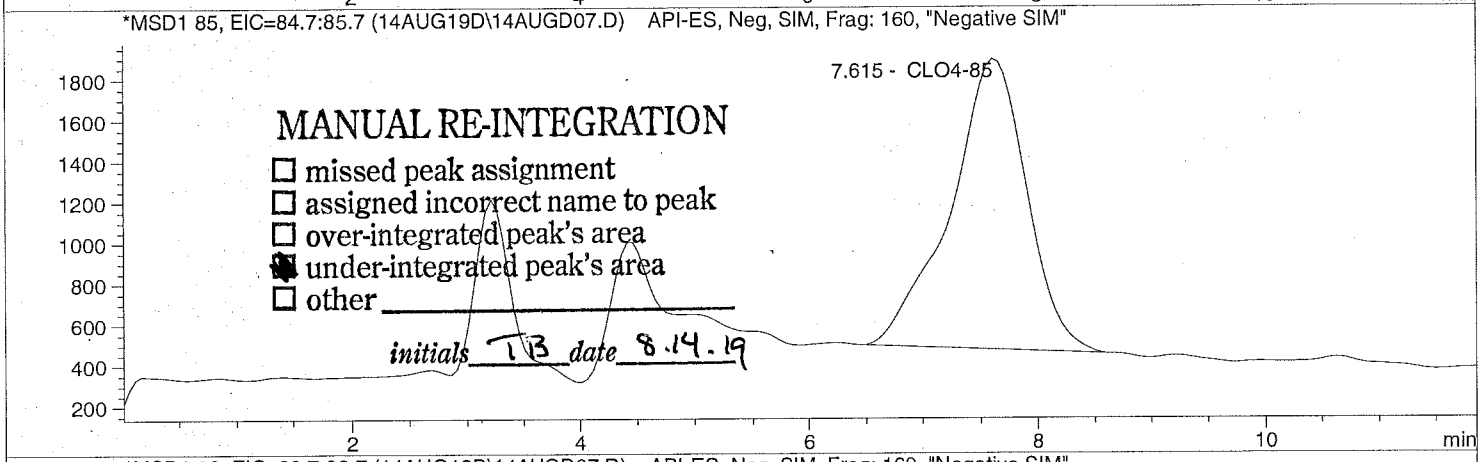
Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD07.D Sample Name: 668350 220271D

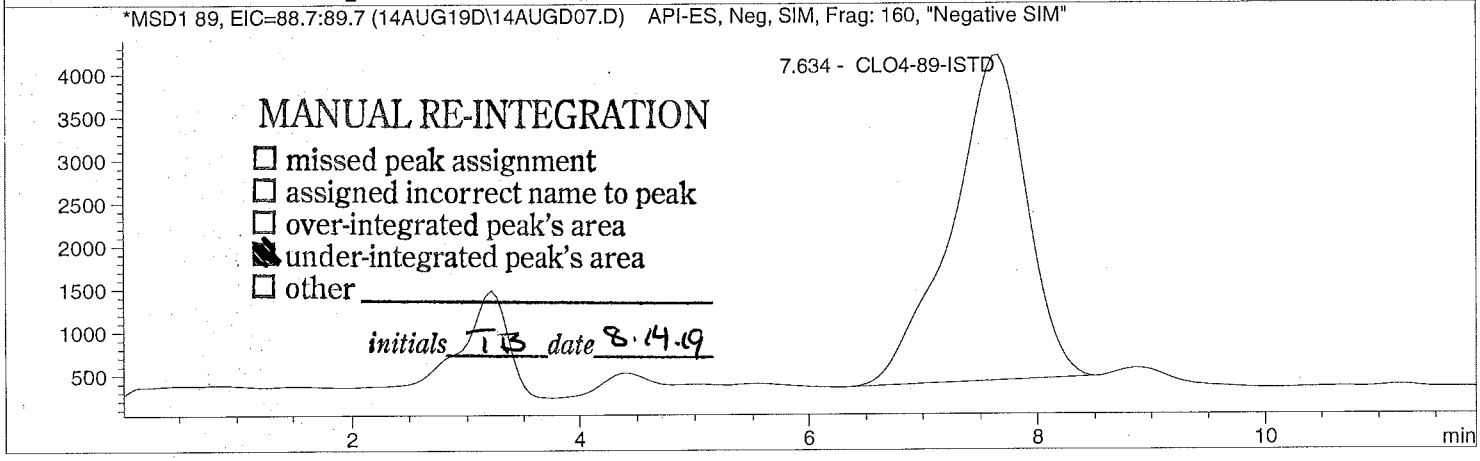
Injection Date:	8/14/2019 09:54:13	Seq Line:	7
Sample Name:	668350 220271D	Location:	Vial 77
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD07.D Sample Name: 668350 220271D

Injection Date:	8/14/2019 09:54:13	Seq Line:	7
Sample Name:	668350 220271D	Location:	Vial 77
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Fri, 12. Apr. 2019,07:52:58 am
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
7.610	MM	187102.7	3.6290	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.615	MM	65317.5	4.0970	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.634	MM	170742.6	5.0000	CLO4-89-ISTD

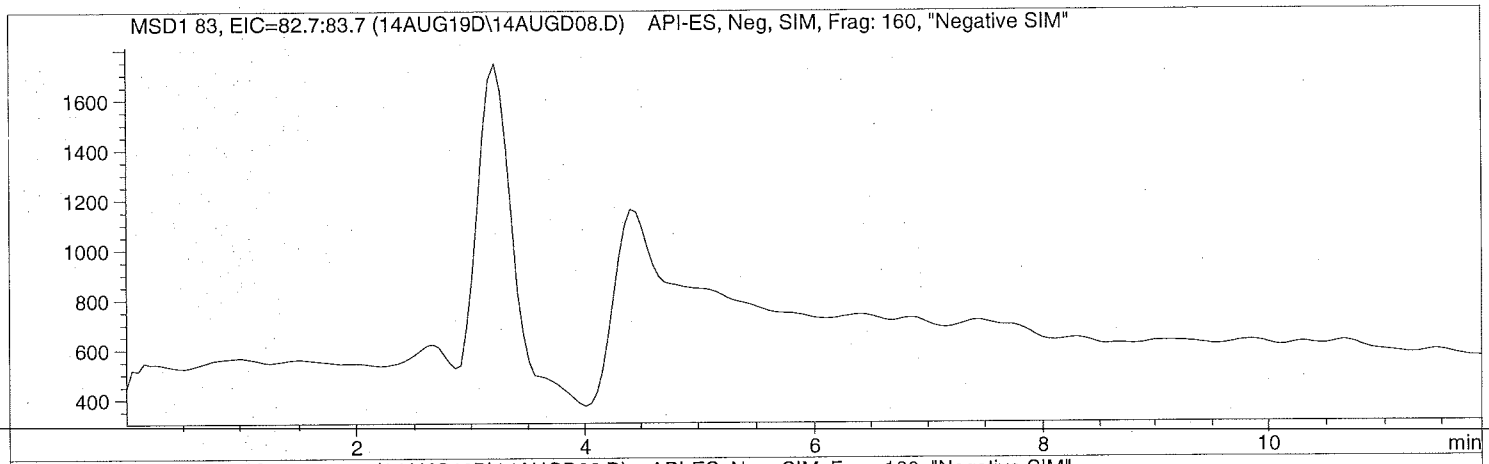
*** End of Report ***

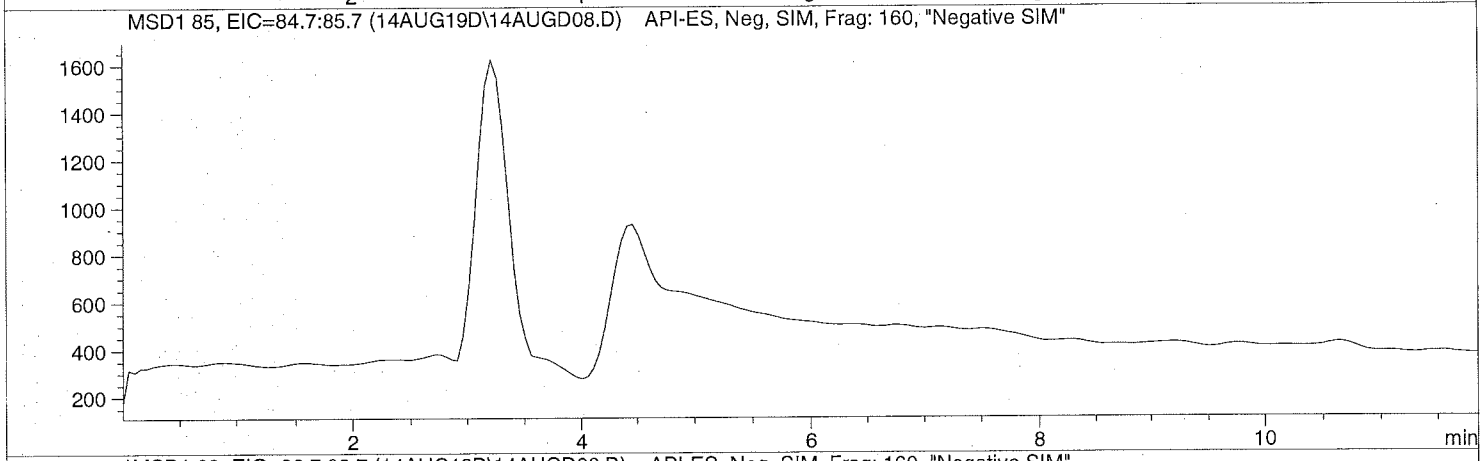
Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD08.D Sample Name: 1922715001

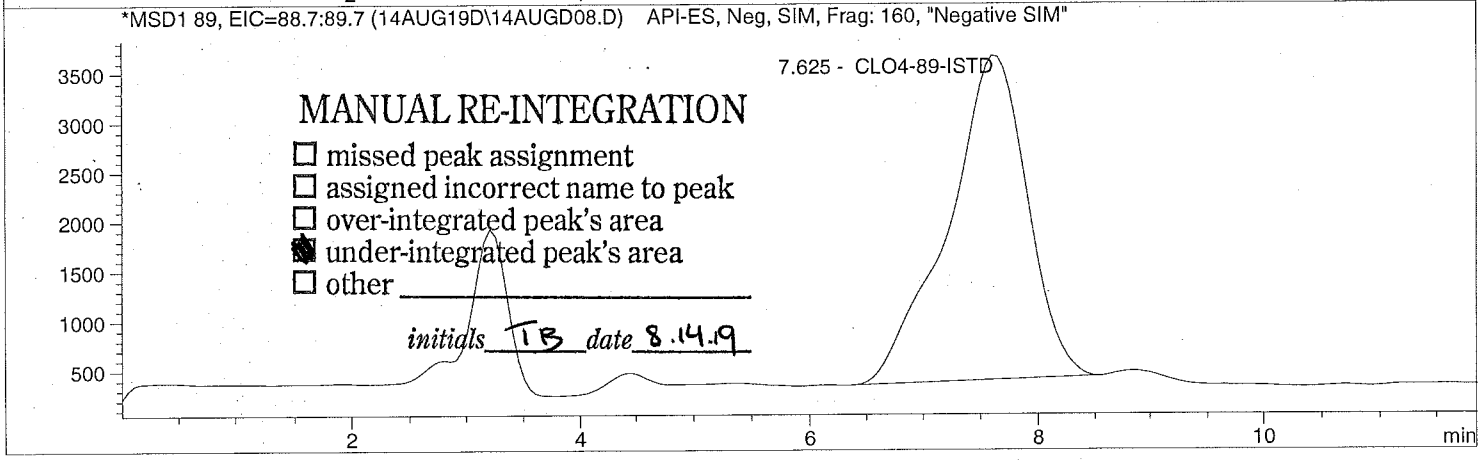
Injection Date:	8/14/2019 10:08:31	Seq Line:	8
Sample Name:	1922715001	Location:	Vial 78
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

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* 8.14.19

Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD08.D Sample Name: 1922715001

Injection Date:	8/14/2019 10:08:31	Seq Line:	8
Sample Name:	1922715001	Location:	Vial 78
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Fri, 12. Apr. 2019,07:52:58 am
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
7.625	MM	155455.2	5.0000	CLO4-89-ISTD

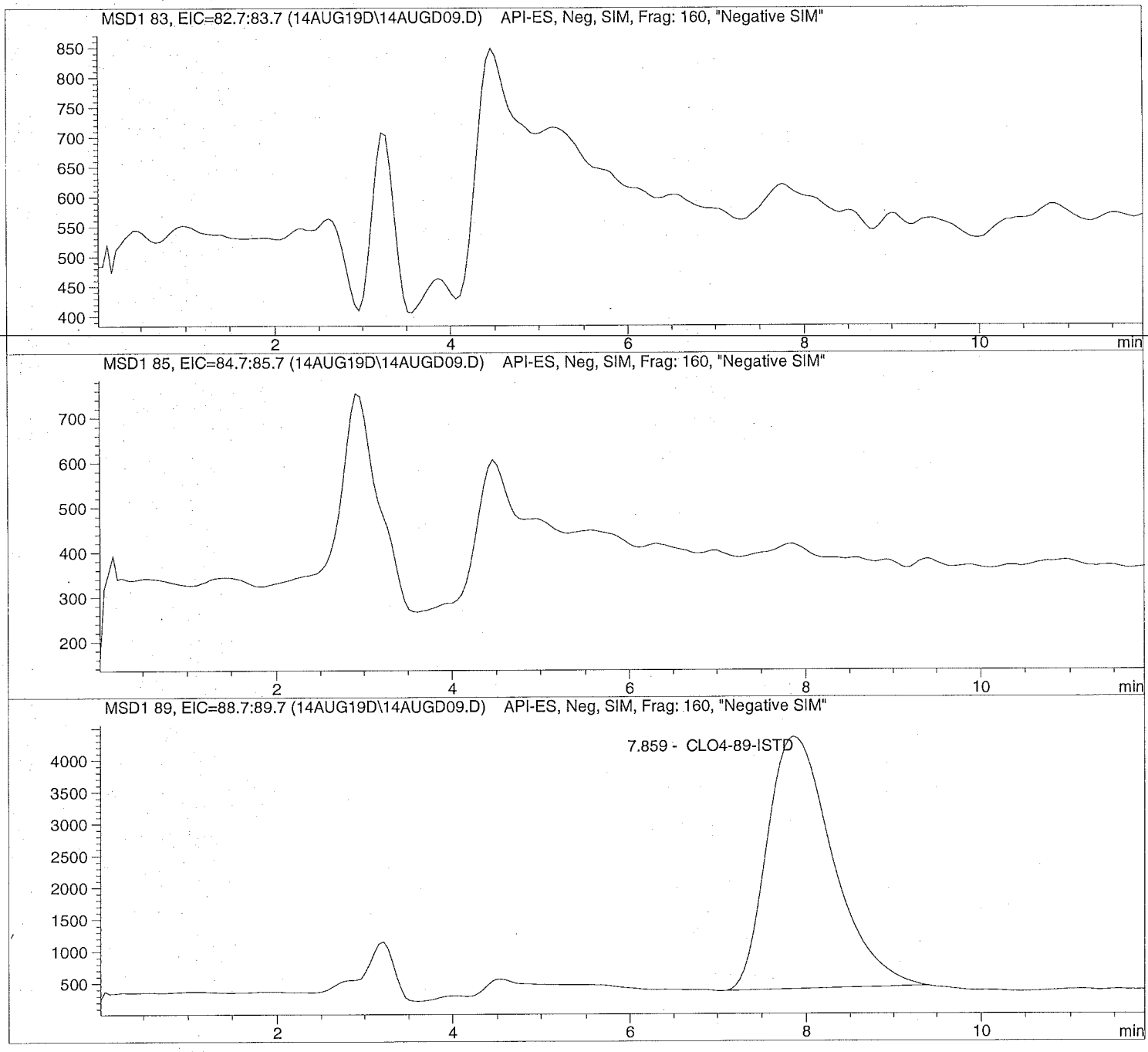
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD09.D Sample Name: 1923027001

Injection Date:	8/14/2019 10:22:43	Seq Line:	9
Sample Name:	1923027001	Location:	Vial 79
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD09.D Sample Name: 1923027001

Injection Date:	8/14/2019 10:22:43	Seq Line:	9
Sample Name:	1923027001	Location:	Vial 79
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Fri, 12. Apr. 2019,07:52:58 am
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
7.859	PBA	203712.1	5.0000	CLO4-89-ISTD

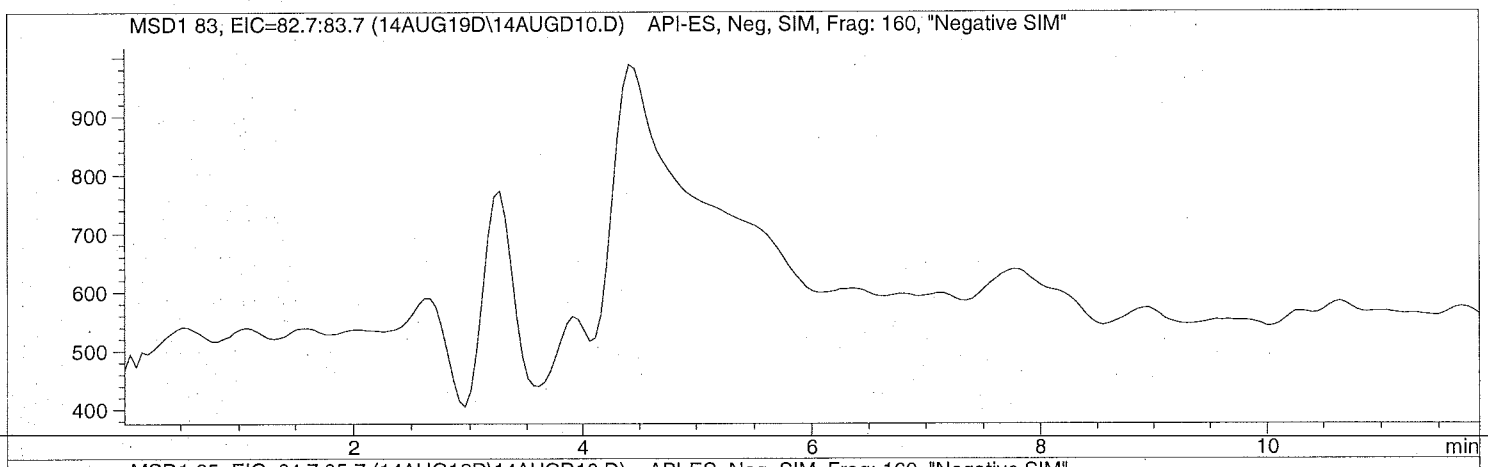
*** End of Report ***

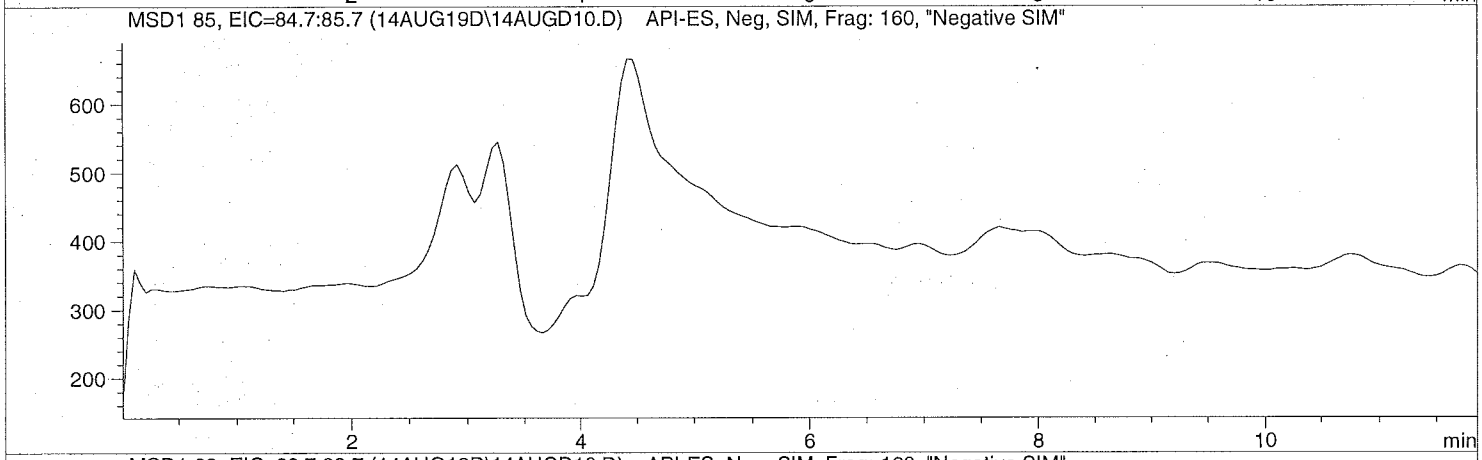
Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD10.D Sample Name: 1923027002

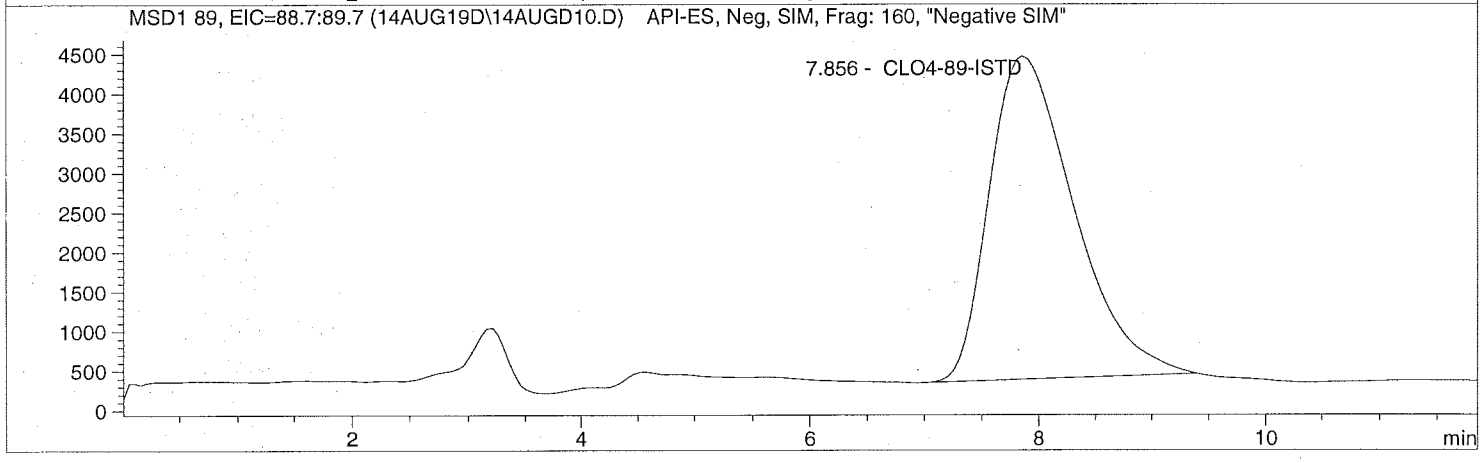
Injection Date:	8/14/2019 10:36:56	Seq Line:	10
Sample Name:	1923027002	Location:	Vial 80
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD10.D Sample Name: 1923027002

Injection Date:	8/14/2019 10:36:56	Seq Line:	10
Sample Name:	1923027002	Location:	Vial 80
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Fri, 12. Apr. 2019,07:52:58 am
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
7.856	PBA	210021.3	5.0000	CLO4-89-ISTD

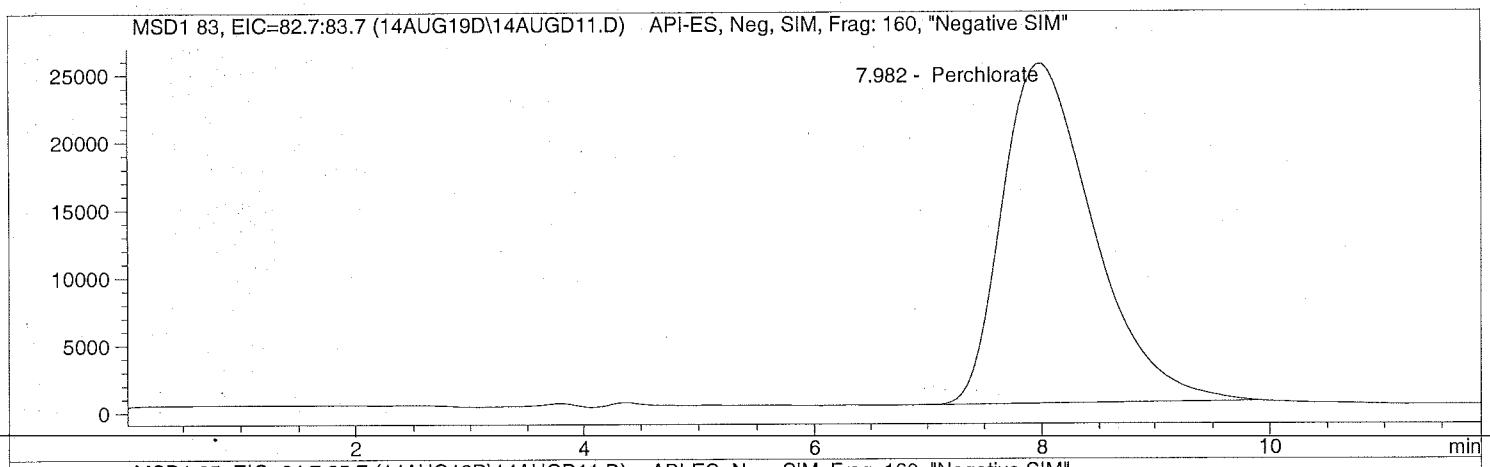
*** End of Report ***

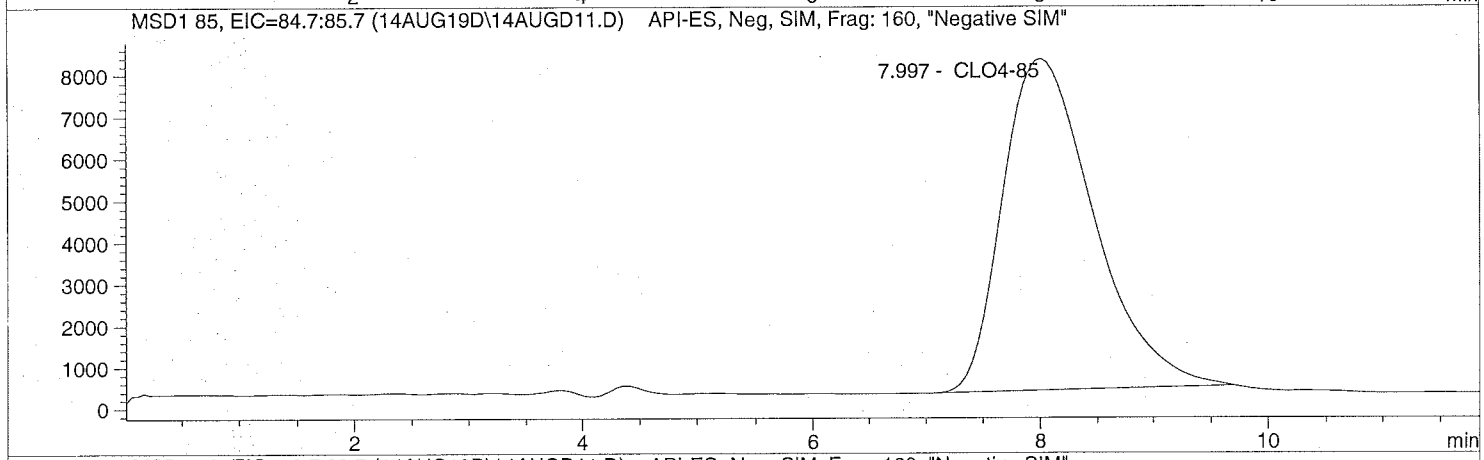
Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD11.D Sample Name: 668351 CCV@25

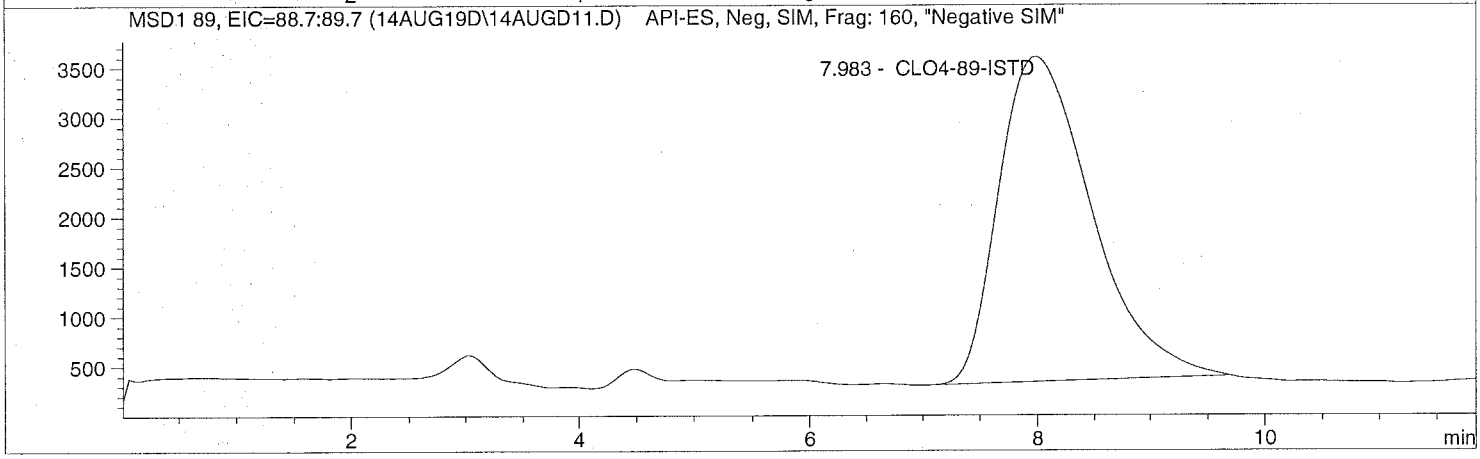
Injection Date:	8/14/2019 10:55:23	Seq Line:	11
Sample Name:	668351 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD11.D Sample Name: 668351 CCV@25

Injection Date:	8/14/2019 10:55:23	Seq Line:	11
Sample Name:	668351 CCV@25	Location:	Vial 71
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Fri, 12. Apr. 2019,07:52:58 am
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
7.982	PBA	1389218.6	23.0642	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.997	PBA	440722.5	24.5580	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.983	PBA	184111.7	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 : 3/19/2019 2:35:19 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]	Sig	Lvl	Amount	Area	Amt/Area	Ref	Grp	Name
8.744	1	1	1.00000	7.76074e4	1.28854e-5		1	Perchlorate
		2	2.00000	1.35273e5	1.47849e-5			
		3	5.00000	3.37764e5	1.48033e-5			
		4	10.00000	6.83454e5	1.46316e-5			
		5	25.00000	2.08433e6	1.19943e-5			
		6	50.00000	4.13334e6	1.20968e-5			
		7	75.00000	5.99313e6	1.25143e-5			
8.755	2	1	1.00000	2.36780e4	4.22333e-5		1	CLO4-85
		2	2.00000	4.69486e4	4.25998e-5			
		3	5.00000	1.06124e5	4.71147e-5			
		4	10.00000	2.13523e5	4.68335e-5			
		5	25.00000	6.14295e5	4.06971e-5			
		6	50.00000	1.19814e6	4.17315e-5			
		7	75.00000	1.78355e6	4.20509e-5			
8.766	3	1	5.00000	2.73208e5	1.83011e-5	+I1		CLO4-89-ISTD
		2	5.00000	2.24886e5	2.22335e-5			
		3	5.00000	2.33196e5	2.14412e-5			
		4	5.00000	2.34454e5	2.13262e-5			
		5	5.00000	2.50568e5	1.99547e-5			
		6	5.00000	2.30977e5	2.16472e-5			

RetTime [min]	Lvl	Amount	Area	Amt/Area	Ref	Grp	Name	Sig
	7	5.00000	2.21504e5	2.25729e-5				

More compound-specific settings:

Compound: Perchlorate
- Time Window : From 6.654 min To 12.544 min
- Curve Type : Quadratic
- Origin : Ignored
- Calibration Level Weights:/
  - Level 1 : 1
  - Level 2 : 0.5
  - Level 3 : 0.2
  - Level 4 : 0.1
  - Level 5 : 0.04
  - Level 6 : 0.02
  - Level 7 : 0.013333

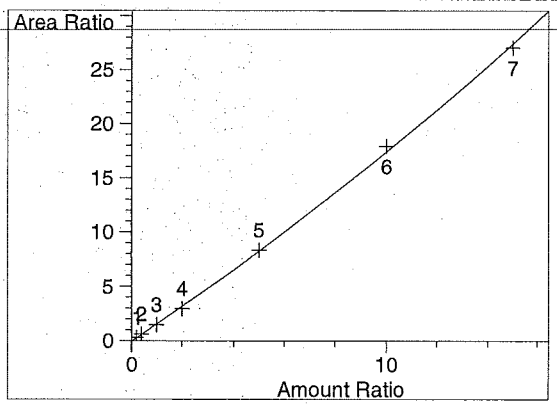
Compound: CLO4-85
- Time Window : From 6.650 min To 12.505 min
- Curve Type : Quadratic
- Origin : Ignored
- Calibration Level Weights:/
  - Level 1 : 1
  - Level 2 : 0.5
  - Level 3 : 0.2
  - Level 4 : 0.1
  - Level 5 : 0.04
  - Level 6 : 0.02
  - Level 7 : 0.013333

Compound: CLO4-89-ISTD
- Time Window : From 6.659 min To 12.466 min
- Curve Type : Linear
- Origin : Included
- Calibration Level Weights:/
  - Level 1 : 1
  - Level 2 : 1
  - Level 3 : 1
  - Level 4 : 1
  - Level 5 : 1
  - Level 6 : 1
  - Level 7 : 1

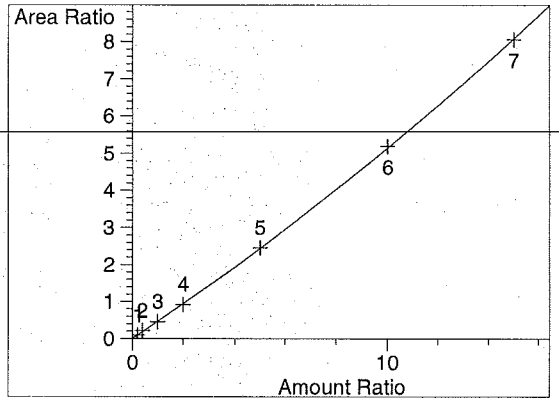
Peak Sum Table

No Entries in table

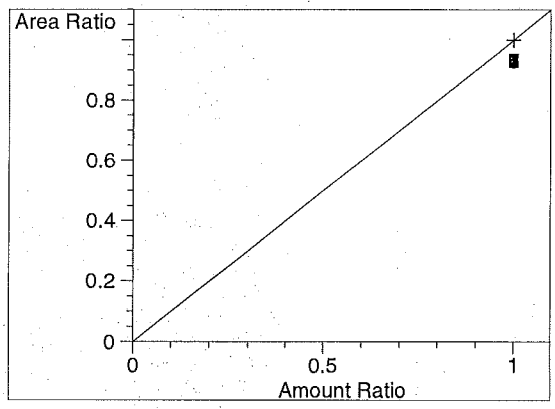
Calibration Curves



Perchlorate at exp. RT: 8.744
MSD1 83, EIC=82.7:83.7
Correlation: 0.99957
Residual Std. Dev.: 0.30744
Formula: $y = ax^2 + bx + c$
a: 1.76988e-2
b: 1.56480
c: -4.92430e-2
x: Amount Ratio
y: Area Ratio
Calibration Level Weights:
Level 1 : 1
Level 2 : 0.5
Level 3 : 0.2
Level 4 : 0.1
Level 5 : 0.04
Level 6 : 0.02
Level 7 : 0.013333



CLO4-85 at exp. RT: 8.755
MSD1 85, EIC=84.7:85.7
Correlation: 0.99983
Residual Std. Dev.: 0.03473
Formula: $y = ax^2 + bx + c$
a: 5.13396e-3
b: 4.62055e-1
c: 4.97209e-4
x: Amount Ratio
y: Area Ratio
Calibration Level Weights:
Level 1 : 1
Level 2 : 0.5
Level 3 : 0.2
Level 4 : 0.1
Level 5 : 0.04
Level 6 : 0.02
Level 7 : 0.013333



CLO4-89-ISTD at exp. RT: 8.766
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 1 : 1
Level 2 : 1
Level 3 : 1
Level 4 : 1
Level 5 : 1
Level 6 : 1
Level 7 : 1

Batch Review Method:
C:\HPCHEM\1\METHODS\CLO4-DP2.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	7.76074e4	8.744	1.06245
#*	CLO4@ 2.0ug/L	Vial 74	1	Control	4	1.35273e5	8.992	2.06969
#*	CLO4@ 5.0ug/L	Vial 75	1	Control	5	3.37764e5	8.586	4.73474
#*	CLO4@ 10.ug/L	Vial 76	1	Control	6	6.83454e5	8.698	9.27727
#*	CLO4@ 25.ug/L	Vial 77	1	Control	7	2.08433e6	8.451	25.29036
#*	CLO4@ 50.ug/L	Vial 78	1	Control	8	4.13334e6	8.810	51.36844
#*	CLO4@ 75.ug/L	Vial 79	1	Control	9	5.99313e6	8.586	74.16754
#*	ICAL Verf@10ug/L	Vial 80	1	Control	10	7.34719e5	8.702	9.25940

#	Sample	Location	Inj	SampleType	Run	CLO4-85 Area	CLO4-85 RT	CLO4-85 Amount
#*	CLO4@ 1.0ug/L	Vial 73	1	Control	3	2.36780e4	8.755	9.30535e-1
#*	CLO4@ 2.0ug/L	Vial 74	1	Control	4	4.69486e4	9.012	2.24255
#*	CLO4@ 5.0ug/L	Vial 75	1	Control	5	1.06124e5	8.602	4.86656
#*	CLO4@ 10.ug/L	Vial 76	1	Control	6	2.13523e5	8.713	9.64312
#*	CLO4@ 25.ug/L	Vial 77	1	Control	7	6.14295e5	8.468	25.12159
#*	CLO4@ 50.ug/L	Vial 78	1	Control	8	1.19814e6	8.825	50.46721
#*	CLO4@ 75.ug/L	Vial 79	1	Control	9	1.78355e6	8.603	74.72019
#*	ICAL Verf@10ug/L	Vial 80	1	Control	10	2.27495e5	8.721	9.54024

#	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	2.73208e5	8.766	5.00000
#*	CLO4@ 2.0ug/L	Vial 74	1	Control	4	2.24886e5	9.012	5.00000
#*	CLO4@ 5.0ug/L	Vial 75	1	Control	5	2.33196e5	8.609	5.00000
#*	CLO4@ 10.ug/L	Vial 76	1	Control	6	2.34454e5	8.716	5.00000
#*	CLO4@ 25.ug/L	Vial 77	1	Control	7	2.50568e5	8.472	5.00000
#*	CLO4@ 50.ug/L	Vial 78	1	Control	8	2.30977e5	8.825	5.00000
#*	CLO4@ 75.ug/L	Vial 79	1	Control	9	2.21504e5	8.610	5.00000
#*	ICAL Verf@10ug/L	Vial 80	1	Control	10	2.52544e5	8.725	5.00000

*** End of Report ***

Sequence: C:\HPCHEM\1\SEQUENCE\CLO4\2019\MAR\19MAR19I.S

Sequence Table:

Method and Injection Info Part:

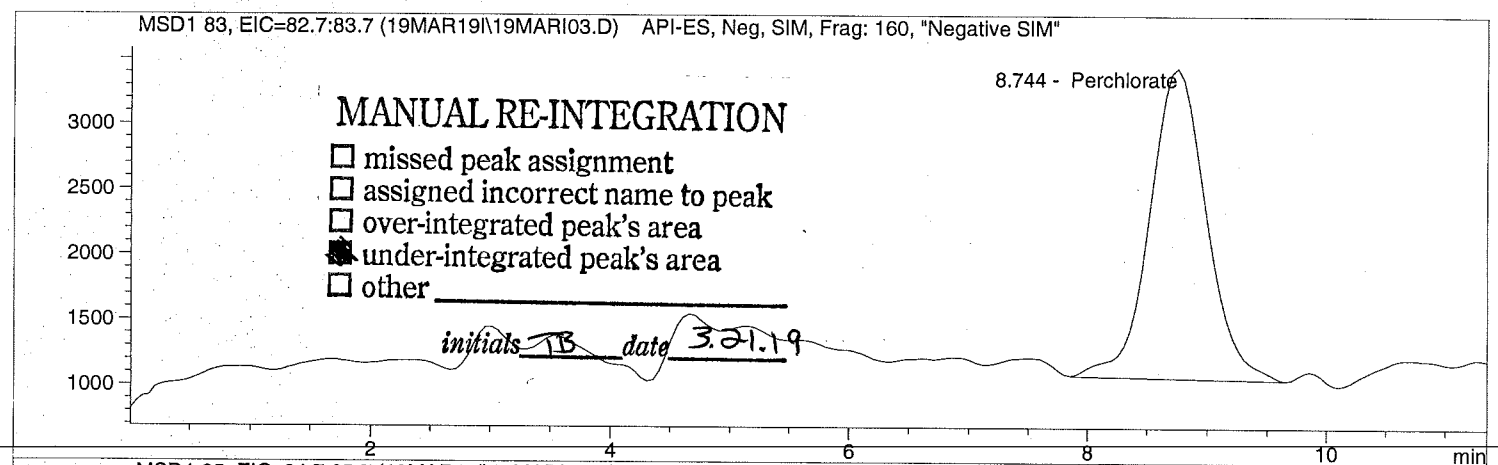
Line	Location	SampleName	Method	Inj	SampleType	InjVolume	DataFile
1	Vial 71	CLO4@ 0.2ug/L	CLO4-AQN	1	Ctrl Samp		
2	Vial 72	CLO4@ 0.5ug/L	CLO4-AQN	1	Ctrl Samp		
3	Vial 73	CLO4@ 1.0ug/L	CLO4-AQN	1	Ctrl Samp		
4	Vial 74	CLO4@ 2.0ug/L	CLO4-AQN	1	Ctrl Samp		
5	Vial 75	CLO4@ 5.0ug/L	CLO4-AQN	1	Ctrl Samp		
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 80	ICAL Verf@10ug/L	CLO4-AQN	1	Ctrl Samp		

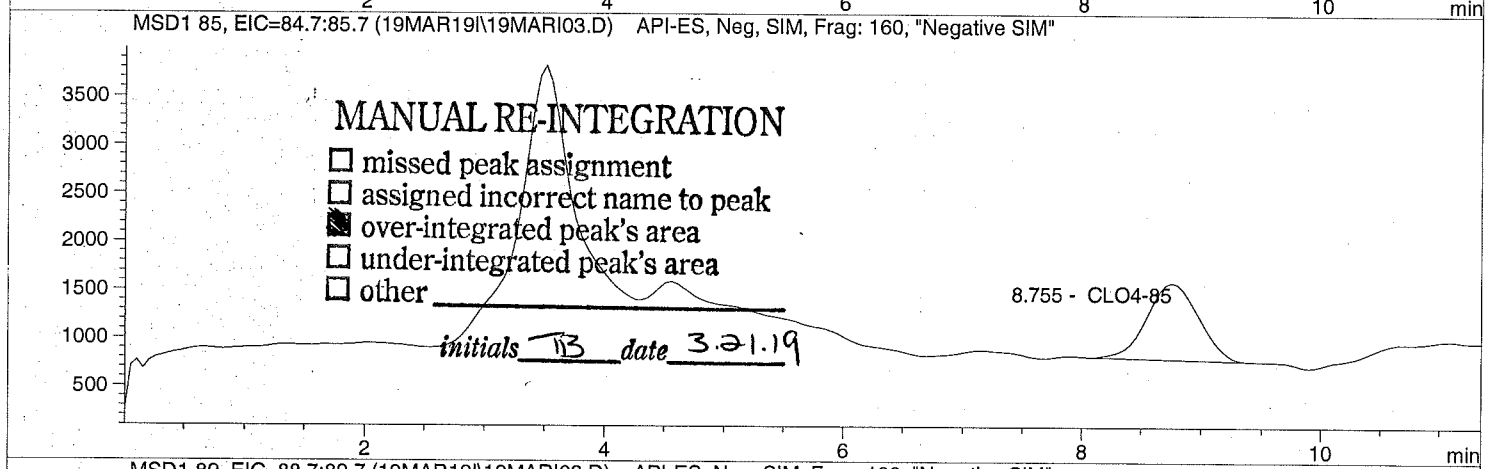
Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI03.D Sample Name: CLO4@ 1.0ug/L

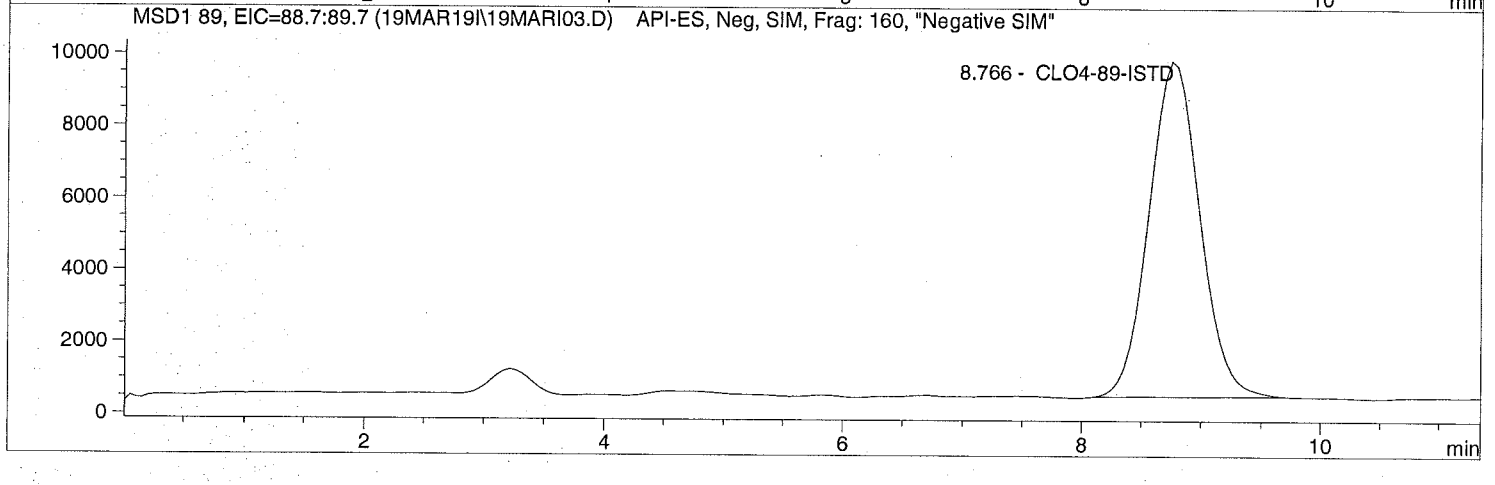
Injection Date:	3/19/2019 09:39:40	Seq Line:	3
Sample Name:	CLO4@ 1.0ug/L	Location:	Vial 73
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI03.D Sample Name: CLO4@ 1.0ug/L

Injection Date:	3/19/2019 09:39:40	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-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Tue, 19. Mar. 2019,02:35:19 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
8.744	MM	77607.4	1.0625	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.755	MM	23678.0	0.9305	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.766	BBA	273207.6	5.0000	CLO4-89-ISTD

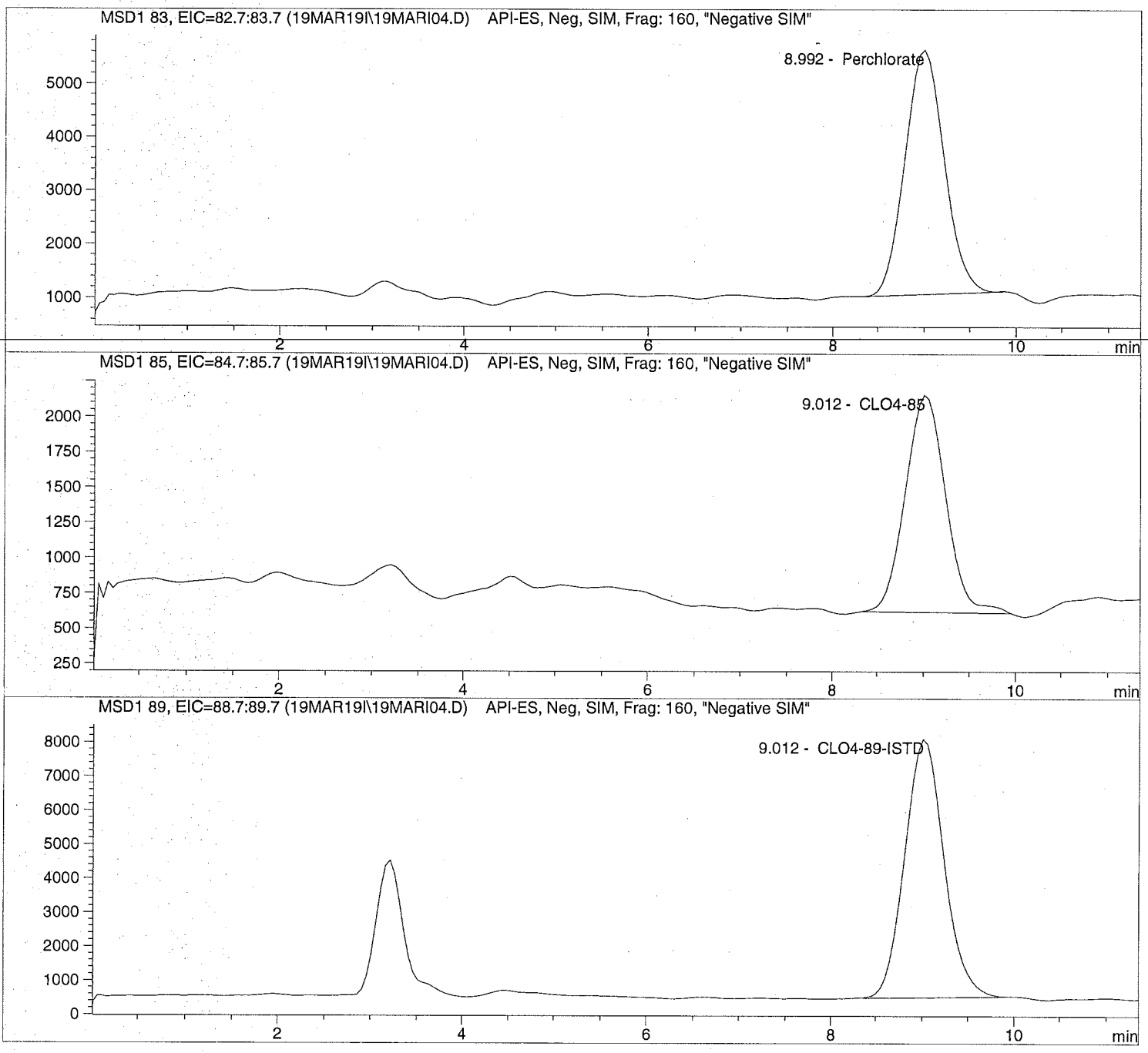
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI04.D Sample Name: CLO4@ 2.0ug/L

Injection Date:	3/19/2019 09:53:00	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-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI04.D Sample Name: CLO4@ 2.0ug/L

Injection Date:	3/19/2019 09:53:00	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-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Tue, 19. Mar. 2019,02:35:19 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
8.992	BBA	135272.8	2.0697	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
9.012	BBA	46948.6	2.2425	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
9.012	BBA	224885.9	5.0000	CLO4-89-ISTD

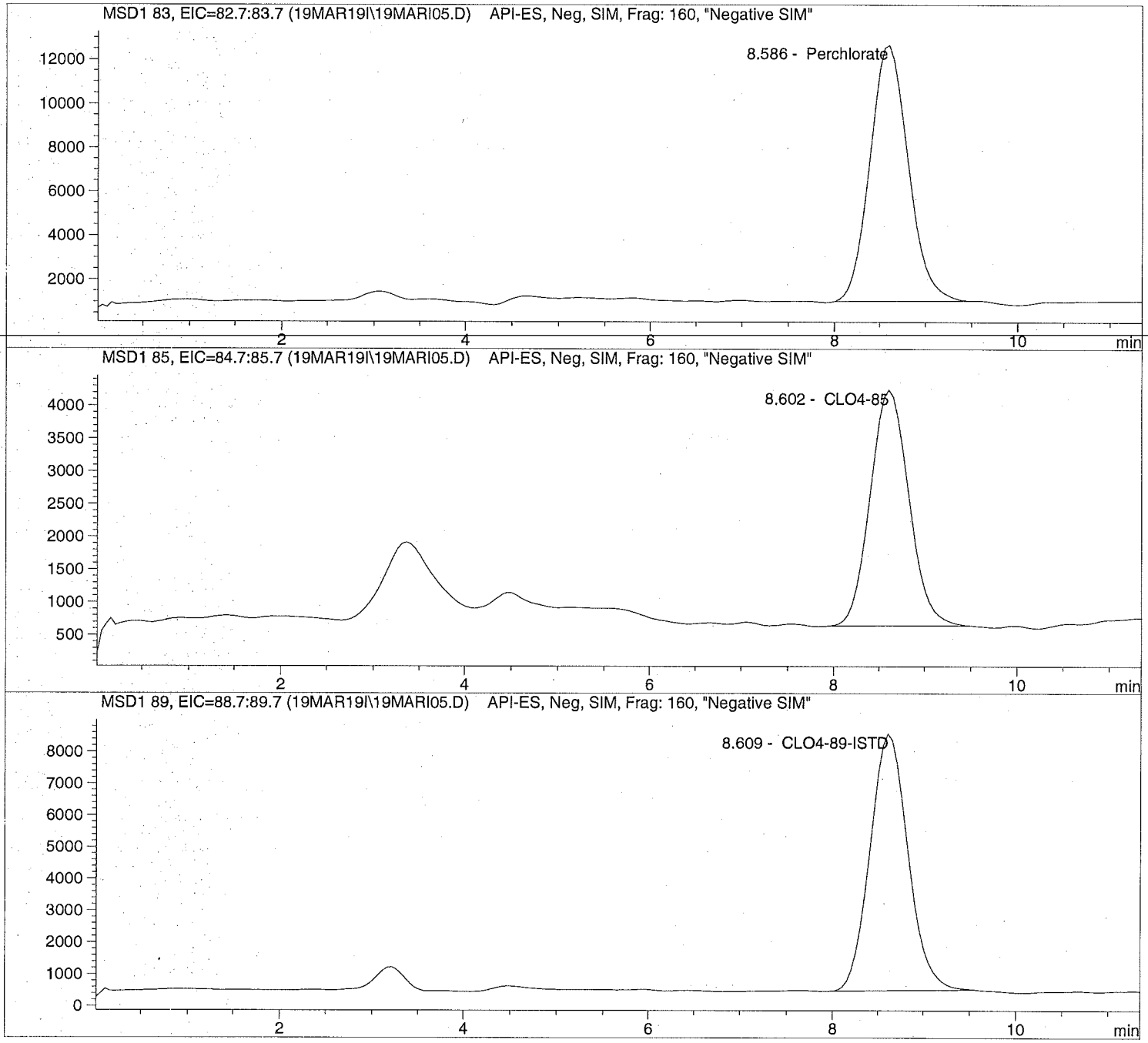
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI05.D Sample Name: CLO4@ 5.0ug/L

Injection Date:	3/19/2019 10:06:16	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-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI05.D Sample Name: CLO4@ 5.0ug/L

Injection Date:	3/19/2019 10:06:16	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-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Tue, 19. Mar. 2019,02:35:19 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
8.586	PBA	337763.6	4.7347	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.602	PBA	106124.0	4.8666	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.609	PBA	233196.3	5.0000	CLO4-89-ISTD

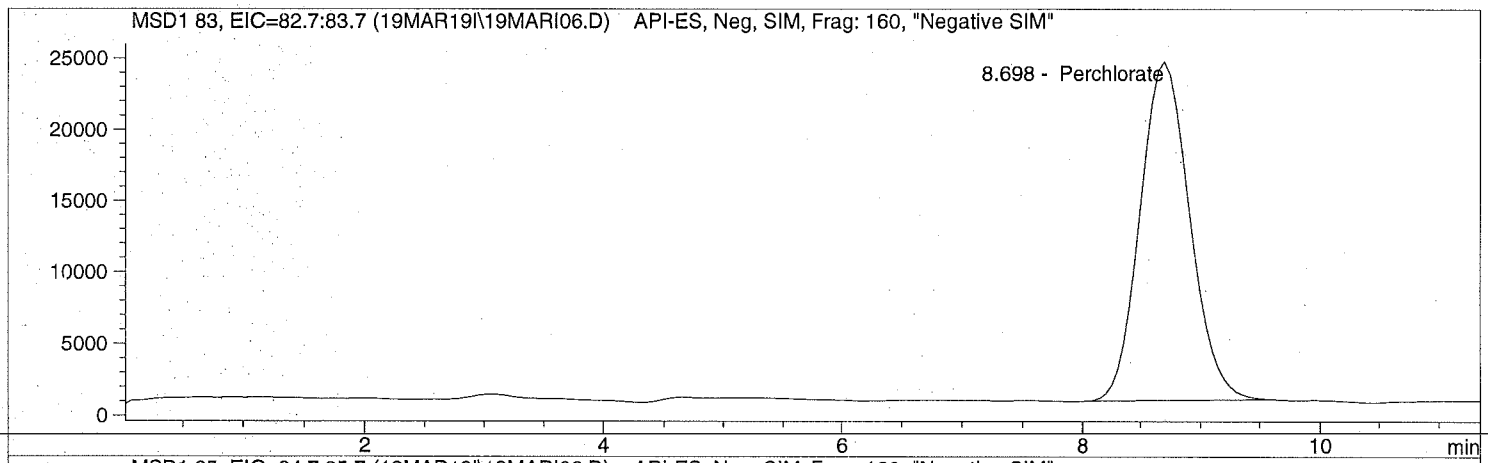
*** End of Report ***

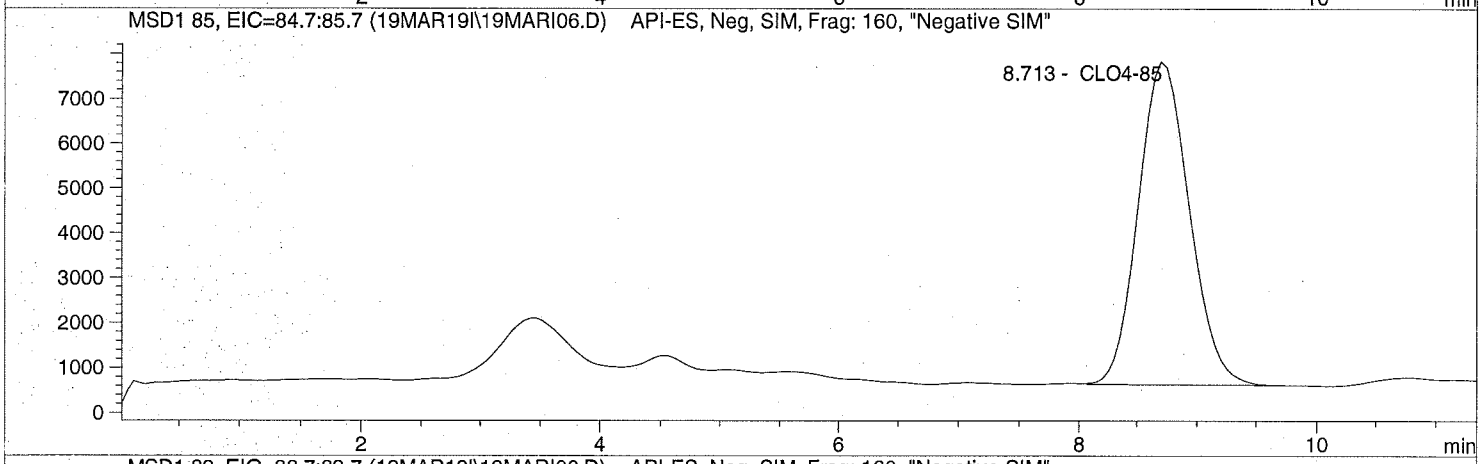
Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI06.D Sample Name: CLO4@ 10.ug/L

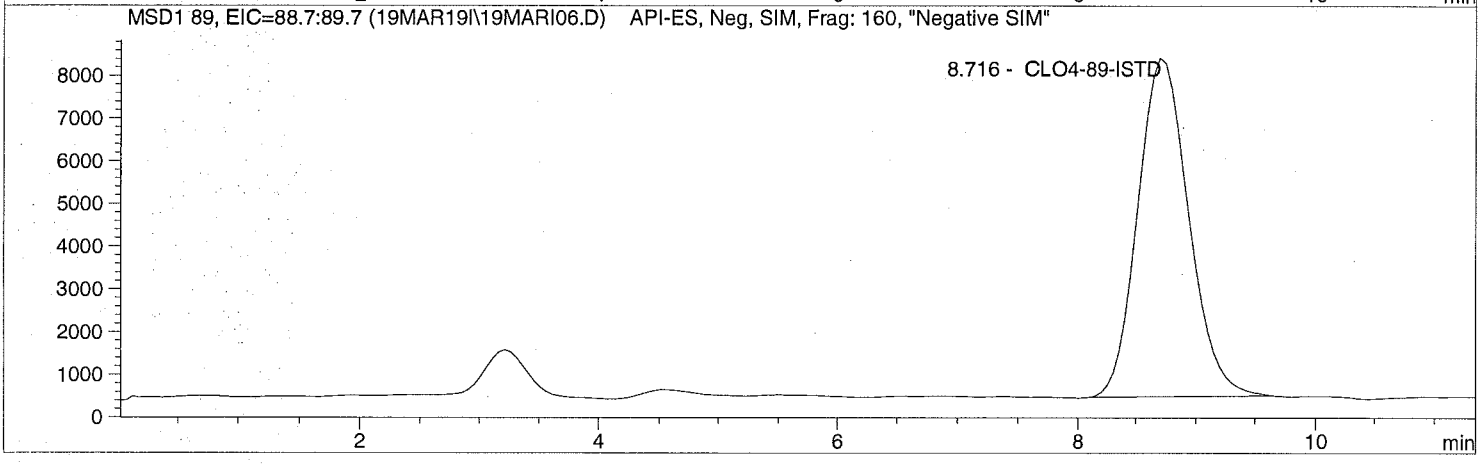
Injection Date:	3/19/2019 10:19:32	Seq Line:	6
Sample Name:	CLO4@ 10.ug/L	Location:	Vial 76
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI06.D Sample Name: CLO4@ 10.ug/L

Injection Date:	3/19/2019 10:19:32	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-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Tue, 19. Mar. 2019,02:35:19 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
8.698	PBA	683454.4	9.2773	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.713	BBA	213522.6	9.6431	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.716	PBA	234453.6	5.0000	CLO4-89-ISTD

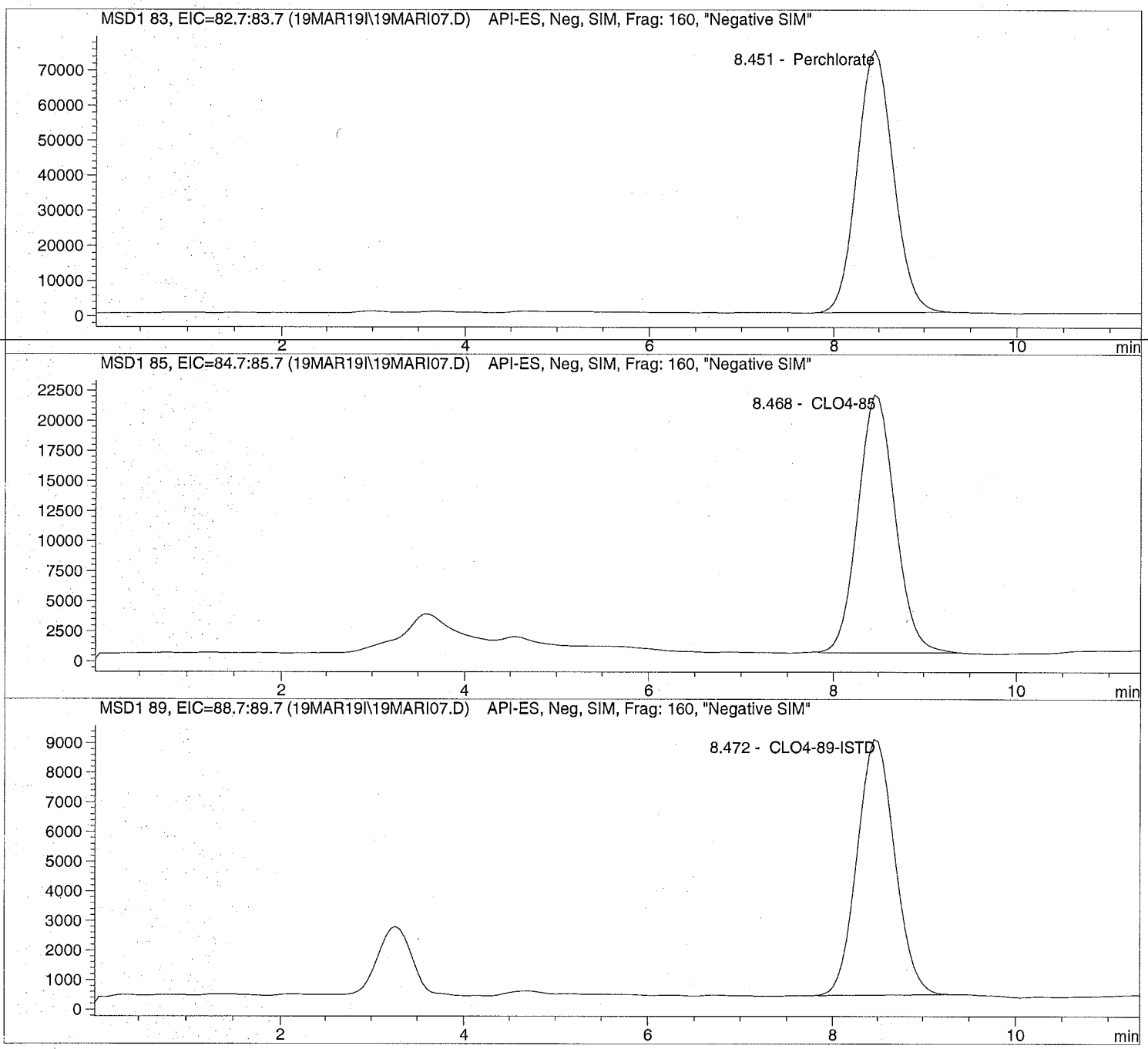
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI07.D Sample Name: CLO4@ 25.ug/L

Injection Date:	3/19/2019 10:32:49	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-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI07.D Sample Name: CLO4@ 25.ug/L

Injection Date:	3/19/2019 10:32:49	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-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis

Sample Information

Sorted By: Signal
Calib. Data Modified: Tue, 19. Mar. 2019,02:35:19 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
8.451	PBA	2084327.4	25.2904	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.468	BBA	614294.8	25.1216	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.472	BBA	250568.0	5.0000	CLO4-89-ISTD

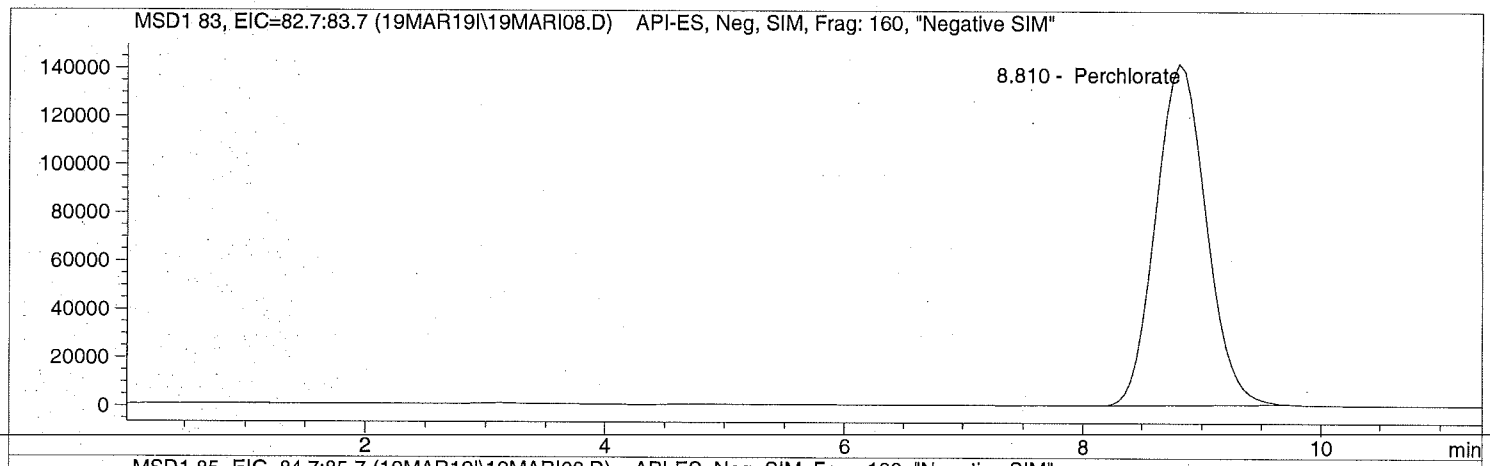
*** End of Report ***

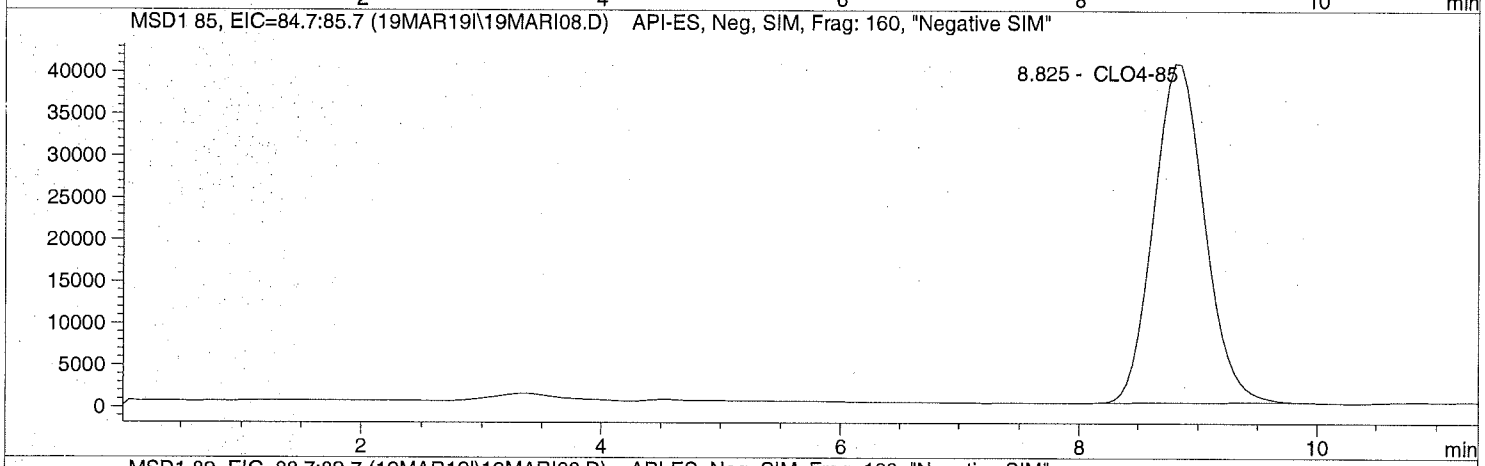
Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI08.D Sample Name: CLO4@ 50.ug/L

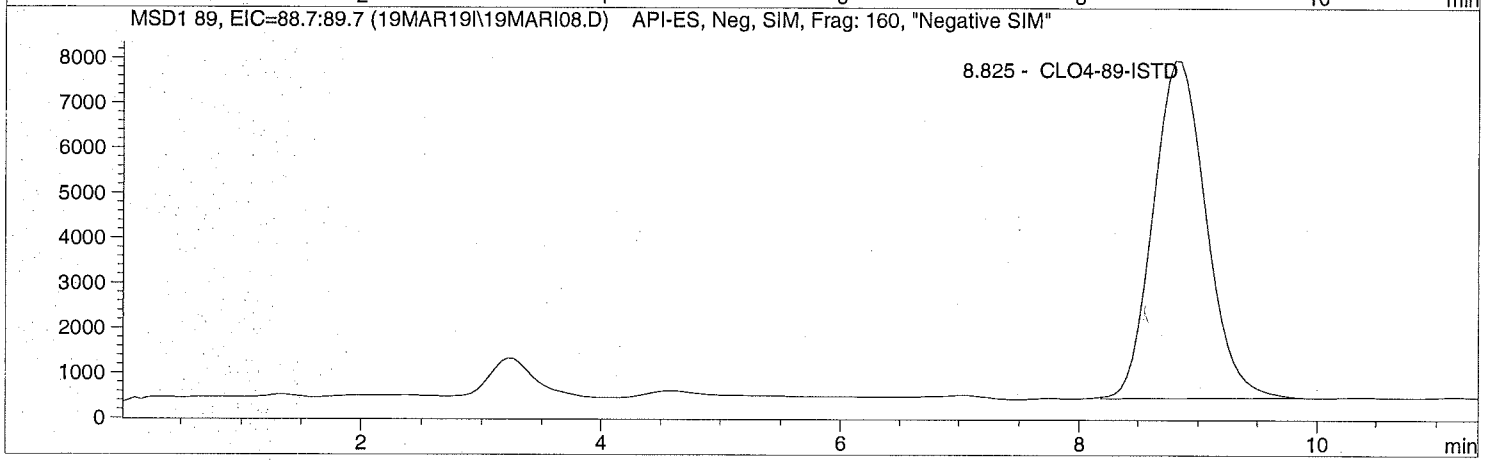
Injection Date:	3/19/2019 10:46:05	Seq Line:	8
Sample Name:	CLO4@ 50.ug/L	Location:	Vial 78
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	30 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI08.D Sample Name: CLO4@ 50.ug/L

Injection Date:	3/19/2019 10:46:05	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-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Tue, 19. Mar. 2019,02:35:19 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
8.810	PBA	4133340.5	51.3684	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.825	BBA	1198135.6	50.4672	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.825	BBA	230976.7	5.0000	CLO4-89-ISTD

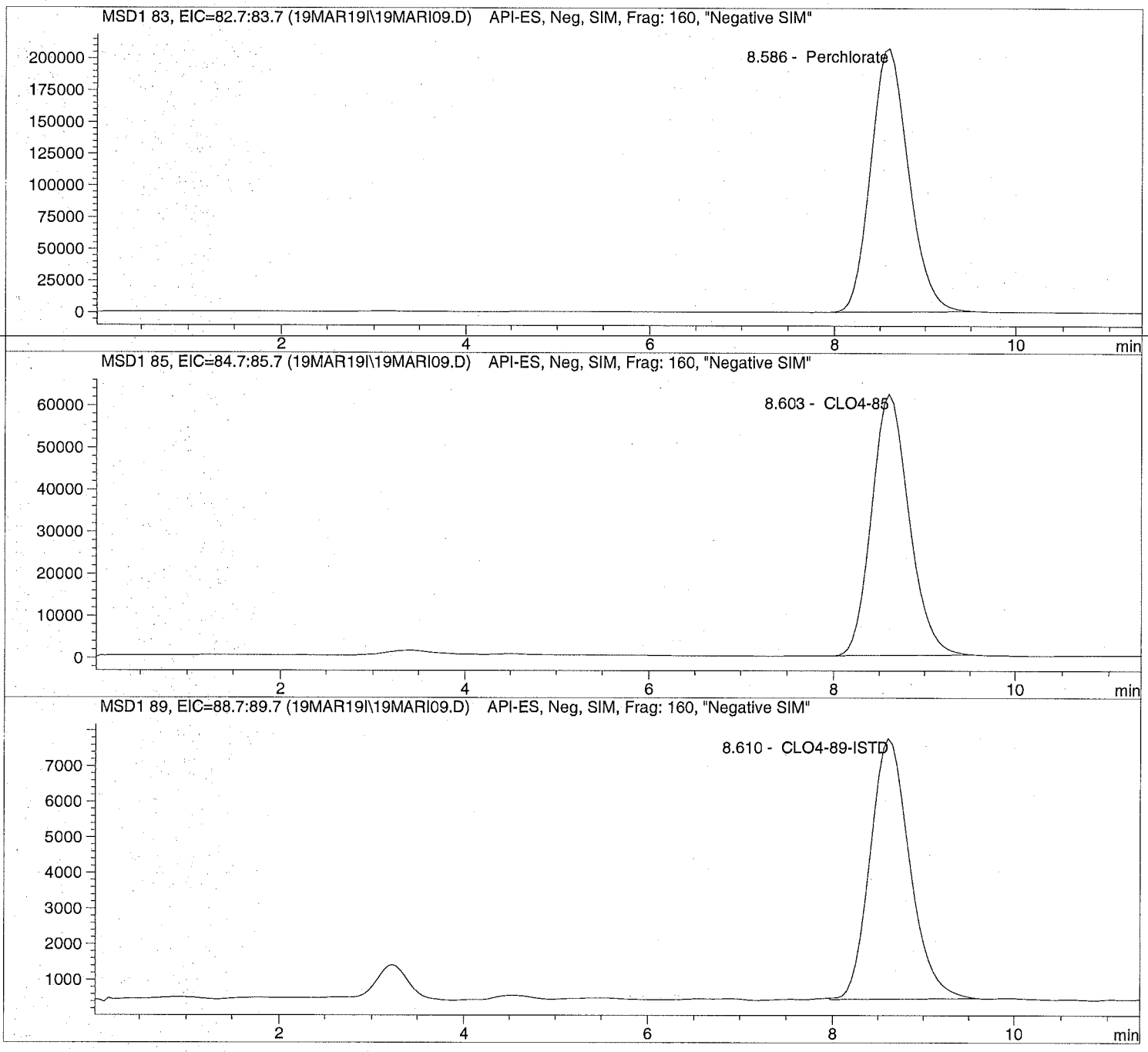
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI09.D Sample Name: CLO4@ 75.ug/L

Injection Date:	3/19/2019 10:59:22	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-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI09.D Sample Name: CLO4@ 75.ug/L

Injection Date:	3/19/2019 10:59:22	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-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Tue, 19. Mar. 2019,02:35:19 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
8.586	PBA	5993128.0	74.1675	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.603	PBA	1783554.4	74.7202	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.610	BBA	221504.5	5.0000	CLO4-89-ISTD

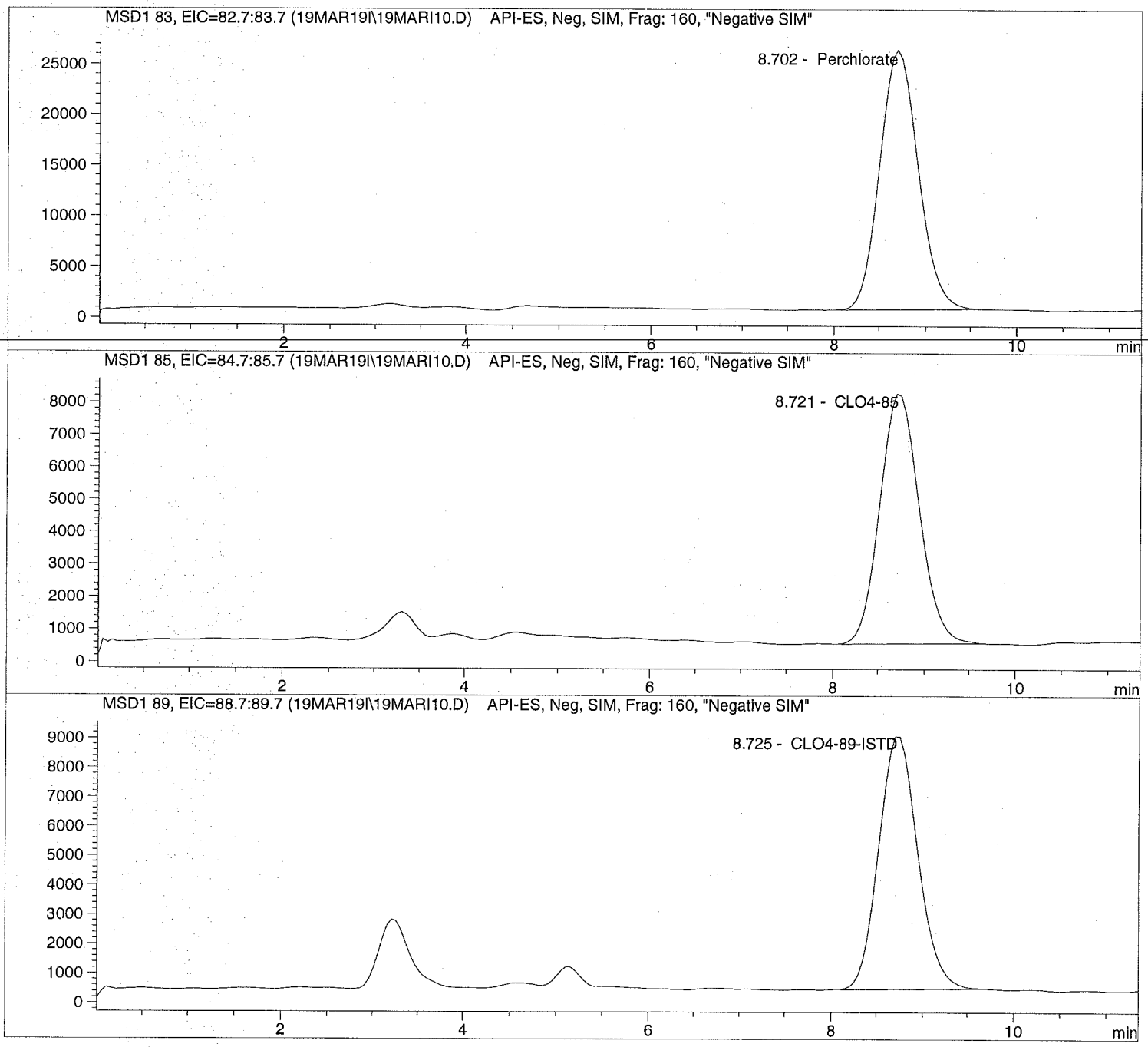
*** End of Report ***

Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI10.D Sample Name: ICAL Verf@10ug/L

Injection Date:	3/19/2019 11:12:42	Seq Line:	10
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-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI10.D Sample Name: ICAL Verf@10ug/L

Injection Date:	3/19/2019 11:12:42	Seq Line:	10
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-DP2.M
Last Changed: 3/19/2019 14:35:22

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Tue, 19. Mar. 2019,02:35:19 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
8.702	PBA	734718.7	9.2594	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.721	PBA	227494.7	9.5402	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.725	BBA	252544.4	5.0000	CLO4-89-ISTD

*** End of Report ***



ALS Laboratory Group
ANALYTICAL CHEMISTRY & TESTING SERVICES

Environmental Division

Raw Data

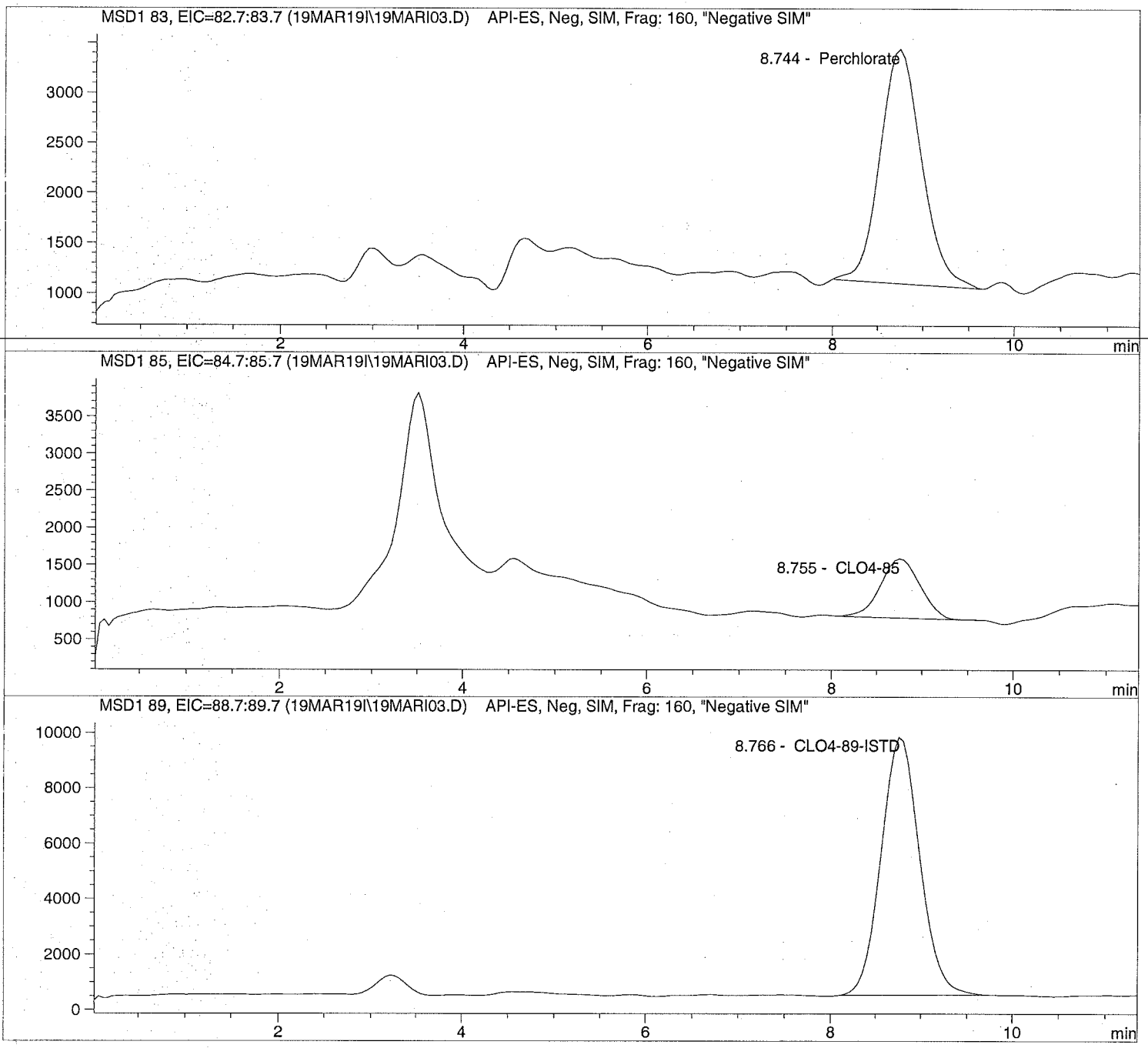
Unmodified

Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI03.D Sample Name: CLO4@ 1.0ug/L

Injection Date:	3/19/2019 09:39:40	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-DP2.M
Last Changed: 3/19/2019 14:38:25

Perchlorate analysis



Data file: C:\HPCHEM\1\DATA\19MAR19I\19MARI03.D Sample Name: CLO4@ 1.0ug/L

Injection Date:	3/19/2019 09:39:40	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-DP2.M
Last Changed: 3/19/2019 14:38:25

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Tue, 19. Mar. 2019,02:35:19 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
8.744	BBA	74166.3	1.0224	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.755	BBA	24138.1	0.9487	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
8.766	BBA	273207.6	5.0000	CLO4-89-ISTD

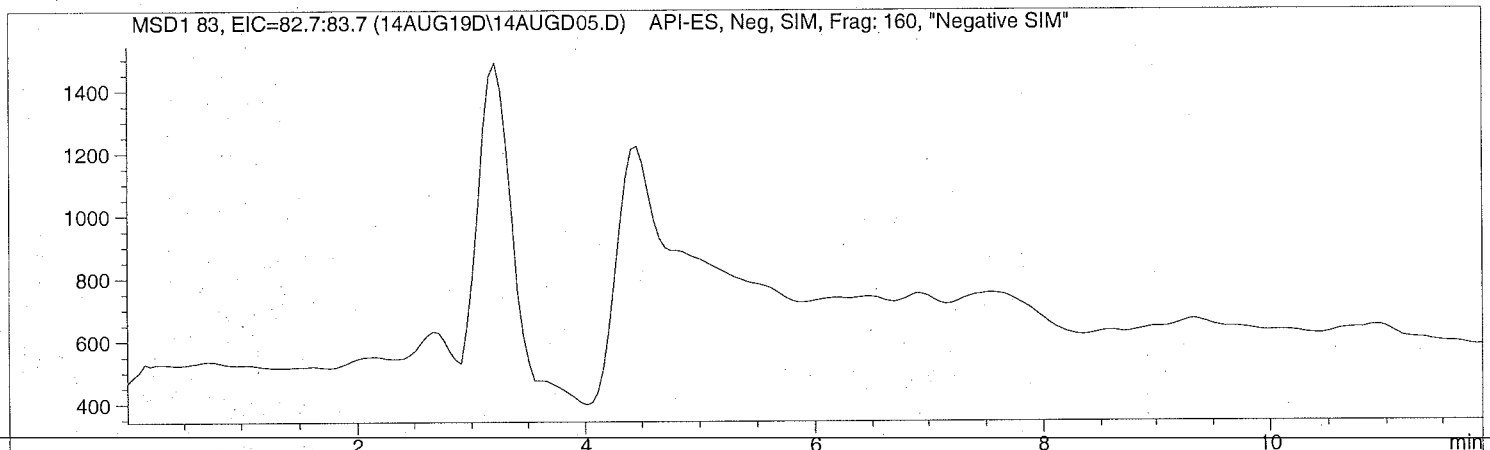
*** End of Report ***

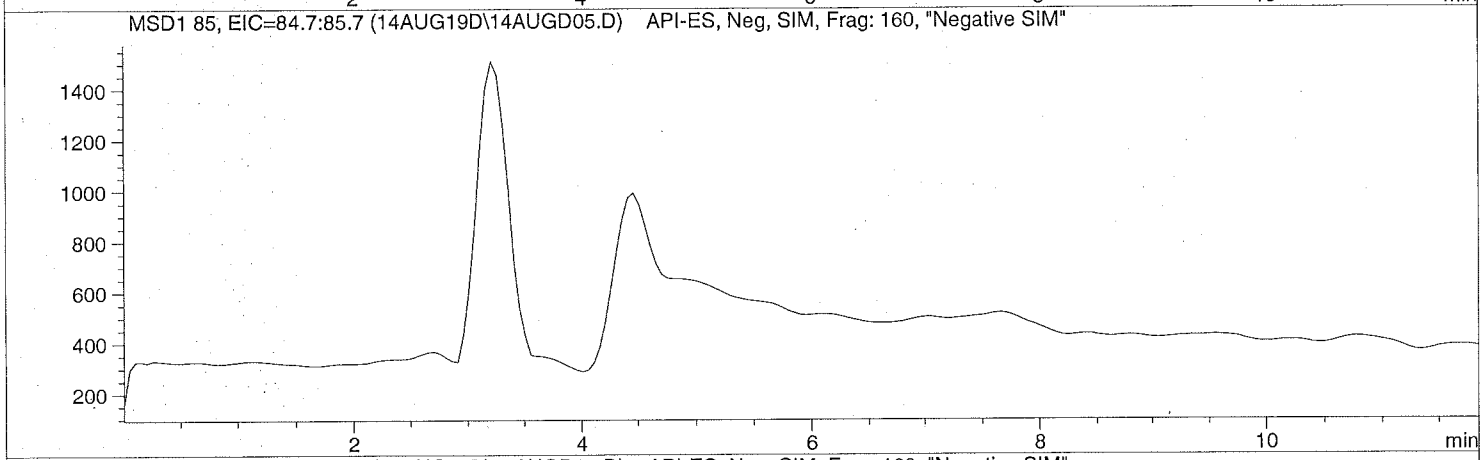
Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD05.D Sample Name: 1922027001

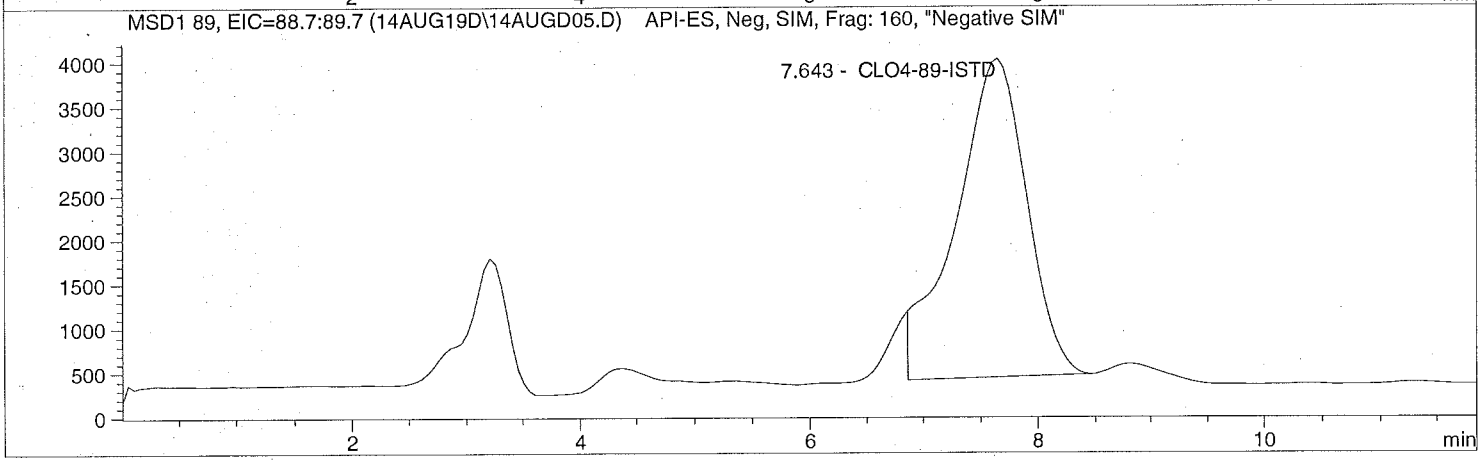
Injection Date:	8/14/2019 09:25:46	Seq Line:	5
Sample Name:	1922027001	Location:	Vial 75
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD05.D Sample Name: 1922027001

Injection Date:	8/14/2019 09:25:46	Seq Line:	5
Sample Name:	1922027001	Location:	Vial 75
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Fri, 12. Apr. 2019,07:52:58 am
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
7.643	BBA	153964.0	5.0000	CLO4-89-ISTD

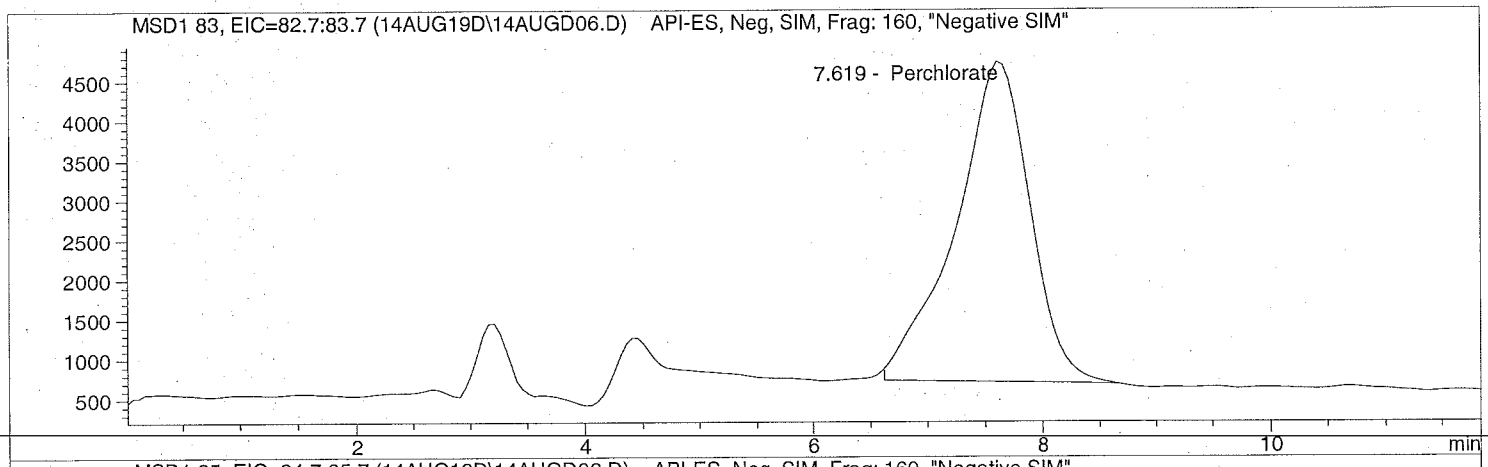
*** End of Report ***

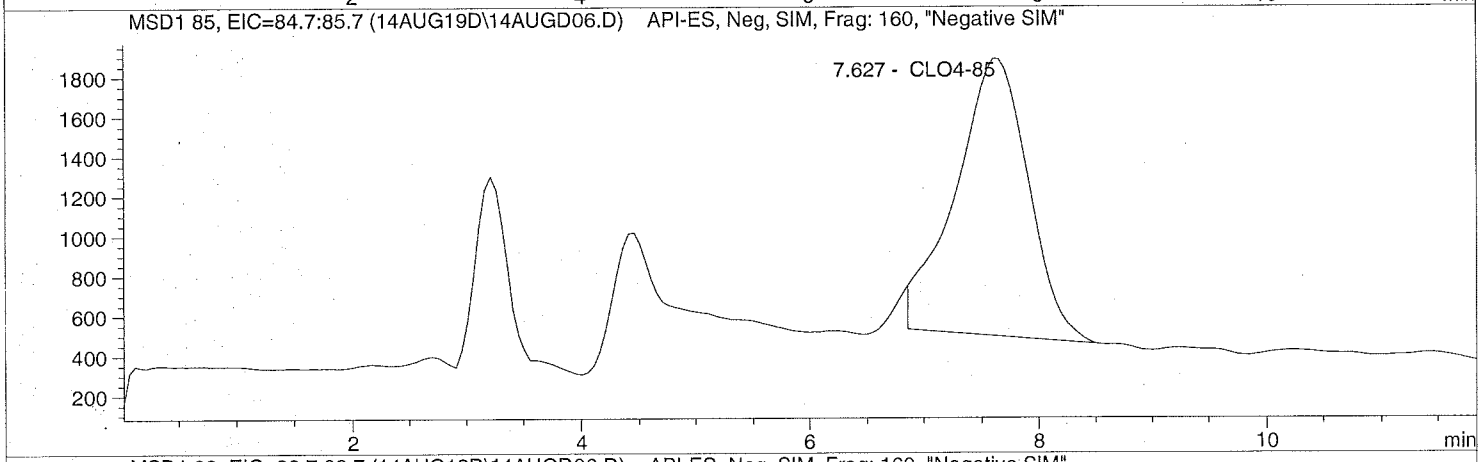
Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD06.D Sample Name: 668349 220271S

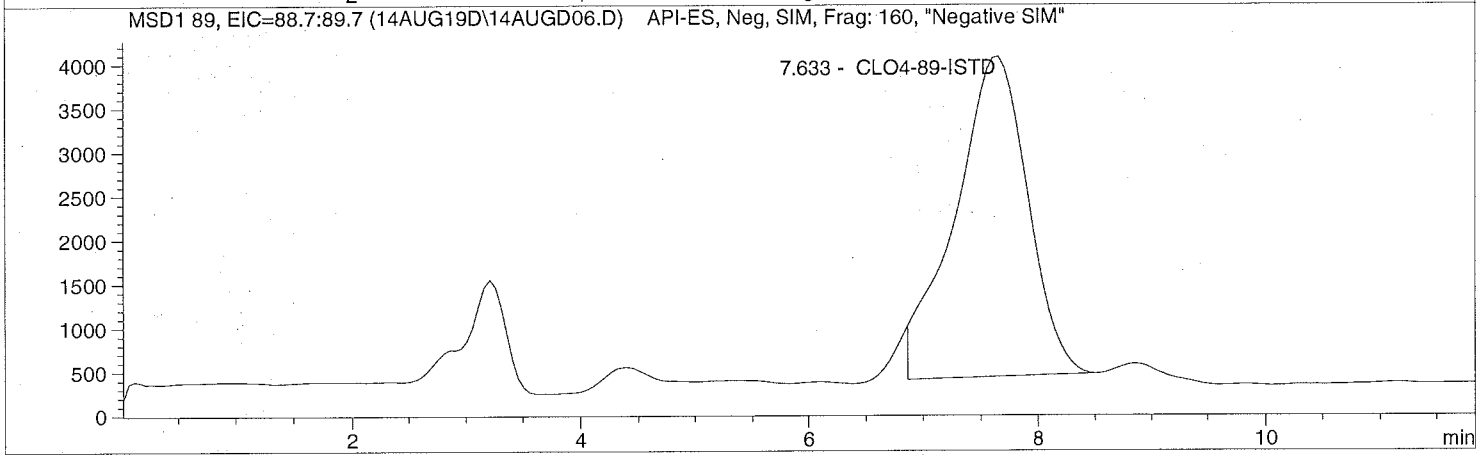
Injection Date:	8/14/2019 09:39:59	Seq Line:	6
Sample Name:	668349 220271S	Location:	Vial 76
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD06.D Sample Name: 668349 220271S

Injection Date:	8/14/2019 09:39:59	Seq Line:	6
Sample Name:	668349 220271S	Location:	Vial 76
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Fri, 12. Apr. 2019,07:52:58 am
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
7.619	BBA	180213.1	3.7183	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.627	BBA	61346.3	4.0986	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.633	BBA	160298.6	5.0000	CLO4-89-ISTD

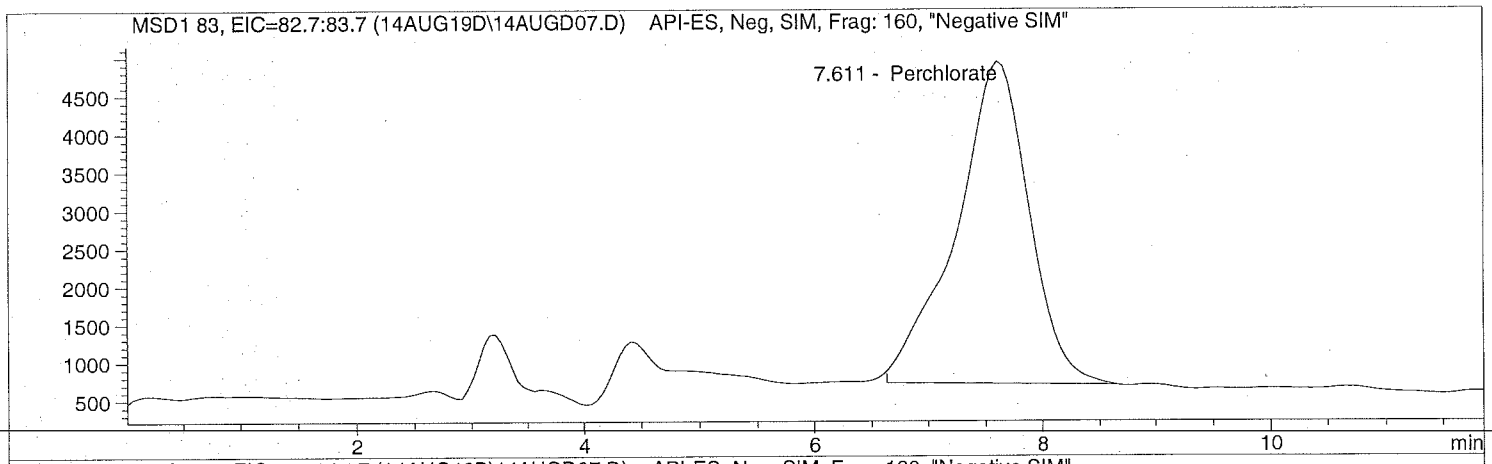
*** End of Report ***

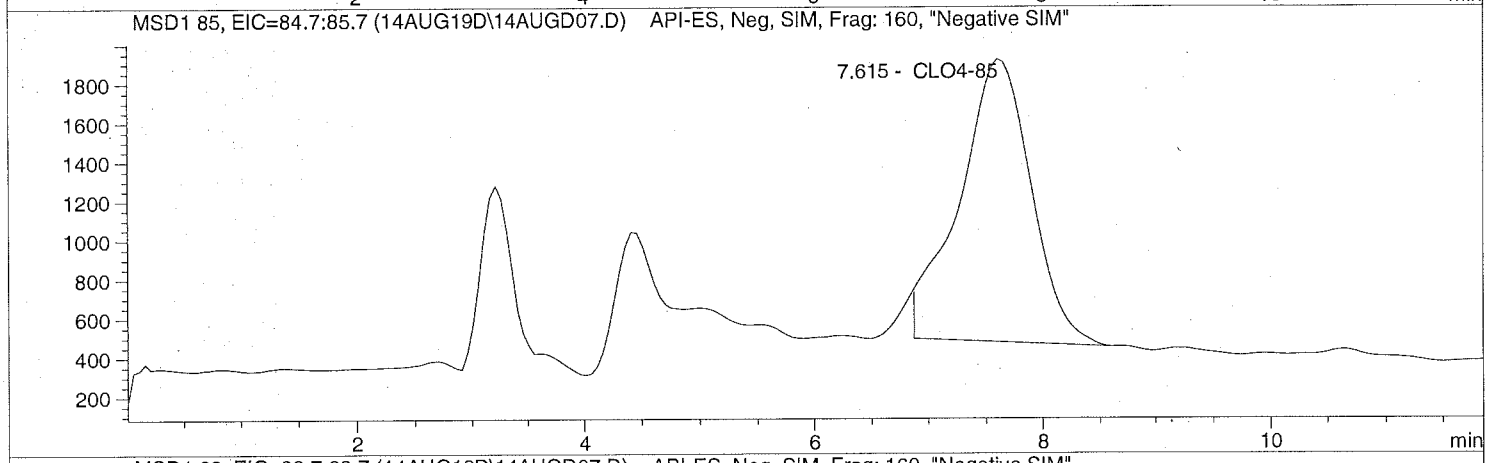
Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD07.D Sample Name: 668350 220271D

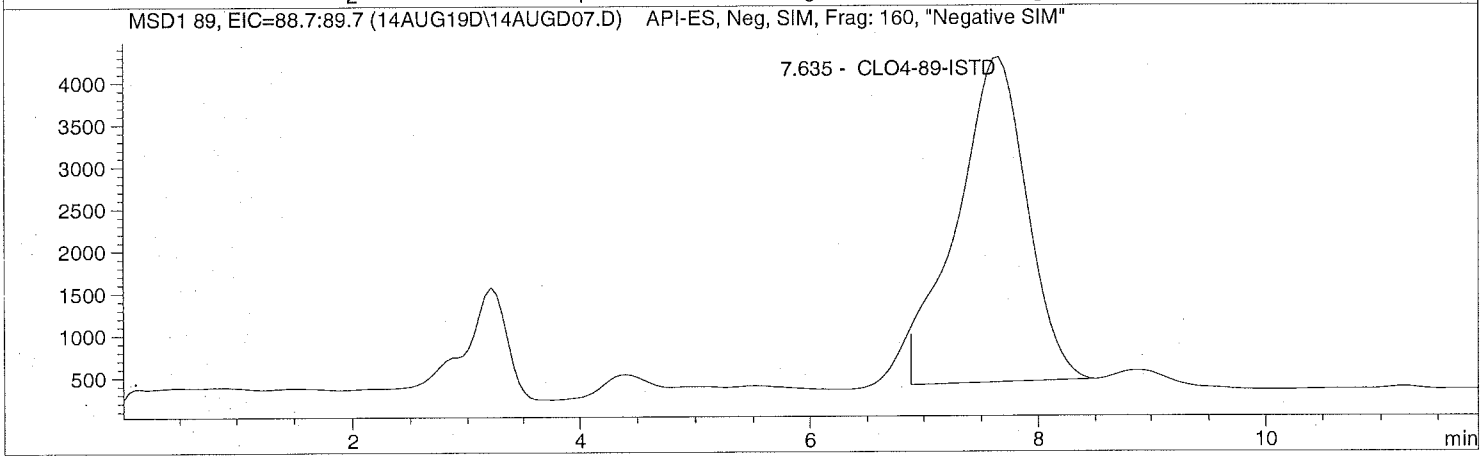
Injection Date:	8/14/2019 09:54:13	Seq Line:	7
Sample Name:	668350 220271D	Location:	Vial 77
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis







Injection Date:	8/14/2019 09:54:13	Seq Line:	7
Sample Name:	668350 220271D	Location:	Vial 77
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Fri, 12. Apr. 2019,07:52:58 am
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
7.611	BBA	186832.0	3.7710	Perchlorate

Signal2: MSD1 85, EIC=84.7:85.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.615	BBA	62944.2	4.1167	CLO4-85

Signal3: MSD1 89, EIC=88.7:89.7

RT [min]	Type	Area	Amount [ug/sample]	Compound Name
7.635	BBA	163743.1	5.0000	CLO4-89-ISTD

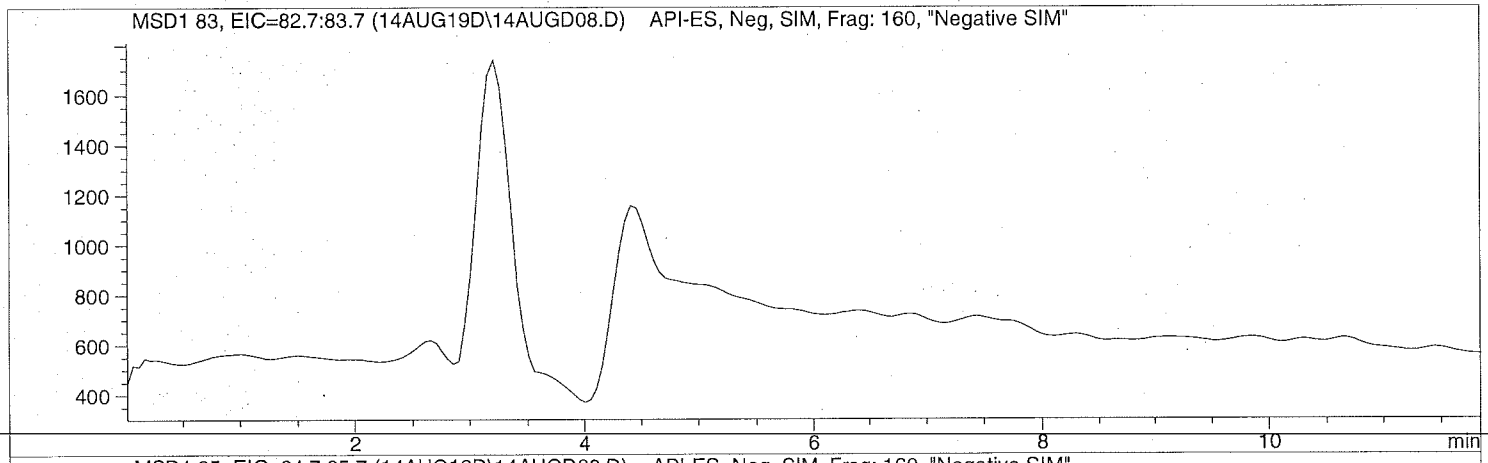
*** End of Report ***

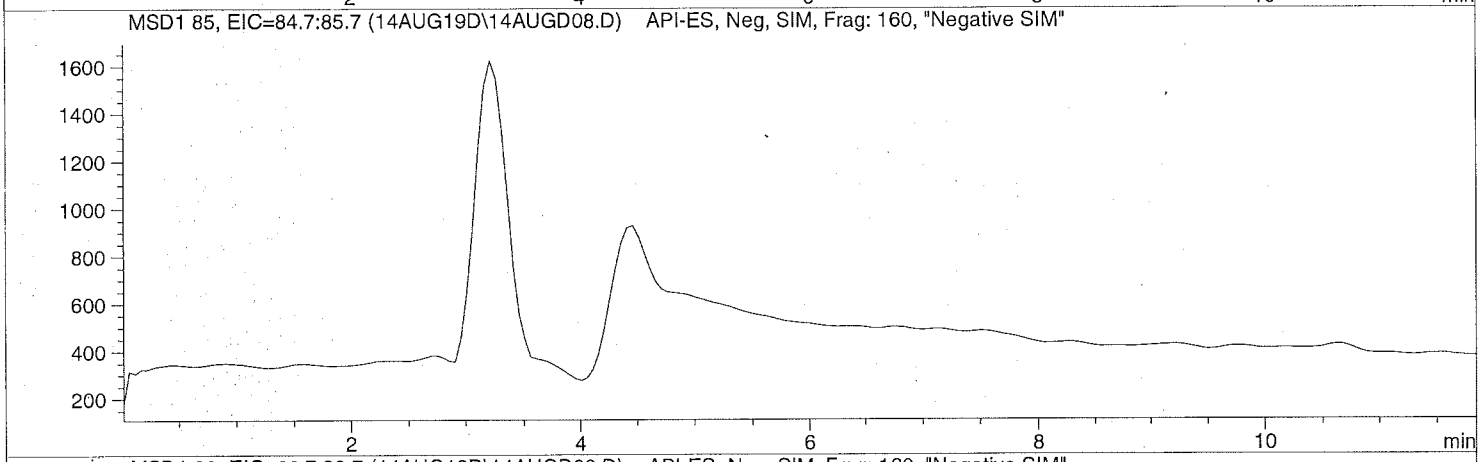
Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD08.D Sample Name: 1922715001

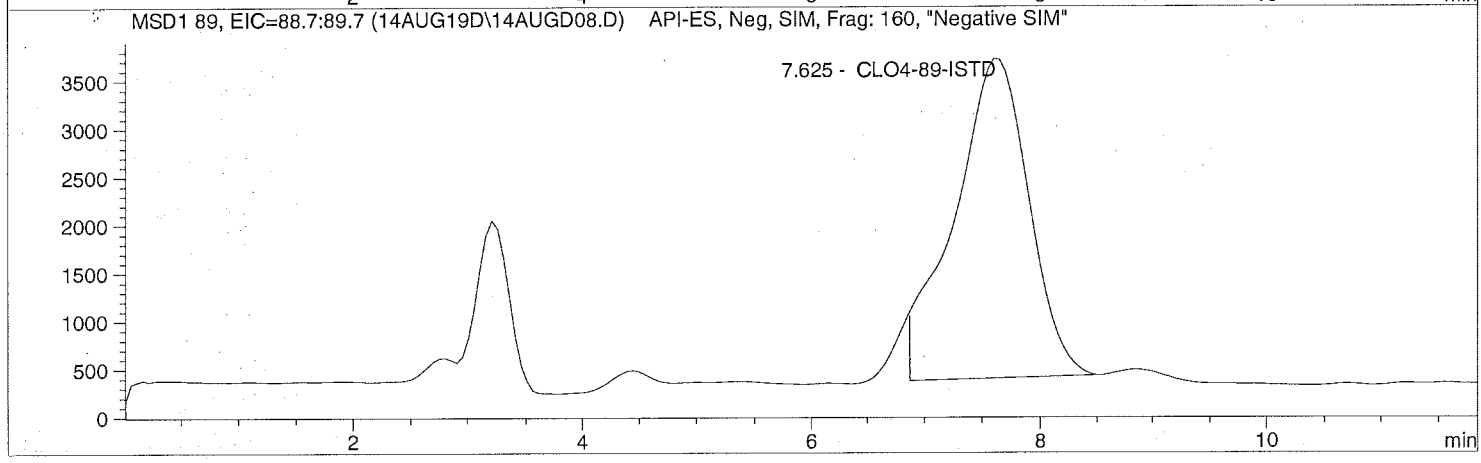
Injection Date:	8/14/2019 10:08:31	Seq Line:	8
Sample Name:	1922715001	Location:	Vial 78
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis







Data file: C:\HPCHEM\1\DATA\14AUG19D\14AUGD08.D Sample Name: 1922715001

Injection Date:	8/14/2019 10:08:31	Seq Line:	8
Sample Name:	1922715001	Location:	Vial 78
Acq Operator:	TNB	Inj. No.:	1
		Inj. Vol.:	50 µl

Acq. Method: CLO4-AQN.M
Analysis Method: C:\HPCHEM\1\METHODS\CLO4-DP2.M
Last Changed: 4/12/2019 07:54:13

Perchlorate analysis

Sample Information

Sorted By:	Signal
Calib. Data Modified:	Fri, 12. Apr. 2019,07:52:58 am
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
7.625	BBA	148522.8	5.0000	CLO4-89-ISTD

*** End of Report ***

APPENDIX G
QUALITY CONTROL SUMMARY REPORT

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QUARTERLY CONTROL SUMMARY REPORT
2nd QUARTER (APRIL-JUNE) 2019
GROUNDWATER TREATMENT PLANT
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

November 2019

Prepared For:

Longhorn Army Ammunition Plant
Karnack, Texas

Under Contract To:

U.S. Army Corps of Engineers
Tulsa District
Tulsa, Oklahoma

Contract Number: W9128F-13-D-0012
Task Order Number: W912BV17F0150

Prepared By:

1608 13th Avenue South, Suite 300
Birmingham, Alabama 35205
1-800-806-4001 • www.bhate.com

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Tables

Table 1: Field Sample Identification and Laboratory Packages
Table 2: Qualified Analytical Data
Table 3: Completeness by Method

1 INTRODUCTION

Bhate reviewed 41 data packages from ALS Environmental, Houston, Texas. Groundwater samples were collected from April 4, 2019, through June 12, 2019, at the Groundwater Treatment Plant (GWTP) and from June 13, 2019, through August 8, 2019, at Site LHAAP 18/24 at Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. Data were reviewed for conformance to the requirements of the following guidance documents: [U.S. Environmental Protection Agency] *USEPA Contract Laboratory Program* [CLP] *National Functional Guidelines for Superfund Organic Methods Data Review* (USEPA, January 2017); *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (USEPA, January 2017); and the *Final Basewide Uniform Federal Policy* [UFP] – *Quality Assurance Project Plan* [QAPP] *Longhorn Army Ammunition Plant* which is in Appendix C of the *Final Installation-Wide Work Plan for Longhorn Army Ammunition Plant Karnack, Texas* (Bhate, May 2018).

1.1 Intended Use of Data

The objective of sampling at the GWTP is to monitor effluent streams to confirm compliance with discharge limits.

Analyses performed include:

- SW6850 – Perchlorate
- E350.3/SM4500 NH3 – Nitrogen, Ammonia
- E365.3/SM4500 P – Orthophosphate
- E415.1/SM5310 – Total Organic Carbon
- SW8260C - Volatile Organic Compounds (VOCs)
- SW8270D Selected Ion Monitoring (SIM) - 1,4-Dioxane
- SW6020A/7470A – Metals
- SW9056A – Chloride (Cl) and Sulfate (SO_4)
- SW7196A – Hexavalent Chromium
- E410.4 – Chemical Oxygen Demand
- E1664A – Oil and Grease
- TO-15 – Volatiles in Air

Table 1 lists the sample identification numbers (IDs) and their associated laboratory package.

Table 2 lists qualified results with the qualification flag and reason code.

The following narrative is a brief synopsis of data that required qualification due to quality control discrepancies.

1.2 Preservation and Holding Times

Sample identification data were evaluated for agreement with the chain-of-custody (COC). All samples were received in appropriate containers, within the proper temperature range, in good condition, and within the required hold time.

1.3 Calibrations

All analytes reported must be present in the initial and continuing calibration. The calibrations must meet the acceptance criteria specified in Worksheet 24 (Analytical Instrument Calibration) of the QAPP. All results reported must be within the calibration range. Samples were diluted, if necessary, to bring analyte responses within the calibration range.

1.3.1 Continuing Calibration Verifications

The calibrations must meet the following criteria otherwise the compound is qualified J or UJ: The continuing calibration verification (CCV) criteria are 20 percent difference (%D) for VOCs and Semi-Volatile Organic Compounds (SVOCs) and 50% for closing CCVs. Metals and general chemistry - 10%D; perchlorate - 15%D; and volatiles in air - 30%D.

GWTP samples LH18/24-SP650_040419 and LH18/24-SP650_041019 reported carbon tetrachloride and tetrachloroethene outside calibration criteria. GWTP sample LH18/24-SP650_061219 reported acetone outside criteria. Packages HS19061164 and HS19061210 reported bromoform and 1,2-dibromo-3-chloropropane below control limits. Packages HS19061482, HS19061386, and HS19061486 reported bromoform; 1,2-dibromo-3-chloropropane; and 1,2,3-trichlorobenzene below control limits. Finally, sample ICT13A_071119 reported the CCV recovery of bromoform above control limits. The associated sample compounds were qualified as estimated non-detected, “UJ”.

1.4 Blanks

If the analyte result for an associated sample was less than 5X (10X for common laboratory contaminants) the analyte concentration in the blank, that result was qualified “UB” and considered an artifact of blank contamination. Where the sample result for the affected analyte was non-detect or greater than 5X the amount in the blank, no qualifier was applied.

1.4.1 Metals - SW6020

LHAAP 18/24 sample ICT2_062819 reported antimony and vanadium at a concentration < 5X the method blank concentration and samples ICT4_062819, ICT7_062819, ICT8_062819, ICT11_062819, ICT11_062819-a, ICT14B_062819, 18WW09_062719, 18WW25_062719, 125_062419, 126_062419, 18WW03_062419, 18WW03_062419-a, 18CPTMW10DW_062019, 18CPTMW19SW_062019, 18WW02_062019, 18CPTMW01DW_061919, MW6_061819, MW21_061819, 18WW14_061319, 18CPTMW12SW_061319, 18CPTMW12SW_061319-a, 18CPTMW12DW_061319, 18CPTMW22SW_061319, 18CPTMW22DW_061319, MW20_061319, MW22_062119, 18CPTMW03SW_062119, AWD3_062119, and MW1_061919 reported vanadium at a concentration < 5X the method blank concentration. Samples 18WW03_062419, 18WW03_062419-a, 18WW17_062419, 17WW08_062519, C03_062619, 18CPTMW18_062619, and 18WW18_062419 reported aluminum < 5X the method blank concentration. Sample 18CPTMW14_062519 reported antimony < 5X the blank concentration. Samples 18CPTMW10DW_062019, 18CPTMW01DW_061919, MW1_061919, MW6_061819, 18CPTMW22R_061319, MW20_061319, MW14_062019, MW14_062019-a, and

18WW02_062019 reported copper <5X the blank concentration. These metals were qualified "UB".

1.4.2 Volatiles - SW8260

Acetone was detected at a concentration < 10X the trip blank and/or method blank concentration in samples C04_062019, 18WW08_062719, 18WW25_062719, 18CPTMW24_062519, 18CPTMW10SW_062019, 18CPTMW10DW_062019, 18CPTMW19_062019, 18WW02_062019, 18WW06_062019, 18WW22_062019, 18CPTMW01DW_061919, 18CPTMW04_061919, 18CPTMW08SW_061819, MW5_061819, 109_061819, 18CPTMW12SW_061319, 18CPTMW12SW_061319-a, 18CPTMW12DW_061319, 18CPTMW23SW_061319, and 18CPTMW04SW_061919. This compound was qualified "UB".

1.5 Surrogates

Surrogates were evaluated using limits defined by each method in the project-specific QAPP Worksheet 28.

1.5.1 1,4-Dioxane - SW8270SIM

Surrogates 4-terphenyl-d14 and nitrobenzene-d5 were spiked with 2X the normal concentration by the lab and recovered above control limits for sample MW21_061819. The result for 1,4-dioxane was considered estimated and flagged "J".

1.5.2 Volatiles - SW8260

Surrogate 1,2-dichloroethane-d4 was recovered above control limits in sample MW14_062019-a. Toluene-d8 was recovered above limits in sample ICT13A_071119. The detected volatile compounds were considered estimated and flagged "J".

1.6 Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD)

LCS/LCSD recoveries were evaluated using limits defined in the project-specific QAPP Worksheet 15.

1.6.1 Volatiles - SW8260

Chloroform reported the LCS recovery above control limits in packages HS19061279 and HS19061383. The associated samples that reported detections were qualified as estimated, "J".

1.7 Matrix Spike (MS)/Matrix Spike Duplicate Sample (MSD)

MS/MSD recoveries were evaluated using limits defined in Worksheet 15 of the project-specific QAPP. When sample results were greater than 4X the spike amount, control limits were not applicable and require no qualification. Furthermore, if a MS/MSD analyses was performed on a batched (unrelated) sample no qualification was made to the sample data. Otherwise, only the sample used for spiking requires qualification.

1.7.1 Volatiles - SW8260

The GWTP spike sample LH18/24-SP650_041719 reported 1,1-dichloroethane; benzene; chlorobenzene; chloroform; methylene chloride; styrene; and toluene below MS and/or MSD control limits. LHAAP 18/24 spike sample ICT14D_062819 reported methylene chloride below MS/MSD control limits. Sample C09_062619 reported the MS and/or MSD recoveries of 1,1-dichloroethane; bromobenzene; bromochloromethane; chlorobenzene; and chloroform below control limits. These compounds were qualified as estimated detect/non-detect, "J/UJ".

1.7.2 Anions - SW9056

The GWTP spike sample LH18/24-SP650_040419 reported chloride below MS recovery control limits and was qualified as estimated, "J".

1.7.3 Metals - SW6020

The GWTP spike samples LH18/24-SP650_060419 reported selenium below MS/MSD recovery limits. Aluminum failed the MSD recovery high in spiked sample ICT14D_062819. Manganese failed the MSD recovery low in spiked sample MW6_061819. Lastly, barium failed the MSD recovery high in the spiked sample ICT13A_071119. These metals were qualified as estimated, "J/UJ".

1.8 Internal Standards

If the percent recovery (%R) for an internal standard in a sample is not within the limit, the associated sample is qualified for those analytes associated with the internal standard(s) outside of the limit.

Internal standards were within acceptance criteria for the associated compounds.

1.9 Precision

Precision is the measure of variability of individual sample measurements. Evaluation of laboratory and/or field duplicates for precision was done using the relative percent difference (RPD). The RPD is defined as the difference between two duplicate samples divided by the mean and expressed as a percent. Field duplicate RPD limits were set at <30% for groundwater and air matrices. Laboratory duplicate RPD limits were set at <25% for air matrices.

1.9.1 Laboratory Duplicate

The laboratory duplicate results were within control limits.

1.9.2 Field Duplicate

The LHAAP 18/24 sample ICT12B_062819 and its duplicate reported benzene and carbon tetrachloride outside control limits. Sample ICT11_062819 and its duplicate were outside the RPD limit for acetone, aluminum, chromium, and vanadium. Sample 18WW03_062419 and its duplicate were outside RPD limits for chromium. Sample MW2_061919 and its duplicate were outside RPD limits for bromochloromethane and 1,4-dioxane. Sample 18CPTMW12SW_061319 and its duplicate were outside limits for 1,4-dioxane and vanadium. Samples

18CPTMW06_062119, MW14_062019, and their duplicates were outside control limits for 1,4-dioxane. Sample AWD4_062619 and its duplicate were outside RPD limits for multiple metals. Sample 18WW10_062519 and its duplicate were outside RPD limits for acetone. These compounds were qualified as estimated, "J", in both parent sample and associated duplicate.

2 DATA USABILITY SUMMARY

The data are usable for the intended purposes of the project (Table 3). The data quality objectives have been met for the project.

Table 1: Field Sample Identification and Laboratory Packages

Client Sample ID	Lab Package	SW6850	E350.3	E365.3	E415.1	SW8270D SIM	SW8260C	SW6020A	SW9056A	SW7196A	E410.4	1664A	TO-15
GWTP Samples													
LH18/24-SP650_040419/BIX	HS19040313	X	X	X	X								
LH18/24-SP650_040419	HS19040319						X		X				
LH18/24-SP650_041019/BIX	HS19040652	X				X	X	X		X			
LH18/24-SP140_041019	HS19040654	X						X		X			
LH18/24-SP650_041019/BIX	HS19040653	X	X	X	X								
LH18/24-SP650_041719/BIX	HS19041072	X	X	X	X								
LH18/24-SP650_041719	HS19041158						X		X				
LH18/24-SP650_050119/BIX	HS19050126	X	X	X	X								
LH18/24-SP650_050119	HS19050138						X		X				
LH18/24-SP140_050719	HS19050401	X						X		X			
LH18/24-SP650_050719/BIX	HS19050398	X				X	X	X		X			
LH18/24-SP650_050719/BIX	HS19050397	X	X	X	X								
LH18/24-SP650_051419/BIX	HS19050886	X	X	X	X								
LH18/24-SP650_051419	HS19050920						X		X				
LH18/24-SP650_052119/BIX	HS19051289	X	X	X	X								
LH18/24-SP650_052919	HS19051866						X		X				
LH18/24-SP650_052919/BIX	HS19051856	X	X	X	X								
LH18/24-SP650_052919/BIX	HS19051859	X				X	X	X	X		X	X	
LH18/24-SP140_052919	HS19051863	X				X	X	X	X		X	X	
LH18/24-SP650_060419/BIX	HS19060168	X				X	X	X		X			
LH18/24-SP140_060419	HS19060174	X						X		X			
LH18/24-SP650_060419/BIX	HS19060172	X	X	X	X								
LH18/24-SP650_061219/BIX	HS19060672	X	X	X	X								
LH18/24-SP650_061219	HS19060699						X		X				
Air Samples													
LH18/24-Air_052919_Stripper	P1903177												X
LH18/24-Air_052919_Stripper_a	P1903177												X
LH18/24-Air_052919_GWTP	P1903177												X
LH18/24-Air_0529_Downwind_South	P1903177												X
Site 18/24													
AWD1_062019	HS19061164					X							
AWD3_062119	HS19061210	X					X	X					
AWD4_062619	HS19061482	X				X	X	X					
AWD4_062619-a	HS19061482	X				X	X	X					
18CPTMW01DW_061919	HS19061083	X				X	X	X					
18CPTMW01SW_061919	HS19061083	X				X	X	X					
18CPTMW03SW_062119	HS19061210	X				X	X	X					
18CPTMW04_061919	HS19061083	X				X	X						
18CPTMW04SW_061919	HS19061083	X				X	X	X					
18CPTMW06_062119	HS19061210	X				X	X						

Client Sample ID	Lab Package	SW6850	E350.3	E365.3	E415.1	SW8270D SIM	SW8260C	SW6020A	SW9056A	SW7196A	E410.4	1664A	TO-15
18CPTMW06_062119-a	HS19061210	X				X	X						
18CPTMW07_062519	HS19061383	X				X	X						
18CPTMW08SW-061819	HS19060986	X				X	X						
18CPTMW08DW-061819	HS19060986	X				X							
18CPTMW10SW_062019	HS19061157	X				X	X						
18CPTMW10DW_062019	HS19061157	X					X	X					
18CPTMW12SW_061719	HS19060929	X				X	X	X					
18CPTMW12SW_061719-a	HS19060929	X				X	X	X					
18CPTMW12DW_061719	HS19060929	X				X	X	X					
18CPTMW14_062519	HS19061383	X				X	X	X					
18CPTMW15_062119	HS19061210	X				X	X						
18CPTMW16_062719	HS19061547	X				X							
18CPTMW18_062619	HS19061486	X				X	X	X					
18CPTMW19_062019	HS19061157	X				X	X						
18CPTMW19SW_062019	HS19061157	X				X	X	X					
18CPTMW22R_061319	HS19060835	X				X	X	X					
18CPTMW22SW_061319	HS19060835	X				X	X	X					
18CPTMW22DW_061319	HS19060835	X				X	X	X					
18CPTMW23-061719	HS19060929	X				X	X						
18CPTMW23SW-061719	HS19060929	X				X	X						
18CPTMW24_062519	HS19061383	X				X	X						
18CPTMW26SW_061319	HS19060835	X				X	X						
17WW08_062519	HS19061386	X					X	X					
18WW02_062019	HS19061157	X				X	X	X					
18WW03_062419	HS19061279	X				X	X	X					
18WW03_062419_a	HS19061279	X				X	X	X					
18WW06_062019	HS19061157	X				X	X						
18WW08_062719	HS19061547	X				X	X						
18WW09_062719	HS19061547	X				X		X					
18WW10_062519	HS19061386	X				X	X						
18WW10_062519-a	HS19061386	X				X	X						
18WW14_061719	HS19060929	X						X					
18WW16_062619	HS19061486	X					X	X					
18WW17_062419	HS19061279	X					X	X					
18WW18_062419	HS19061279	X				X	X	X					
18WW19_080819	HS19080486	X					X	X					
18WW20_080819	HS19080486	X				X	X	X					
18WW22_062019	HS19061157	X				X	X	X					
18WW24_062619	HS19061482	X					X	X					
18WW25_062719	HS19061547	X				X	X	X					
C01_062119	HS19061210	X					X						
C02_062519	HS19061386	X					X						
C03_062619	HS19061486	X				X	X	X					
C04_062019	HS19061157	X					X						
C06_062619	HS19061486	X					X	X					
C08_062119	HS19061210	X				X	X						
C09_062619	HS19061486	X					X	X					
MW1_061919	HS19061083	X					X	X					
MW2_061919	HS19061083	X				X	X						
MW2_061919_a	HS19061083	X				X	X						
MW3_062519	HS19061383	X					X	X					
MW5_061819	HS19060986	X				X	X						
MW6_061819	HS19060986	X					X	X					
MW7_061719	HS19060929	X				X	X						
MW8_062119	HS19061210	X				X	X						
MW9_062519	HS19061386	X				X	X	X					

Client Sample ID	Lab Package	SW6850	E350.3	E365.3	E415.1	SW8270D SIM	SW8260C	SW6020A	SW9056A	SW7196A	E410.4	1664A	TO-15
MW10_062519	HS19061386	X				X	X						
MW12_062019	HS19061164	X					X						
MW13_062519	HS19061386	X					X	X					
MW14_062019	HS19061164	X				X	X	X					
MW14_062019-a	HS19061164	X				X	X	X					
MW16_062619	HS19061482	X				X	X						
MW17_062519	HS19061386	X				X							
MW18_062619	HS19061486	X					X						
MW19_062619	HS19061482	X					X	X					
MW20_061319	HS19060835	X					X	X					
MW21-061819	HS19060986	X				X	X	X					
MW22_062119	HS19061210	X					X	X					
MW23_062419	HS19061279	X					X						
102_062419	HS19061279	X					X	X					
109_061819	HS19060986	X				X	X						
120_062019	HS19061164	X				X	X						
125_062419	HS19061279	X					X	X					
126_062419	HS19061279	X				X	X	X					
129_062419	HS19061279	X				X	X	X					
130_062519	HS19061386	X					X	X					
130_062519-a	HS19061386	X					X	X					
ICT2_062819	HS19070016	X					X	X					
ICT4_062819	HS19070016	X					X	X					
ICT7_062819	HS19070016	X					X	X					
ICT8_062819	HS19070016	X					X	X					
ICT11_062819	HS19070016	X					X	X					
ICT11_062819-a	HS19070016	X					X	X					
ICT12B_062819	HS19070016	X					X	X					
ICT12B_062819-a	HS19070016	X					X	X					
ICT12C_062819	HS19070016	X					X	X					
ICT12D_062819	HS19070016	X					X	X					
ICT12E_062819	HS19070016	X					X	X					
ICT13A_062819	HS19070622	X					X	X					
ICT13B_062819	HS19070016	X					X	X					
ICT13D_062819	HS19070016	X					X	X					
ICT13E_062819	HS19070016	X					X	X					
ICT13F_062819	HS19070016	X					X	X					
ICT14B_062819	HS19070016	X					X	X					
ICT14C_062819	HS19070016	X					X	X					
ICT14D_062819	HS19070016	X					X	X					

Notes:
MW – Monitoring Well
SM – Standard Method
SW-846 - Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.
E – U.S. Environmental Protection Agency Method
HS – Houston
ICT – Interceptor Collection Trench

Table 2: Qualified Analytical Data

Client Sample ID Laboratory	Laboratory Package	Analyte Name	Result and Qualifier+	Reason for Qualification
GWTP				
LH18/24-SP650_040419	HS19040319	Carbon Tetrachloride Tetrachloroethene Chloride	0.5 UJ 0.5 UJ 377 J	CCV CCV MS <
LH18/24-SP650_041019	HS19040652	Carbon Tetrachloride Tetrachloroethene	0.5 UJ 0.5 UJ	CCV CCV
LH18/24-SP650_041719	HS19041158	1,1-Dichloroethane Benzene Chlorobenzene Chloroform Methylene chloride Styrene Toluene	0.5 UJ 0.5 UJ 0.5 UJ 0.5 UJ 0.5 UJ 37 J 1.8 J	MS/MSD < MSD < MSD < MS/MSD < MSD < MSD/MSD < MS/MSD <
LH18/24-SP650_060419	HS19060168	Selenium	0.00250 UJ	MS/MSD <
LH18/24-SP650_061219	HS19060699	Acetone	1.0 UJ	CCV
LHAAP 18/24				
ICT2_062819	HS19070016	Antimony Vanadium	0.000493 UB 0.00189 UB	MB MB
ICT4_062819	HS19070016	Vanadium	0.00174 UB	MB
ICT7_062819	HS19070016	Vanadium	0.00136 UB	MB
ICT8_062819	HS19070016	Vanadium	0.00195 UB	MB
ICT11_062819	HS19070016	Acetone Aluminum Chromium Vanadium	6.4 J 0.00846 J 0.142 J 0.00109 UB*	FD RPD FD RPD FD RPD MB/FD RPD
ICT11_062819-a	HS19070016	Acetone Aluminum Chromium Vanadium	3.6 J 0.0149 J 0.219 J 0.00243 UB*	FD RPD FD RPD FD RPD MB/FD RPD
ICT12B_062819	HS19070016	Benzene Carbon Tetrachloride	16 J 68 J	FD RPD FD RPD
ICT12B_062819-a	HS19070016	Benzene Carbon Tetrachloride	11 J 49 J	FD RPD FD RPD
ICT14B_062819	HS19070016	Vanadium	0.00184 UB	MB
ICT14D_062819	HS19070016	Methylene chloride Aluminum	11,000 J 0.0223 J	MS/MSD < MSD >
18WW08_062719	HS19061547	Acetone	2.1 UB	TB
18WW09_062719	HS19061547	Vanadium	0.00236 UB	MB
18WW25_062719	HS19061547	Acetone Vanadium	2.3 UB 0.000983 UB	TB MB
MW23_062419	HS19061279	Chloroform	20 J	LCS >
125_062419	HS19061279	Chloroform Vanadium	26 J 0.00142 UB	LCS > MB
126_062419	HS19061279	Vanadium	0.00257 UB	MB
129_062419	HS19061279	Chloroform	1.2 J	LCS >
18WW03_062419	HS19061279	Aluminum Chromium Vanadium	0.0156 UB 0.0540 J 0.00237 UB	MB FD RPD MB
18WW03_062419-a	HS19061279	Aluminum Chromium Vanadium	0.0175 UB 0.0356 J 0.00240 UB	MB FD RPD MB
18WW17_062419	HS19061279	Aluminum	0.0219 UB	MB
18WW18_062419	HS19061279	Aluminum	0.0389 UB	MB
18CPTMW14_062519	HS19061383	Chloroform Antimony	6.7 J 0.000513 UB	LCS > MB
18CPTMW24_062519	HS19061383	Acetone	5.1 UB	MB
18CPTMW10SW_062019	HS19061157	Acetone	5.4 UB	MB

Client Sample ID Laboratory	Laboratory Package	Analyte Name	Result and Qualifier+	Reason for Qualification
18CPTMW10DW_062019	HS19061157	Acetone Copper Vanadium	3.3 UB 0.00188 UB 0.00163 UB	MB MB MB
18CPTMW19_062019	HS19061157	Acetone	4.8 UB	MB
18CPTMW19SW_062019	HS19061157	Vanadium	0.00184 UB	MB
18WW02_062019	HS19061157	Acetone Copper Vanadium	5.4 UB 0.00663 UB 0.00394 UB	MB MB MB
18WW06_062019	HS19061157	Acetone	3.0 UB	MB
18WW22_062019	HS19061157	Acetone	9.1 UB	MB
C04_062019	HS19061157	Acetone	4.8 UB	MB
18CPTMW01DW_061919	HS19061083	Acetone Copper Vanadium	5.1 UB 0.00332 UB 0.00102 UB	TB MB MB
18CPTMW04_061919	HS19061083	Acetone	4.6 UB	TB
18CPTMW04SW_061919	HS19061083	Acetone	5.0 UB	TB
MW1_061919	HS19061083	Copper Vanadium	0.00256 UB 0.00117 UB	MB MB
MW2_061919	HS19061083	Bromochloromethane 1,4-Dioxane	660 J 3.5 J	FD RPD FD RPD
MW2_061919-a	HS19061083	Bromochloromethane 1,4-Dioxane	460 J 6.2 J	FD RPD FD RPD
MW5_061819	HS19060986	Acetone	4.9 UB	TB
MW6_061819	HS19060986	Manganese Copper Vanadium	0.137 J 0.00520 UB 0.00378 UB	MSD < MB MB
18CPTMW08SW_061819	HS19060986	Acetone	2.7 UB	TB
MW21_061819	HS19060986	1,4-Dioxane Vanadium	1.2 J 0.00433 UB	Surr > MB
109_061819	HS19060986	Acetone	7.8 UB	TB
18CPTMW12SW_061319	HS19060929	Acetone Vanadium 1,4-Dioxane	2.9 UB 0.00102 UB* 0.073 J	TB MB/FD RPD FD RPD
18CPTMW12SW_061319-a	HS19060929	Acetone Vanadium 1,4-Dioxane	3.0 UB 0.00150 UB* 0.18 J	TB MB/FD RPD FD PRD
18CPTMW12DW_061319	HS19060929	Acetone Vanadium	3.2 UB 0.00169 UB	TB MB
18CPTMW23SW_061319	HS19060929	Acetone	2.7 UB	TB
18WW14_061319	HS19060929	Vanadium	0.00422 UB	MB
18CPTMW22R_061319	HS19060835	Copper	0.00172 UB	MB
18CPTMW22SW_061319	HS19060835	Vanadium	0.00200 UB	MB
18CPTMW22DW_061319	HS19060835	Vanadium	0.00216 UB	MB
MW20_061319	HS19060835	Copper Vanadium	0.00576 UB 0.00507 UB	MB MB
C01_062119	HS19061210	Bromoform 1,2-Dibromo-2-Chloropropane	0.50 UJ 0.50 UJ	CCV CCV
C08_062119	HS19061210	Bromoform 1,2-Dibromo-2-Chloropropane	0.50 UJ 0.50 UJ	CCV CCV
MW8_062119	HS19061210	Bromoform 1,2-Dibromo-2-Chloropropane	0.50 UJ 0.50 UJ	CCV CCV
MW22_062119	HS19061210	Vanadium Bromoform 1,2-Dibromo-2-Chloropropane	0.00257 UB 0.50 UJ 0.50 UJ	MB CCV CCV
18CPTMW03SW_062119	HS19061210	Vanadium Bromoform 1,2-Dibromo-2-Chloropropane	0.00183 UB 0.50 UJ 0.50 UJ	MB CCV CCV
18CPTMW06_062119	HS19061210	1,4-Dioxane Bromoform 1,2-Dibromo-2-Chloropropane	0.46 J 0.50 UJ 0.50 UJ	FD RPD CCV CCV

Client Sample ID Laboratory	Laboratory Package	Analyte Name	Result and Qualifier+	Reason for Qualification
18CPTMW06_062119-a	HS19061210	1,4-Dioxane	0.052 J	FD RPD
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
18CPTMW15_062119	HS19061210	Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
AWD3_062119	HS19061210	Vanadium	0.00191 UB	MB
		Bromoform	5.0 UJ	CCV
		1,2-Dibromo-2-Chloropropane	5.0 UJ	CCV
MW12_062019	HS19061164	Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
MW14_062019	HS19061164	Copper	0.00394 UB	MB
		1,4-Dioxane	280 J	FD RPD
		Bromoform	10 UJ	CCV
		1,2-Dibromo-2-Chloropropane	10 UJ	CCV
MW14_062019-a	HS19061164	1,1-Dichloroethene	140 J	Surr >
		1,2-Dichloroethane	110 J	Surr >
		Chloroform	25 J	Surr >
		cis-1,2-Dichloroethene	2,000 J	Surr >
		Copper	0.00362 UB	MB
		1,4-Dioxane	390 J	FD RPD
		Bromoform	10 UJ	CCV
		1,2-Dibromo-2-Chloropropane	10 UJ	CCV
120_062019	HS19061164	Bromoform	10 UJ	CCV
		1,2-Dibromo-2-Chloropropane	10 UJ	CCV
AWD4_062619	HS19061482	Aluminum	20.1 J	FD RPD
		Arsenic	0.00257 J	FD RPD
		Beryllium	0.000982 J	FD RPD
		Chromium	0.387 J	FD RPD
		Cobalt	0.0121 J	FD RPD
		Copper	0.0215 J	FD RPD
		Iron	22.3 J	FD RPD
		Lead	0.00842 J	FD RPD
		Potassium	1.29 J	FD RPD
		Vanadium	0.0366 J	FD RPD
		Zinc	0.0883 J	FD RPD
		1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
AWD4_062619-a	HS19061482	Aluminum	9.41 J	FD RPD
		Arsenic	0.00158 J	FD RPD
		Beryllium	0.000691 J	FD RPD
		Chromium	0.193 J	FD RPD
		Cobalt	0.00828 J	FD RPD
		Copper	0.0140 J	FD RPD
		Iron	11 J	FD RPD
		Lead	0.00448 J	FD RPD
		Potassium	0.827 J	FD RPD
		Vanadium	0.0207 J	FD RPD
		Zinc	0.0588 J	FD RPD
		1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
18WW24_062619	HS19061482	1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
MW16_062619	HS19061482	1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
MW19_062619	HS19061482	1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV

Client Sample ID Laboratory	Laboratory Package	Analyte Name	Result and Qualifier+	Reason for Qualification
17WW08_062519	HS19061386	Aluminum	0.0212 UB	MB
18WW10_062519	HS19061386	Acetone	3.9 J	FD RPD
		1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
18WW10_062519-a	HS19061386	Acetone	2.0 J	FD RPD
		1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
130_062519-a	HS19061386	1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
MW9_062519	HS19061386	1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
MW10_062519	HS19061386	1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
MW13_062519	HS19061386	1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
C02_062519	HS19061386	1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
C03_062619	HS19061486	Aluminum	0.00694 UB	MB
C06_062619	HS19061486	1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
C09_062619	HS19061486	1,1-Dichloroethane	0.50 UJ	MS/MSD <
		Bromobenzene	0.50 UJ	MS/MSD <
		Bromochloromethane	0.50 UJ	MS/MSD <
		Chlorobenzene	0.50 UJ	MS <
		Chloroform	0.50 UJ	MSD <
		1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
18CPTMW18_062619	HS19061486	Aluminum	0.0122 UB	MB
		1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
18WW16_062619	HS19061486	1,2,3-Trichlorobenzene	0.50 UJ	CCV
		Bromoform	0.50 UJ	CCV
		1,2-Dibromo-2-Chloropropane	0.50 UJ	CCV
ICT13A_071119	HS19070622	1,1-Dichloroethane	1.3 J	Surr >
		1,1-Dichloroethene	5.5 J	Surr >
		1,2-Dichloroethane	18 J	Surr >
		cis-1,2-Dichloroethene	86 J	Surr >
		Tetrachloroethene	2.2 J	Surr >
		trans-1,2-Dichloroethene	1.1 J	Surr >
		Vinyl chloride	6.4 J	Surr >
		Bromoform	0.05 UJ	CCV
		Barium	0.0656 J	MSD >

Client Sample ID Laboratory	Laboratory Package	Analyte Name	Result and Qualifier+	Reason for Qualification

Notes:
J – Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
UJ – Estimated not detected; The analyte was not detected but considered estimated due to discrepancies in meeting quality control criteria and reported to the limit of detection.
UB – considered an artifact of blank contamination
FD RPD – Field Duplicate Relative Percent Difference outside control limits
MB – Method Blank contamination; TB – trip blank contamination
CCV – Continuing calibration verification percent recovery outside control limits
MS/MSD <>– Matrix spike/Matrix spike duplicate below/above control limits; LCS > - laboratory control sample above control limits
Surr > - surrogate recover above control limits
*- UB flag supersedes all others
+ - Volatiles/semi-volatiles in micrograms per liter (μg/L); metals and general chemistry in milligrams per liter (mg/L)

Table 3: Completeness by Method

Method	No. of Rejected Results	% Completeness
SW6850	0	100
E350.1	0	100
E365.2	0	100
E415.1	0	100
SW8270D	0	100
SW8260B	0	100
SW6020A	0	100
SW9056	0	100
SW7196A	0	100
E410.4	0	100
E1664	0	100
TO-15	0	100

APPENDIX H
AIR MONITORING ANALYTICAL LABORATORY REPORT
(PROVIDED ON CD ONLY)

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2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
www.alsglobal.com

LABORATORY REPORT

June 25, 2019

Marcia Olive
Bhate Environmental Associates, Inc.
445 Union Blvd Suite 129
Lakewood, CO 80228

RE: LHAAP-GWTP / NW01312.0150

Dear Marcia:

Enclosed are the results of the samples submitted to our laboratory on June 4, 2019. For your reference, these analyses have been assigned our service request number P1903177.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

By Sue Anderson at 3:20 pm, Jun 25, 2019

Sue Anderson
Project Manager

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
www.alsglobal.com

Client: Bhate Environmental Associates, Inc. Service Request No: P1903177
Project: LHAAP-GWTP / NW01312.0150

CASE NARRATIVE

The samples were received intact under chain of custody on June 4, 2019 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Volatile Organic Compound Analysis

The samples were analyzed for volatile organic compounds in accordance with EPA Method TO-15 from the Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition (EPA/625/R-96/010b), January, 1999. This procedure is described in laboratory SOP VOA-TO15. The analytical system was comprised of a gas chromatograph / mass spectrometer (GC/MS) interfaced to a whole-air preconcentrator. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the NELAP or DoD-ELAP accreditation.

The containers were cleaned, prior to sampling, down to the method reporting limit (MRL) reported for this project. For projects requiring DoD QSM 5.1 compliance canisters were cleaned to <1/2 the MRL. Please note, projects which require reporting below the MRL could have results between the MRL and method detection limit (MDL) that are biased high.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.

2655 Park Center Dr., Suite A
Simi Valley, CA 93065
T: +1 805 526 7161
www.alsglobal.com

ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Alaska DEC	http://dec.alaska.gov/eh/lab.aspx	17-019
Arizona DHS	http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home	AZ0694
Florida DOH (NELAP)	http://www.floridahealth.gov/licensing-and-regulation/environmental-laboratories/index.html	E871020
Louisiana DEQ (NELAP)	http://www.deq.louisiana.gov/page/la-lab-accreditation	05071
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/professionals/labCert.shtml	2018027
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	1521096
New Jersey DEP (NELAP)	http://www.nj.gov/dep/enforcement/oqa.html	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://www.oregon.gov/oha/ph/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-006
Pennsylvania DEP	http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx	68-03307 (Registration)
PJLA (DoD ELAP)	http://www.pjlabs.com/search-accredited-labs	65818 (Testing)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/agency/qa/env_lab_accreditation.html	T104704413-18-9
Utah DOH (NELAP)	http://health.utah.gov/lab/lab_cert_env	CA016272018-9
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: Bhate Environmental Associates, Inc. Service Request: P1903177
Project ID: LHAAP-GWTP / NW01312.0150

Date Received: 6/4/2019
Time Received: 09:10

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	Container ID	Pi1 (psig)	Pf1 (psig)	TO-15 - VOC Cans
LH18/24-Air_052919_Stripper	P1903177-001	Air	5/29/2019	14:00	AS01320	-0.09	3.55	X
LH18/24-Air_052919_Stripper_a	P1903177-002	Air	5/29/2019	14:00	AS00732	-0.10	3.62	X
LH18/24-Air_052919_GWTP	P1903177-003	Air	5/29/2019	14:15	AC02346	-2.16	3.68	X
LH18/24-Air_0529_Downwind_South	P1903177-004	Air	5/30/2019	07:00	AC02318	0.12	3.52	X

Air - Chain of Custody Record & Analytical Service Request

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

ALS Project No. P1903177

ALS Contact:

Company Name & Address (Reporting Information): BHATE ENVIRONMENTAL, 445 UNION BLVD. STE 129, LAKEWOOD, CO. 80228

Project Name: LHAAP - GWTP

Project Number: NW01312.0150

Project Manager: Kim Nemmers

P.O. # / Billing Information:

Phone: 720-463-3905

Fax:

Email Address for Result Reporting: molive@bhate.com

Sampler (Print & Sign): Scott Beesinger [signature]

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	Analysis Method: TO-15		Comments e.g. Actual Preservative or specific instructions
LH18/24-AIR-052919_Stripper		5/29/19	1400	AS01320		-30	0	6L	✓		
LH18/24-AIR_052919_Stripper_cc		5/29/19	1400	AS00732		-28	0	6L	✓		
LH18/24-AIR-052919_GWTP		5/29/19	1415	AC02346	SFC00182	-27	-5	6L	✓		
LH18/24-AIR_0529_Downwind_South		5/30/19	0700	AC02318	SFC00157	-25	0	6L	✓		

Report Tier Levels - please select

Tier I - Results (Default if not specified) ____
Tier II (Results + QC Summaries) X
Tier III (Results + QC & Calibration Summaries) ____
Tier IV (Data Validation Package) 10% Surcharge ____

EDD required Yes / No
Type: _____ Units: _____

Chain of Custody Seal: (Circle) INTACT BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
[signature]	5/30/19	07:15			
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
			[signature]	6/4/19	0910

Cooler / Blank Temperature ____ °C

00942808

ALS Environmental
Sample Acceptance Check Form

Client: Bhate Environmental Associates, Inc. Work order: P1903177

Project: LHAAP-GWTP / NW01312.0150

Sample(s) received on: 6/4/19 Date opened: 6/4/19 by: HAYDEN.AKERS

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Did **sample containers** arrive in good condition?	☒	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
5	Was **sample volume** received adequate for analysis?	☒	☐	☐
6	Are samples within specified holding times?	☒	☐	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☐	☐	☒
8	Were **custody seals** on outside of cooler/Box/Container?	☐	☐	☒
	Location of seal(s)? _____ Sealing Lid?	☐	☐	☒
	Were signature and date included?	☐	☐	☒
	Were seals intact?	☐	☐	☒
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1903177-001.01	6.0 L Silonite Can					
P1903177-002.01	6.0 L Silonite Can					
P1903177-003.01	6.0 L Ambient Can					
P1903177-004.01	6.0 L Ambient Can					

Explain any discrepancies: (include lab sample ID numbers):

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **LH18/24-Air_052919_Stripper** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P1903177-001

Test Code: EPA TO-15 Date Collected: 5/29/19
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 6/4/19
Analyst: Simon Cao Date Analyzed: 6/12 - 6/13/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.0080 Liter(s)
Test Notes: 0.0040 Liter(s)
Container ID: AS01320

Initial Pressure (psig): -0.09 Final Pressure (psig): 3.55

Container Dilution Factor: 1.25

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	ND	81	ND	47	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	81	ND	16	
74-87-3	Chloromethane	ND	78	ND	38	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	80	ND	11	
75-01-4	Vinyl Chloride	**120**	83	**46**	32	
106-99-0	1,3-Butadiene	ND	81	ND	37	
74-83-9	Bromomethane	ND	78	ND	20	
75-00-3	Chloroethane	ND	80	ND	30	
64-17-5	Ethanol	ND	800	ND	420	
75-05-8	Acetonitrile	ND	81	ND	48	
107-02-8	Acrolein	ND	160	ND	68	
67-64-1	Acetone	ND	840	ND	360	
75-69-4	Trichlorofluoromethane (CFC 11)	ND	83	ND	15	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	330	ND	130	
107-13-1	Acrylonitrile	ND	81	ND	37	
75-35-4	1,1-Dichloroethene	**190**	84	**49**	21	
75-09-2	Methylene Chloride	**7,200**	84	**2,100**	24	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	83	ND	26	
76-13-1	Trichlorotrifluoroethane (CFC 113)	**16,000**	83	**2,100**	11	
75-15-0	Carbon Disulfide	ND	170	ND	55	
156-60-5	trans-1,2-Dichloroethene	ND	83	ND	21	
75-34-3	1,1-Dichloroethane	ND	81	ND	20	
1634-04-4	Methyl tert-Butyl Ether	ND	84	ND	23	
108-05-4	Vinyl Acetate	ND	830	ND	240	
78-93-3	2-Butanone (MEK)	ND	160	ND	53	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **LH18/24-Air_052919_Stripper** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P1903177-001

Test Code: EPA TO-15 Date Collected: 5/29/19
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 6/4/19
Analyst: Simon Cao Date Analyzed: 6/12 - 6/13/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.0080 Liter(s)
Test Notes: 0.0040 Liter(s)
Container ID: AS01320

Initial Pressure (psig): -0.09 Final Pressure (psig): 3.55

Container Dilution Factor: 1.25

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	**9,200**	83	**2,300**	21	
141-78-6	Ethyl Acetate	ND	170	ND	48	
110-54-3	n-Hexane	ND	84	ND	24	
67-66-3	Chloroform	ND	84	ND	17	
109-99-9	Tetrahydrofuran (THF)	ND	83	ND	28	
107-06-2	1,2-Dichloroethane	**180**	83	**45**	20	
71-55-6	1,1,1-Trichloroethane	ND	84	ND	15	
71-43-2	Benzene	ND	81	ND	25	
56-23-5	Carbon Tetrachloride	ND	81	ND	13	
110-82-7	Cyclohexane	ND	160	ND	45	
78-87-5	1,2-Dichloropropane	ND	84	ND	18	
75-27-4	Bromodichloromethane	ND	83	ND	12	
79-01-6	Trichloroethene	**21,000**	170	**3,900**	31	**D**
123-91-1	1,4-Dioxane	ND	83	ND	23	
80-62-6	Methyl Methacrylate	ND	170	ND	42	
142-82-5	n-Heptane	ND	84	ND	21	
10061-01-5	cis-1,3-Dichloropropene	ND	88	ND	19	
108-10-1	4-Methyl-2-pentanone	ND	83	ND	20	
10061-02-6	trans-1,3-Dichloropropene	ND	83	ND	18	
79-00-5	1,1,2-Trichloroethane	ND	84	ND	15	
108-88-3	Toluene	ND	83	ND	22	
591-78-6	2-Hexanone	ND	84	ND	21	
124-48-1	Dibromochloromethane	ND	84	ND	9.9	
106-93-4	1,2-Dibromoethane	ND	84	ND	11	
123-86-4	n-Butyl Acetate	ND	84	ND	18	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

D = The reported result is from a dilution.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **LH18/24-Air_052919_Stripper** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P1903177-001

Test Code: EPA TO-15 Date Collected: 5/29/19
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 6/4/19
Analyst: Simon Cao Date Analyzed: 6/12 - 6/13/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.0080 Liter(s)
Test Notes: 0.0040 Liter(s)
Container ID: AS01320

Initial Pressure (psig): -0.09 Final Pressure (psig): 3.55

Container Dilution Factor: 1.25

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	84	ND	18	
127-18-4	Tetrachloroethene	**150**	83	**22**	12	
108-90-7	Chlorobenzene	ND	83	ND	18	
100-41-4	Ethylbenzene	ND	81	ND	19	
179601-23-1	m,p-Xylenes	ND	170	ND	40	
75-25-2	Bromoform	ND	83	ND	8.0	
100-42-5	Styrene	ND	83	ND	19	
95-47-6	o-Xylene	ND	83	ND	19	
111-84-2	n-Nonane	ND	84	ND	16	
79-34-5	1,1,2,2-Tetrachloroethane	ND	83	ND	12	
98-82-8	Cumene	ND	83	ND	17	
80-56-8	alpha-Pinene	ND	81	ND	15	
103-65-1	n-Propylbenzene	ND	84	ND	17	
622-96-8	4-Ethyltoluene	ND	83	ND	17	
108-67-8	1,3,5-Trimethylbenzene	ND	83	ND	17	
95-63-6	1,2,4-Trimethylbenzene	ND	83	ND	17	
100-44-7	Benzyl Chloride	ND	170	ND	33	
541-73-1	1,3-Dichlorobenzene	ND	84	ND	14	
106-46-7	1,4-Dichlorobenzene	ND	84	ND	14	
95-50-1	1,2-Dichlorobenzene	ND	84	ND	14	
5989-27-5	d-Limonene	ND	80	ND	14	
96-12-8	1,2-Dibromo-3-chloropropane	ND	81	ND	8.4	
120-82-1	1,2,4-Trichlorobenzene	ND	83	ND	11	
91-20-3	Naphthalene	ND	80	ND	15	
87-68-3	Hexachlorobutadiene	ND	83	ND	7.8	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **LH18/24-Air_052919_Stripper_a** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P1903177-002

Test Code: EPA TO-15 Date Collected: 5/29/19
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 6/4/19
Analyst: Simon Cao Date Analyzed: 6/12 - 6/13/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.0080 Liter(s)
Test Notes: 0.0040 Liter(s)
Container ID: AS00732

Initial Pressure (psig): -0.10 Final Pressure (psig): 3.62

Container Dilution Factor: 1.25

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	ND	81	ND	47	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	81	ND	16	
74-87-3	Chloromethane	ND	78	ND	38	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	80	ND	11	
75-01-4	Vinyl Chloride	**110**	83	**43**	32	
106-99-0	1,3-Butadiene	ND	81	ND	37	
74-83-9	Bromomethane	ND	78	ND	20	
75-00-3	Chloroethane	ND	80	ND	30	
64-17-5	Ethanol	ND	800	ND	420	
75-05-8	Acetonitrile	ND	81	ND	48	
107-02-8	Acrolein	ND	160	ND	68	
67-64-1	Acetone	ND	840	ND	360	
75-69-4	Trichlorofluoromethane (CFC 11)	ND	83	ND	15	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	330	ND	130	
107-13-1	Acrylonitrile	ND	81	ND	37	
75-35-4	1,1-Dichloroethene	**180**	84	**45**	21	
75-09-2	Methylene Chloride	**6,400**	84	**1,800**	24	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	83	ND	26	
76-13-1	Trichlorotrifluoroethane (CFC 113)	**14,000**	83	**1,900**	11	
75-15-0	Carbon Disulfide	ND	170	ND	55	
156-60-5	trans-1,2-Dichloroethene	ND	83	ND	21	
75-34-3	1,1-Dichloroethane	ND	81	ND	20	
1634-04-4	Methyl tert-Butyl Ether	ND	84	ND	23	
108-05-4	Vinyl Acetate	ND	830	ND	240	
78-93-3	2-Butanone (MEK)	ND	160	ND	53	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **LH18/24-Air_052919_Stripper_a** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P1903177-002

Test Code: EPA TO-15 Date Collected: 5/29/19
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 6/4/19
Analyst: Simon Cao Date Analyzed: 6/12 - 6/13/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.0080 Liter(s)
Test Notes: 0.0040 Liter(s)
Container ID: AS00732

Initial Pressure (psig): -0.10 Final Pressure (psig): 3.62

Container Dilution Factor: 1.25

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	**8,400**	83	**2,100**	21	
141-78-6	Ethyl Acetate	ND	170	ND	48	
110-54-3	n-Hexane	ND	84	ND	24	
67-66-3	Chloroform	ND	84	ND	17	
109-99-9	Tetrahydrofuran (THF)	ND	83	ND	28	
107-06-2	1,2-Dichloroethane	**170**	83	**41**	20	
71-55-6	1,1,1-Trichloroethane	ND	84	ND	15	
71-43-2	Benzene	ND	81	ND	25	
56-23-5	Carbon Tetrachloride	ND	81	ND	13	
110-82-7	Cyclohexane	ND	160	ND	45	
78-87-5	1,2-Dichloropropane	ND	84	ND	18	
75-27-4	Bromodichloromethane	ND	83	ND	12	
79-01-6	Trichloroethene	**19,000**	170	**3,500**	31	**D**
123-91-1	1,4-Dioxane	ND	83	ND	23	
80-62-6	Methyl Methacrylate	ND	170	ND	42	
142-82-5	n-Heptane	ND	84	ND	21	
10061-01-5	cis-1,3-Dichloropropene	ND	88	ND	19	
108-10-1	4-Methyl-2-pentanone	ND	83	ND	20	
10061-02-6	trans-1,3-Dichloropropene	ND	83	ND	18	
79-00-5	1,1,2-Trichloroethane	ND	84	ND	15	
108-88-3	Toluene	ND	83	ND	22	
591-78-6	2-Hexanone	ND	84	ND	21	
124-48-1	Dibromochloromethane	ND	84	ND	9.9	
106-93-4	1,2-Dibromoethane	ND	84	ND	11	
123-86-4	n-Butyl Acetate	ND	84	ND	18	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

D = The reported result is from a dilution.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **LH18/24-Air_052919_Stripper_a** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P1903177-002

Test Code: EPA TO-15 Date Collected: 5/29/19
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 6/4/19
Analyst: Simon Cao Date Analyzed: 6/12 - 6/13/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.0080 Liter(s)
Test Notes: 0.0040 Liter(s)
Container ID: AS00732

Initial Pressure (psig): -0.10 Final Pressure (psig): 3.62

Container Dilution Factor: 1.25

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	84	ND	18	
127-18-4	Tetrachloroethene	**130**	83	**20**	12	
108-90-7	Chlorobenzene	ND	83	ND	18	
100-41-4	Ethylbenzene	ND	81	ND	19	
179601-23-1	m,p-Xylenes	ND	170	ND	40	
75-25-2	Bromoform	ND	83	ND	8.0	
100-42-5	Styrene	ND	83	ND	19	
95-47-6	o-Xylene	ND	83	ND	19	
111-84-2	n-Nonane	ND	84	ND	16	
79-34-5	1,1,2,2-Tetrachloroethane	ND	83	ND	12	
98-82-8	Cumene	ND	83	ND	17	
80-56-8	alpha-Pinene	ND	81	ND	15	
103-65-1	n-Propylbenzene	ND	84	ND	17	
622-96-8	4-Ethyltoluene	ND	83	ND	17	
108-67-8	1,3,5-Trimethylbenzene	ND	83	ND	17	
95-63-6	1,2,4-Trimethylbenzene	ND	83	ND	17	
100-44-7	Benzyl Chloride	ND	170	ND	33	
541-73-1	1,3-Dichlorobenzene	ND	84	ND	14	
106-46-7	1,4-Dichlorobenzene	ND	84	ND	14	
95-50-1	1,2-Dichlorobenzene	ND	84	ND	14	
5989-27-5	d-Limonene	ND	80	ND	14	
96-12-8	1,2-Dibromo-3-chloropropane	ND	81	ND	8.4	
120-82-1	1,2,4-Trichlorobenzene	ND	83	ND	11	
91-20-3	Naphthalene	ND	80	ND	15	
87-68-3	Hexachlorobutadiene	ND	83	ND	7.8	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **LH18/24-Air_052919_GWTP** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P1903177-003

Test Code: EPA TO-15 Date Collected: 5/29/19
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 6/4/19
Analyst: Simon Cao Date Analyzed: 6/12/19
Sample Type: 6.0 L Summa Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:
Container ID: AC02346

Initial Pressure (psig): -2.16 Final Pressure (psig): 3.68

Container Dilution Factor: 1.47

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	**1.6**	0.76	**0.96**	0.44	
75-71-8	Dichlorodifluoromethane (CFC 12)	**2.7**	0.76	**0.55**	0.15	
74-87-3	Chloromethane	ND	0.74	ND	0.36	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.75	ND	0.11	
75-01-4	Vinyl Chloride	ND	0.78	ND	0.30	
106-99-0	1,3-Butadiene	ND	0.76	ND	0.35	
74-83-9	Bromomethane	ND	0.74	ND	0.19	
75-00-3	Chloroethane	ND	0.75	ND	0.28	
64-17-5	Ethanol	**8.6**	7.5	**4.6**	4.0	
75-05-8	Acetonitrile	ND	0.76	ND	0.46	
107-02-8	Acrolein	ND	1.5	ND	0.64	
67-64-1	Acetone	**11**	7.9	**4.6**	3.3	
75-69-4	Trichlorofluoromethane (CFC 11)	**1.6**	0.78	**0.29**	0.14	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	3.1	ND	1.3	
107-13-1	Acrylonitrile	ND	0.76	ND	0.35	
75-35-4	1,1-Dichloroethene	ND	0.79	ND	0.20	
75-09-2	Methylene Chloride	**2.1**	0.79	**0.61**	0.23	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.78	ND	0.25	
76-13-1	Trichlorotrifluoroethane (CFC 113)	**23**	0.78	**3.0**	0.10	
75-15-0	Carbon Disulfide	ND	1.6	ND	0.52	
156-60-5	trans-1,2-Dichloroethene	ND	0.78	ND	0.20	
75-34-3	1,1-Dichloroethane	ND	0.76	ND	0.19	
1634-04-4	Methyl tert-Butyl Ether	ND	0.79	ND	0.22	
108-05-4	Vinyl Acetate	ND	7.8	ND	2.2	
78-93-3	2-Butanone (MEK)	**7.5**	1.5	**2.5**	0.50	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **LH18/24-Air_052919_GWTP** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P1903177-003

Test Code: EPA TO-15 Date Collected: 5/29/19
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 6/4/19
Analyst: Simon Cao Date Analyzed: 6/12/19
Sample Type: 6.0 L Summa Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:
Container ID: AC02346

Initial Pressure (psig): -2.16 Final Pressure (psig): 3.68

Container Dilution Factor: 1.47

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	**4.2**	0.78	**1.1**	0.20	
141-78-6	Ethyl Acetate	**2.9**	1.6	**0.80**	0.45	
110-54-3	n-Hexane	**0.86**	0.79	**0.24**	0.23	
67-66-3	Chloroform	ND	0.79	ND	0.16	
109-99-9	Tetrahydrofuran (THF)	**1.1**	0.78	**0.37**	0.26	
107-06-2	1,2-Dichloroethane	ND	0.78	ND	0.19	
71-55-6	1,1,1-Trichloroethane	ND	0.79	ND	0.15	
71-43-2	Benzene	ND	0.76	ND	0.24	
56-23-5	Carbon Tetrachloride	ND	0.76	ND	0.12	
110-82-7	Cyclohexane	ND	1.5	ND	0.43	
78-87-5	1,2-Dichloropropane	ND	0.79	ND	0.17	
75-27-4	Bromodichloromethane	ND	0.78	ND	0.12	
79-01-6	Trichloroethene	**12**	0.78	**2.1**	0.15	
123-91-1	1,4-Dioxane	ND	0.78	ND	0.22	
80-62-6	Methyl Methacrylate	ND	1.6	ND	0.40	
142-82-5	n-Heptane	ND	0.79	ND	0.19	
10061-01-5	cis-1,3-Dichloropropene	ND	0.82	ND	0.18	
108-10-1	4-Methyl-2-pentanone	**5.0**	0.78	**1.2**	0.19	
10061-02-6	trans-1,3-Dichloropropene	ND	0.78	ND	0.17	
79-00-5	1,1,2-Trichloroethane	ND	0.79	ND	0.15	
108-88-3	Toluene	**3.6**	0.78	**0.96**	0.21	
591-78-6	2-Hexanone	ND	0.79	ND	0.19	
124-48-1	Dibromochloromethane	ND	0.79	ND	0.093	
106-93-4	1,2-Dibromoethane	ND	0.79	ND	0.10	
123-86-4	n-Butyl Acetate	ND	0.79	ND	0.17	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **LH18/24-Air_052919_GWTP** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P1903177-003

Test Code: EPA TO-15 Date Collected: 5/29/19
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 6/4/19
Analyst: Simon Cao Date Analyzed: 6/12/19
Sample Type: 6.0 L Summa Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:
Container ID: AC02346

Initial Pressure (psig): -2.16 Final Pressure (psig): 3.68

Container Dilution Factor: 1.47

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.79	ND	0.17	
127-18-4	Tetrachloroethene	ND	0.78	ND	0.11	
108-90-7	Chlorobenzene	ND	0.78	ND	0.17	
100-41-4	Ethylbenzene	ND	0.76	ND	0.18	
179601-23-1	m,p-Xylenes	**1.6**	1.6	**0.37**	0.37	
75-25-2	Bromoform	ND	0.78	ND	0.075	
100-42-5	Styrene	ND	0.78	ND	0.18	
95-47-6	o-Xylene	ND	0.78	ND	0.18	
111-84-2	n-Nonane	ND	0.79	ND	0.15	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.78	ND	0.11	
98-82-8	Cumene	ND	0.78	ND	0.16	
80-56-8	alpha-Pinene	**1.6**	0.76	**0.28**	0.14	
103-65-1	n-Propylbenzene	ND	0.79	ND	0.16	
622-96-8	4-Ethyltoluene	ND	0.78	ND	0.16	
108-67-8	1,3,5-Trimethylbenzene	ND	0.78	ND	0.16	
95-63-6	1,2,4-Trimethylbenzene	ND	0.78	ND	0.16	
100-44-7	Benzyl Chloride	ND	1.6	ND	0.31	
541-73-1	1,3-Dichlorobenzene	ND	0.79	ND	0.13	
106-46-7	1,4-Dichlorobenzene	ND	0.79	ND	0.13	
95-50-1	1,2-Dichlorobenzene	ND	0.79	ND	0.13	
5989-27-5	d-Limonene	ND	0.75	ND	0.13	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.76	ND	0.079	
120-82-1	1,2,4-Trichlorobenzene	ND	0.78	ND	0.10	
91-20-3	Naphthalene	ND	0.75	ND	0.14	
87-68-3	Hexachlorobutadiene	ND	0.78	ND	0.073	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **LH18/24-Air_0529_Downwind_South** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P1903177-004

Test Code: EPA TO-15 Date Collected: 5/30/19
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 6/4/19
Analyst: Simon Cao Date Analyzed: 6/12/19
Sample Type: 6.0 L Summa Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:
Container ID: AC02318

Initial Pressure (psig): 0.12 Final Pressure (psig): 3.52

Container Dilution Factor: 1.23

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	**3.9**	0.64	**2.3**	0.37	
75-71-8	Dichlorodifluoromethane (CFC 12)	**14**	0.64	**2.8**	0.13	
74-87-3	Chloromethane	ND	0.62	ND	0.30	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.63	ND	0.090	
75-01-4	Vinyl Chloride	ND	0.65	ND	0.26	
106-99-0	1,3-Butadiene	ND	0.64	ND	0.29	
74-83-9	Bromomethane	ND	0.62	ND	0.16	
75-00-3	Chloroethane	ND	0.63	ND	0.24	
64-17-5	Ethanol	**38**	6.3	**20**	3.3	
75-05-8	Acetonitrile	**0.90**	0.64	**0.54**	0.38	
107-02-8	Acrolein	**2.0**	1.2	**0.86**	0.54	
67-64-1	Acetone	**33**	6.6	**14**	2.8	
75-69-4	Trichlorofluoromethane (CFC 11)	**13**	0.65	**2.4**	0.12	
67-63-0	2-Propanol (Isopropyl Alcohol)	**7.2**	2.6	**2.9**	1.1	
107-13-1	Acrylonitrile	ND	0.64	ND	0.29	
75-35-4	1,1-Dichloroethene	ND	0.66	ND	0.17	
75-09-2	Methylene Chloride	ND	0.66	ND	0.19	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.65	ND	0.21	
76-13-1	Trichlorotrifluoroethane (CFC 113)	**0.67**	0.65	**0.087**	0.085	
75-15-0	Carbon Disulfide	**3.2**	1.4	**1.0**	0.43	
156-60-5	trans-1,2-Dichloroethene	ND	0.65	ND	0.16	
75-34-3	1,1-Dichloroethane	ND	0.64	ND	0.16	
1634-04-4	Methyl tert-Butyl Ether	ND	0.66	ND	0.18	
108-05-4	Vinyl Acetate	ND	6.5	ND	1.9	
78-93-3	2-Butanone (MEK)	**13**	1.2	**4.3**	0.42	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **LH18/24-Air_0529_Downwind_South** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P1903177-004

Test Code: EPA TO-15 Date Collected: 5/30/19
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 6/4/19
Analyst: Simon Cao Date Analyzed: 6/12/19
Sample Type: 6.0 L Summa Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:
Container ID: AC02318

Initial Pressure (psig): 0.12 Final Pressure (psig): 3.52

Container Dilution Factor: 1.23

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.65	ND	0.16	
141-78-6	Ethyl Acetate	**67**	1.4	**19**	0.38	
110-54-3	n-Hexane	**8.9**	0.66	**2.5**	0.19	
67-66-3	Chloroform	**0.74**	0.66	**0.15**	0.14	
109-99-9	Tetrahydrofuran (THF)	**21**	0.65	**7.1**	0.22	
107-06-2	1,2-Dichloroethane	**1.5**	0.65	**0.38**	0.16	
71-55-6	1,1,1-Trichloroethane	ND	0.66	ND	0.12	
71-43-2	Benzene	**1.7**	0.64	**0.54**	0.20	
56-23-5	Carbon Tetrachloride	ND	0.64	ND	0.10	
110-82-7	Cyclohexane	**1.9**	1.2	**0.56**	0.36	
78-87-5	1,2-Dichloropropane	ND	0.66	ND	0.14	
75-27-4	Bromodichloromethane	ND	0.65	ND	0.097	
79-01-6	Trichloroethene	ND	0.65	ND	0.12	
123-91-1	1,4-Dioxane	ND	0.65	ND	0.18	
80-62-6	Methyl Methacrylate	ND	1.4	ND	0.33	
142-82-5	n-Heptane	**4.9**	0.66	**1.2**	0.16	
10061-01-5	cis-1,3-Dichloropropene	ND	0.69	ND	0.15	
108-10-1	4-Methyl-2-pentanone	**0.92**	0.65	**0.22**	0.16	
10061-02-6	trans-1,3-Dichloropropene	ND	0.65	ND	0.14	
79-00-5	1,1,2-Trichloroethane	ND	0.66	ND	0.12	
108-88-3	Toluene	**30**	0.65	**7.9**	0.17	
591-78-6	2-Hexanone	ND	0.66	ND	0.16	
124-48-1	Dibromochloromethane	ND	0.66	ND	0.078	
106-93-4	1,2-Dibromoethane	ND	0.66	ND	0.086	
123-86-4	n-Butyl Acetate	**1.4**	0.66	**0.29**	0.14	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **LH18/24-Air_0529_Downwind_South** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P1903177-004

Test Code: EPA TO-15 Date Collected: 5/30/19
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: 6/4/19
Analyst: Simon Cao Date Analyzed: 6/12/19
Sample Type: 6.0 L Summa Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:
Container ID: AC02318

Initial Pressure (psig): 0.12 Final Pressure (psig): 3.52

Container Dilution Factor: 1.23

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	**1.5**	0.66	**0.32**	0.14	
127-18-4	Tetrachloroethene	**2.7**	0.65	**0.40**	0.096	
108-90-7	Chlorobenzene	ND	0.65	ND	0.14	
100-41-4	Ethylbenzene	**3.1**	0.64	**0.70**	0.15	
179601-23-1	m,p-Xylenes	**9.9**	1.4	**2.3**	0.31	
75-25-2	Bromoform	ND	0.65	ND	0.063	
100-42-5	Styrene	**0.87**	0.65	**0.20**	0.15	
95-47-6	o-Xylene	**3.5**	0.65	**0.80**	0.15	
111-84-2	n-Nonane	**1.1**	0.66	**0.21**	0.13	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.65	ND	0.095	
98-82-8	Cumene	ND	0.65	ND	0.13	
80-56-8	alpha-Pinene	**2.2**	0.64	**0.40**	0.11	
103-65-1	n-Propylbenzene	ND	0.66	ND	0.14	
622-96-8	4-Ethyltoluene	**0.88**	0.65	**0.18**	0.13	
108-67-8	1,3,5-Trimethylbenzene	**0.75**	0.65	**0.15**	0.13	
95-63-6	1,2,4-Trimethylbenzene	**3.0**	0.65	**0.61**	0.13	
100-44-7	Benzyl Chloride	ND	1.4	ND	0.26	
541-73-1	1,3-Dichlorobenzene	ND	0.66	ND	0.11	
106-46-7	1,4-Dichlorobenzene	ND	0.66	ND	0.11	
95-50-1	1,2-Dichlorobenzene	ND	0.66	ND	0.11	
5989-27-5	d-Limonene	**1.3**	0.63	**0.24**	0.11	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.64	ND	0.066	
120-82-1	1,2,4-Trichlorobenzene	ND	0.65	ND	0.088	
91-20-3	Naphthalene	ND	0.63	ND	0.12	
87-68-3	Hexachlorobutadiene	ND	0.65	ND	0.061	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **Method Blank** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P190612-MB

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 6/12/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:

Container Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	ND	0.52	ND	0.30	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.52	ND	0.11	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.51	ND	0.073	
75-01-4	Vinyl Chloride	ND	0.53	ND	0.21	
106-99-0	1,3-Butadiene	ND	0.52	ND	0.24	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.51	ND	0.19	
64-17-5	Ethanol	ND	5.1	ND	2.7	
75-05-8	Acetonitrile	ND	0.52	ND	0.31	
107-02-8	Acrolein	ND	1.0	ND	0.44	
67-64-1	Acetone	ND	5.4	ND	2.3	
75-69-4	Trichlorofluoromethane (CFC 11)	ND	0.53	ND	0.094	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	2.1	ND	0.85	
107-13-1	Acrylonitrile	ND	0.52	ND	0.24	
75-35-4	1,1-Dichloroethene	ND	0.54	ND	0.14	
75-09-2	Methylene Chloride	ND	0.54	ND	0.16	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.53	ND	0.17	
76-13-1	Trichlorotrifluoroethane (CFC 113)	ND	0.53	ND	0.069	
75-15-0	Carbon Disulfide	ND	1.1	ND	0.35	
156-60-5	trans-1,2-Dichloroethene	ND	0.53	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.52	ND	0.13	
1634-04-4	Methyl tert-Butyl Ether	ND	0.54	ND	0.15	
108-05-4	Vinyl Acetate	ND	5.3	ND	1.5	
78-93-3	2-Butanone (MEK)	ND	1.0	ND	0.34	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **Method Blank** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P190612-MB

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 6/12/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:

Container Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.53	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.1	ND	0.31	
110-54-3	n-Hexane	ND	0.54	ND	0.15	
67-66-3	Chloroform	ND	0.54	ND	0.11	
109-99-9	Tetrahydrofuran (THF)	ND	0.53	ND	0.18	
107-06-2	1,2-Dichloroethane	ND	0.53	ND	0.13	
71-55-6	1,1,1-Trichloroethane	ND	0.54	ND	0.099	
71-43-2	Benzene	ND	0.52	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.52	ND	0.083	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.54	ND	0.12	
75-27-4	Bromodichloromethane	ND	0.53	ND	0.079	
79-01-6	Trichloroethene	ND	0.53	ND	0.099	
123-91-1	1,4-Dioxane	ND	0.53	ND	0.15	
80-62-6	Methyl Methacrylate	ND	1.1	ND	0.27	
142-82-5	n-Heptane	ND	0.54	ND	0.13	
10061-01-5	cis-1,3-Dichloropropene	ND	0.56	ND	0.12	
108-10-1	4-Methyl-2-pentanone	ND	0.53	ND	0.13	
10061-02-6	trans-1,3-Dichloropropene	ND	0.53	ND	0.12	
79-00-5	1,1,2-Trichloroethane	ND	0.54	ND	0.099	
108-88-3	Toluene	ND	0.53	ND	0.14	
591-78-6	2-Hexanone	ND	0.54	ND	0.13	
124-48-1	Dibromochloromethane	ND	0.54	ND	0.063	
106-93-4	1,2-Dibromoethane	ND	0.54	ND	0.070	
123-86-4	n-Butyl Acetate	ND	0.54	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **Method Blank** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P190612-MB

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 6/12/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:

Container Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.54	ND	0.12	
127-18-4	Tetrachloroethene	ND	0.53	ND	0.078	
108-90-7	Chlorobenzene	ND	0.53	ND	0.12	
100-41-4	Ethylbenzene	ND	0.52	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.1	ND	0.25	
75-25-2	Bromoform	ND	0.53	ND	0.051	
100-42-5	Styrene	ND	0.53	ND	0.12	
95-47-6	o-Xylene	ND	0.53	ND	0.12	
111-84-2	n-Nonane	ND	0.54	ND	0.10	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.53	ND	0.077	
98-82-8	Cumene	ND	0.53	ND	0.11	
80-56-8	alpha-Pinene	ND	0.52	ND	0.093	
103-65-1	n-Propylbenzene	ND	0.54	ND	0.11	
622-96-8	4-Ethyltoluene	ND	0.53	ND	0.11	
108-67-8	1,3,5-Trimethylbenzene	ND	0.53	ND	0.11	
95-63-6	1,2,4-Trimethylbenzene	ND	0.53	ND	0.11	
100-44-7	Benzyl Chloride	ND	1.1	ND	0.21	
541-73-1	1,3-Dichlorobenzene	ND	0.54	ND	0.090	
106-46-7	1,4-Dichlorobenzene	ND	0.54	ND	0.090	
95-50-1	1,2-Dichlorobenzene	ND	0.54	ND	0.090	
5989-27-5	d-Limonene	ND	0.51	ND	0.092	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.52	ND	0.054	
120-82-1	1,2,4-Trichlorobenzene	ND	0.53	ND	0.071	
91-20-3	Naphthalene	ND	0.51	ND	0.097	
87-68-3	Hexachlorobutadiene	ND	0.53	ND	0.050	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **Method Blank** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P190613-MB

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 6/13/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:

Container Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
115-07-1	Propene	ND	0.52	ND	0.30	
75-71-8	Dichlorodifluoromethane (CFC 12)	ND	0.52	ND	0.11	
74-87-3	Chloromethane	ND	0.50	ND	0.24	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	ND	0.51	ND	0.073	
75-01-4	Vinyl Chloride	ND	0.53	ND	0.21	
106-99-0	1,3-Butadiene	ND	0.52	ND	0.24	
74-83-9	Bromomethane	ND	0.50	ND	0.13	
75-00-3	Chloroethane	ND	0.51	ND	0.19	
64-17-5	Ethanol	ND	5.1	ND	2.7	
75-05-8	Acetonitrile	ND	0.52	ND	0.31	
107-02-8	Acrolein	ND	1.0	ND	0.44	
67-64-1	Acetone	ND	5.4	ND	2.3	
75-69-4	Trichlorofluoromethane (CFC 11)	ND	0.53	ND	0.094	
67-63-0	2-Propanol (Isopropyl Alcohol)	ND	2.1	ND	0.85	
107-13-1	Acrylonitrile	ND	0.52	ND	0.24	
75-35-4	1,1-Dichloroethene	ND	0.54	ND	0.14	
75-09-2	Methylene Chloride	ND	0.54	ND	0.16	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	ND	0.53	ND	0.17	
76-13-1	Trichlorotrifluoroethane (CFC 113)	ND	0.53	ND	0.069	
75-15-0	Carbon Disulfide	ND	1.1	ND	0.35	
156-60-5	trans-1,2-Dichloroethene	ND	0.53	ND	0.13	
75-34-3	1,1-Dichloroethane	ND	0.52	ND	0.13	
1634-04-4	Methyl tert-Butyl Ether	ND	0.54	ND	0.15	
108-05-4	Vinyl Acetate	ND	5.3	ND	1.5	
78-93-3	2-Butanone (MEK)	ND	1.0	ND	0.34	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **Method Blank** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P190613-MB

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 6/13/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:

Container Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	ND	0.53	ND	0.13	
141-78-6	Ethyl Acetate	ND	1.1	ND	0.31	
110-54-3	n-Hexane	ND	0.54	ND	0.15	
67-66-3	Chloroform	ND	0.54	ND	0.11	
109-99-9	Tetrahydrofuran (THF)	ND	0.53	ND	0.18	
107-06-2	1,2-Dichloroethane	ND	0.53	ND	0.13	
71-55-6	1,1,1-Trichloroethane	ND	0.54	ND	0.099	
71-43-2	Benzene	ND	0.52	ND	0.16	
56-23-5	Carbon Tetrachloride	ND	0.52	ND	0.083	
110-82-7	Cyclohexane	ND	1.0	ND	0.29	
78-87-5	1,2-Dichloropropane	ND	0.54	ND	0.12	
75-27-4	Bromodichloromethane	ND	0.53	ND	0.079	
79-01-6	Trichloroethene	ND	0.53	ND	0.099	
123-91-1	1,4-Dioxane	ND	0.53	ND	0.15	
80-62-6	Methyl Methacrylate	ND	1.1	ND	0.27	
142-82-5	n-Heptane	ND	0.54	ND	0.13	
10061-01-5	cis-1,3-Dichloropropene	ND	0.56	ND	0.12	
108-10-1	4-Methyl-2-pentanone	ND	0.53	ND	0.13	
10061-02-6	trans-1,3-Dichloropropene	ND	0.53	ND	0.12	
79-00-5	1,1,2-Trichloroethane	ND	0.54	ND	0.099	
108-88-3	Toluene	ND	0.53	ND	0.14	
591-78-6	2-Hexanone	ND	0.54	ND	0.13	
124-48-1	Dibromochloromethane	ND	0.54	ND	0.063	
106-93-4	1,2-Dibromoethane	ND	0.54	ND	0.070	
123-86-4	n-Butyl Acetate	ND	0.54	ND	0.11	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **Method Blank** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P190613-MB

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 6/13/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 1.00 Liter(s)
Test Notes:

Container Dilution Factor: 1.00

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
111-65-9	n-Octane	ND	0.54	ND	0.12	
127-18-4	Tetrachloroethene	ND	0.53	ND	0.078	
108-90-7	Chlorobenzene	ND	0.53	ND	0.12	
100-41-4	Ethylbenzene	ND	0.52	ND	0.12	
179601-23-1	m,p-Xylenes	ND	1.1	ND	0.25	
75-25-2	Bromoform	ND	0.53	ND	0.051	
100-42-5	Styrene	ND	0.53	ND	0.12	
95-47-6	o-Xylene	ND	0.53	ND	0.12	
111-84-2	n-Nonane	ND	0.54	ND	0.10	
79-34-5	1,1,2,2-Tetrachloroethane	ND	0.53	ND	0.077	
98-82-8	Cumene	ND	0.53	ND	0.11	
80-56-8	alpha-Pinene	ND	0.52	ND	0.093	
103-65-1	n-Propylbenzene	ND	0.54	ND	0.11	
622-96-8	4-Ethyltoluene	ND	0.53	ND	0.11	
108-67-8	1,3,5-Trimethylbenzene	ND	0.53	ND	0.11	
95-63-6	1,2,4-Trimethylbenzene	ND	0.53	ND	0.11	
100-44-7	Benzyl Chloride	ND	1.1	ND	0.21	
541-73-1	1,3-Dichlorobenzene	ND	0.54	ND	0.090	
106-46-7	1,4-Dichlorobenzene	ND	0.54	ND	0.090	
95-50-1	1,2-Dichlorobenzene	ND	0.54	ND	0.090	
5989-27-5	d-Limonene	ND	0.51	ND	0.092	
96-12-8	1,2-Dibromo-3-chloropropane	ND	0.52	ND	0.054	
120-82-1	1,2,4-Trichlorobenzene	ND	0.53	ND	0.071	
91-20-3	Naphthalene	ND	0.51	ND	0.097	
87-68-3	Hexachlorobutadiene	ND	0.53	ND	0.050	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

SURROGATE SPIKE RECOVERY RESULTS

Client: **Bhate Environmental Associates, Inc.**
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Project ID: P1903177

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date(s) Collected: 5/29 - 5/30/19
Analyst: Simon Cao Date(s) Received: 6/4/19
Sample Type: 6.0 L Silonite Canister(s) / 6.0 L Summa Canister(s) Date(s) Analyzed: 6/12 - 6/13/19
Test Notes:

Client Sample ID	ALS Sample ID	1,2-Dichloroethane-d4 Percent Recovered	Toluene-d8 Percent Recovered	Bromofluorobenzene Percent Recovered	Acceptance Limits	Data Qualifier
Method Blank	P190612-MB	**102**	**100**	**99**	70-130	
Method Blank	P190613-MB	**105**	**99**	**96**	70-130	
Lab Control Sample	P190612-LCS	**100**	**99**	**98**	70-130	
Lab Control Sample	P190613-LCS	**104**	**99**	**98**	70-130	
LH18/24-Air_052919_Stripper	P1903177-001	**101**	**100**	**98**	70-130	
LH18/24-Air_052919_Stripper_a	P1903177-002	**101**	**100**	**97**	70-130	
LH18/24-Air_052919_GWTP	P1903177-003	**107**	**99**	**98**	70-130	
LH18/24-Air_0529_Downwind_South	P1903177-004	**107**	**97**	**98**	70-130	

Surrogate percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly from the on-column percent recovery.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P190612-LCS

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 6/12/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
115-07-1	Propene	211	**215**	**102**	53-112	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	**197**	**94**	62-103	
74-87-3	Chloromethane	211	**213**	**101**	51-121	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	**197**	**93**	56-111	
75-01-4	Vinyl Chloride	214	**205**	**96**	57-117	
106-99-0	1,3-Butadiene	210	**219**	**104**	53-134	
74-83-9	Bromomethane	212	**205**	**97**	65-110	
75-00-3	Chloroethane	214	**203**	**95**	64-111	
64-17-5	Ethanol	1,020	**969**	**95**	57-124	
75-05-8	Acetonitrile	206	**204**	**99**	57-126	
107-02-8	Acrolein	205	**190**	**93**	62-121	
67-64-1	Acetone	1,060	**1000**	**94**	60-113	
75-69-4	Trichlorofluoromethane (CFC 11)	211	**201**	**95**	63-104	
67-63-0	2-Propanol (Isopropyl Alcohol)	413	**400**	**97**	60-124	
107-13-1	Acrylonitrile	207	**201**	**97**	66-125	
75-35-4	1,1-Dichloroethene	218	**203**	**93**	68-107	
75-09-2	Methylene Chloride	217	**201**	**93**	66-105	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	216	**212**	**98**	63-127	
76-13-1	Trichlorotrifluoroethane (CFC 113)	216	**201**	**93**	59-109	
75-15-0	Carbon Disulfide	218	**200**	**92**	67-109	
156-60-5	trans-1,2-Dichloroethene	214	**202**	**94**	70-115	
75-34-3	1,1-Dichloroethane	216	**205**	**95**	66-106	
1634-04-4	Methyl tert-Butyl Ether	214	**213**	**100**	67-109	
108-05-4	Vinyl Acetate	1,060	**1030**	**97**	68-136	
78-93-3	2-Butanone (MEK)	208	**182**	**88**	71-116	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P190612-LCS

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 6/12/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	211	**199**	**94**	67-110	
141-78-6	Ethyl Acetate	436	**424**	**97**	64-127	
110-54-3	n-Hexane	216	**205**	**95**	60-115	
67-66-3	Chloroform	217	**204**	**94**	66-105	
109-99-9	Tetrahydrofuran (THF)	216	**199**	**92**	65-110	
107-06-2	1,2-Dichloroethane	215	**201**	**93**	60-110	
71-55-6	1,1,1-Trichloroethane	215	**204**	**95**	64-108	
71-43-2	Benzene	211	**185**	**88**	67-106	
56-23-5	Carbon Tetrachloride	212	**200**	**94**	64-112	
110-82-7	Cyclohexane	416	**400**	**96**	67-110	
78-87-5	1,2-Dichloropropane	216	**206**	**95**	66-112	
75-27-4	Bromodichloromethane	215	**211**	**98**	67-113	
79-01-6	Trichloroethene	213	**203**	**95**	66-108	
123-91-1	1,4-Dioxane	214	**202**	**94**	70-116	
80-62-6	Methyl Methacrylate	431	**435**	**101**	73-118	
142-82-5	n-Heptane	215	**206**	**96**	66-110	
10061-01-5	cis-1,3-Dichloropropene	214	**213**	**100**	75-120	
108-10-1	4-Methyl-2-pentanone	209	**213**	**102**	65-124	
10061-02-6	trans-1,3-Dichloropropene	213	**218**	**102**	77-123	
79-00-5	1,1,2-Trichloroethane	215	**207**	**96**	68-112	
108-88-3	Toluene	212	**192**	**91**	62-111	
591-78-6	2-Hexanone	214	**207**	**97**	59-128	
124-48-1	Dibromochloromethane	213	**209**	**98**	67-123	
106-93-4	1,2-Dibromoethane	216	**205**	**95**	66-122	
123-86-4	n-Butyl Acetate	219	**214**	**98**	64-128	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P190612-LCS

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 6/12/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
111-65-9	n-Octane	217	**203**	**94**	65-114	
127-18-4	Tetrachloroethene	213	**199**	**93**	55-120	
108-90-7	Chlorobenzene	215	**198**	**92**	61-114	
100-41-4	Ethylbenzene	212	**196**	**92**	64-113	
179601-23-1	m,p-Xylenes	426	**393**	**92**	64-114	
75-25-2	Bromoform	213	**214**	**100**	65-132	
100-42-5	Styrene	212	**210**	**99**	67-124	
95-47-6	o-Xylene	214	**200**	**93**	65-114	
111-84-2	n-Nonane	215	**203**	**94**	64-117	
79-34-5	1,1,2,2-Tetrachloroethane	214	**194**	**91**	66-119	
98-82-8	Cumene	214	**200**	**93**	61-116	
80-56-8	alpha-Pinene	211	**210**	**100**	65-120	
103-65-1	n-Propylbenzene	218	**204**	**94**	63-117	
622-96-8	4-Ethyltoluene	214	**215**	**100**	63-124	
108-67-8	1,3,5-Trimethylbenzene	214	**198**	**93**	60-117	
95-63-6	1,2,4-Trimethylbenzene	215	**204**	**95**	61-122	
100-44-7	Benzyl Chloride	217	**229**	**106**	77-142	
541-73-1	1,3-Dichlorobenzene	216	**202**	**94**	61-125	
106-46-7	1,4-Dichlorobenzene	216	**202**	**94**	59-123	
95-50-1	1,2-Dichlorobenzene	216	**202**	**94**	61-126	
5989-27-5	d-Limonene	211	**225**	**107**	66-124	
96-12-8	1,2-Dibromo-3-chloropropane	209	**212**	**101**	67-138	
120-82-1	1,2,4-Trichlorobenzene	214	**215**	**100**	62-141	
91-20-3	Naphthalene	203	**222**	**109**	62-145	
87-68-3	Hexachlorobutadiene	209	**201**	**96**	49-131	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P190613-LCS

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 6/13/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
115-07-1	Propene	211	**217**	**103**	53-112	
75-71-8	Dichlorodifluoromethane (CFC 12)	210	**197**	**94**	62-103	
74-87-3	Chloromethane	211	**219**	**104**	51-121	
76-14-2	1,2-Dichloro-1,1,2,2-tetrafluoroethane (CFC 114)	211	**191**	**91**	56-111	
75-01-4	Vinyl Chloride	214	**204**	**95**	57-117	
106-99-0	1,3-Butadiene	210	**216**	**103**	53-134	
74-83-9	Bromomethane	212	**201**	**95**	65-110	
75-00-3	Chloroethane	214	**201**	**94**	64-111	
64-17-5	Ethanol	1,020	**979**	**96**	57-124	
75-05-8	Acetonitrile	206	**206**	**100**	57-126	
107-02-8	Acrolein	205	**188**	**92**	62-121	
67-64-1	Acetone	1,060	**999**	**94**	60-113	
75-69-4	Trichlorofluoromethane (CFC 11)	211	**198**	**94**	63-104	
67-63-0	2-Propanol (Isopropyl Alcohol)	413	**405**	**98**	60-124	
107-13-1	Acrylonitrile	207	**201**	**97**	66-125	
75-35-4	1,1-Dichloroethene	218	**197**	**90**	68-107	
75-09-2	Methylene Chloride	217	**198**	**91**	66-105	
107-05-1	3-Chloro-1-propene (Allyl Chloride)	216	**214**	**99**	63-127	
76-13-1	Trichlorotrifluoroethane (CFC 113)	216	**194**	**90**	59-109	
75-15-0	Carbon Disulfide	218	**197**	**90**	67-109	
156-60-5	trans-1,2-Dichloroethene	214	**202**	**94**	70-115	
75-34-3	1,1-Dichloroethane	216	**204**	**94**	66-106	
1634-04-4	Methyl tert-Butyl Ether	214	**211**	**99**	67-109	
108-05-4	Vinyl Acetate	1,060	**1010**	**95**	68-136	
78-93-3	2-Butanone (MEK)	208	**180**	**87**	71-116	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P190613-LCS

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 6/13/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
156-59-2	cis-1,2-Dichloroethene	211	**198**	**94**	67-110	
141-78-6	Ethyl Acetate	436	**416**	**95**	64-127	
110-54-3	n-Hexane	216	**203**	**94**	60-115	
67-66-3	Chloroform	217	**201**	**93**	66-105	
109-99-9	Tetrahydrofuran (THF)	216	**195**	**90**	65-110	
107-06-2	1,2-Dichloroethane	215	**202**	**94**	60-110	
71-55-6	1,1,1-Trichloroethane	215	**200**	**93**	64-108	
71-43-2	Benzene	211	**180**	**85**	67-106	
56-23-5	Carbon Tetrachloride	212	**196**	**92**	64-112	
110-82-7	Cyclohexane	416	**389**	**94**	67-110	
78-87-5	1,2-Dichloropropane	216	**202**	**94**	66-112	
75-27-4	Bromodichloromethane	215	**206**	**96**	67-113	
79-01-6	Trichloroethene	213	**196**	**92**	66-108	
123-91-1	1,4-Dioxane	214	**197**	**92**	70-116	
80-62-6	Methyl Methacrylate	431	**419**	**97**	73-118	
142-82-5	n-Heptane	215	**201**	**93**	66-110	
10061-01-5	cis-1,3-Dichloropropene	214	**208**	**97**	75-120	
108-10-1	4-Methyl-2-pentanone	209	**210**	**100**	65-124	
10061-02-6	trans-1,3-Dichloropropene	213	**214**	**100**	77-123	
79-00-5	1,1,2-Trichloroethane	215	**200**	**93**	68-112	
108-88-3	Toluene	212	**185**	**87**	62-111	
591-78-6	2-Hexanone	214	**204**	**95**	59-128	
124-48-1	Dibromochloromethane	213	**201**	**94**	67-123	
106-93-4	1,2-Dibromoethane	216	**197**	**91**	66-122	
123-86-4	n-Butyl Acetate	219	**212**	**97**	64-128	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE SUMMARY

Client: **Bhate Environmental Associates, Inc.**
Client Sample ID: **Lab Control Sample** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150** ALS Sample ID: P190613-LCS

Test Code: EPA TO-15 Date Collected: NA
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Date Received: NA
Analyst: Simon Cao Date Analyzed: 6/13/19
Sample Type: 6.0 L Silonite Canister Volume(s) Analyzed: 0.125 Liter(s)
Test Notes:

CAS #	Compound	Spike Amount µg/m³	Result µg/m³	% Recovery	ALS Acceptance Limits	Data Qualifier
111-65-9	n-Octane	217	**198**	**91**	65-114	
127-18-4	Tetrachloroethene	213	**190**	**89**	55-120	
108-90-7	Chlorobenzene	215	**190**	**88**	61-114	
100-41-4	Ethylbenzene	212	**189**	**89**	64-113	
179601-23-1	m,p-Xylenes	426	**387**	**91**	64-114	
75-25-2	Bromoform	213	**204**	**96**	65-132	
100-42-5	Styrene	212	**201**	**95**	67-124	
95-47-6	o-Xylene	214	**193**	**90**	65-114	
111-84-2	n-Nonane	215	**201**	**93**	64-117	
79-34-5	1,1,2,2-Tetrachloroethane	214	**188**	**88**	66-119	
98-82-8	Cumene	214	**192**	**90**	61-116	
80-56-8	alpha-Pinene	211	**203**	**96**	65-120	
103-65-1	n-Propylbenzene	218	**198**	**91**	63-117	
622-96-8	4-Ethyltoluene	214	**197**	**92**	63-124	
108-67-8	1,3,5-Trimethylbenzene	214	**191**	**89**	60-117	
95-63-6	1,2,4-Trimethylbenzene	215	**197**	**92**	61-122	
100-44-7	Benzyl Chloride	217	**223**	**103**	77-142	
541-73-1	1,3-Dichlorobenzene	216	**194**	**90**	61-125	
106-46-7	1,4-Dichlorobenzene	216	**193**	**89**	59-123	
95-50-1	1,2-Dichlorobenzene	216	**195**	**90**	61-126	
5989-27-5	d-Limonene	211	**220**	**104**	66-124	
96-12-8	1,2-Dibromo-3-chloropropane	209	**205**	**98**	67-138	
120-82-1	1,2,4-Trichlorobenzene	214	**207**	**97**	62-141	
91-20-3	Naphthalene	203	**215**	**106**	62-145	
87-68-3	Hexachlorobutadiene	209	**195**	**93**	49-131	

Laboratory Control Sample percent recovery is verified and accepted based on the on-column result.
Reported results are shown in concentration units and as a result of the calculation, may vary slightly.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150**

Internal Standard Area and RT Summary

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Lab File ID: 06121902.D
Analyst: Simon Cao Date Analyzed: 6/12/19
Sample Type: 6.0 L Silonite Canister(s) Time Analyzed: 06:14
Test Notes:

		IS1 (BCM)		IS2 (DFB)		IS3 (CBZ)	
		AREA #	RT #	AREA #	RT #	AREA #	RT #
	24 Hour Standard	202233	9.15	917369	11.12	490228	15.46
	Upper Limit	283126	9.48	1284317	11.45	686319	15.79
	Lower Limit	121340	8.82	550421	10.79	294137	15.13
	Client Sample ID						
01	Method Blank	181881	9.13	846947	11.11	438055	15.46
02	Lab Control Sample	188479	9.16	844497	11.12	445152	15.46
03	LH18/24-Air_052919_Stripper	199331	9.13	905011	11.11	471298	15.46
04	LH18/24-Air_052919_Stripper_a	194774	9.13	883357	11.11	462420	15.46
05	LH18/24-Air_052919_GWTP	169351	9.13	794745	11.11	415955	15.46
06	LH18/24-Air_0529_Downwind_South	168656	9.14	781505	11.11	422001	15.46
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

IS1 (BCM) = Bromochloromethane
IS2 (DFB) = 1,4-Difluorobenzene
IS3 (CBZ) = Chlorobenzene-d5

AREA UPPER LIMIT = 140% of internal standard area
AREA LOWER LIMIT = 60% of internal standard area
RT UPPER LIMIT = 0.33 minutes of internal standard RT
RT LOWER LIMIT = 0.33 minutes of internal standard RT

# Column used to flag values outside QC limits with an I.
I = Internal standard not within the specified limits.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **Bhate Environmental Associates, Inc.** ALS Project ID: P1903177
Client Project ID: **LHAAP-GWTP / NW01312.0150**

Internal Standard Area and RT Summary

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5973inert/6890N/MS9 Lab File ID: 06131902.D
Analyst: Simon Cao Date Analyzed: 6/13/19
Sample Type: 6.0 L Silonite Canister(s) Time Analyzed: 06:14
Test Notes:

		IS1 (BCM)		IS2 (DFB)		IS3 (CBZ)	
		AREA #	RT #	AREA #	RT #	AREA #	RT #
	24 Hour Standard	188687	9.16	865051	11.12	464814	15.46
	Upper Limit	264162	9.49	1211071	11.45	650740	15.79
	Lower Limit	113212	8.83	519031	10.79	278888	15.13
	Client Sample ID						
01	Method Blank	171243	9.13	795421	11.11	417260	15.46
02	Lab Control Sample	180652	9.16	817398	11.12	434407	15.46
03	LH18/24-Air_052919_Stripper (Dilution)	189523	9.13	857075	11.11	447294	15.46
04	LH18/24-Air_052919_Stripper_a (Dilution)	182299	9.13	833276	11.11	436528	15.46
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

IS1 (BCM) = Bromochloromethane
IS2 (DFB) = 1,4-Difluorobenzene
IS3 (CBZ) = Chlorobenzene-d5

AREA UPPER LIMIT = 140% of internal standard area
AREA LOWER LIMIT = 60% of internal standard area
RT UPPER LIMIT = 0.33 minutes of internal standard RT
RT LOWER LIMIT = 0.33 minutes of internal standard RT

# Column used to flag values outside QC limits with an I.
I = Internal standard not within the specified limits.

Data File: I:\MS09\Data\2019 06\12\06121920.D
Acq On : 12 Jun 2019 16:51 Operator: SC
Sample : P1903177-001 (8.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

6/13/19

Quant Time: Jun 13 16:02:44 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	199331	12.500	ng	-0.04
37) 1,4-Difluorobenzene (IS2)	11.11	114	905011	12.500	ng	-0.02
56) Chlorobenzene-d5 (IS3)	15.46	82	471298	12.500	ng	0.00
System Monitoring Compounds						
33) 1,2-Dichloroethane-d4(...	9.92	65	365903	12.595	ng	-0.03
Spiked Amount 12.500	Range 70 - 130		Recovery = 100.80%			
57) Toluene-d8 (SS2)	13.55	98	1097539	12.485	ng	-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 99.84%			
73) Bromofluorobenzene (SS3)	17.05	174	287969	12.211	ng	0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 97.68%			
Target Compounds						Qvalue
2) Propene	3.88	42	1206	N.D.		
3) Dichlorodifluoromethan...	3.98	85	1242	N.D.		
4) Chloromethane	4.17	50	455	N.D.		
5) 1,2-Dichloro-1,1,2,2-t...	0.00	135	0	N.D.		
6) Vinyl Chloride	4.45	62	24005	0.758	ng	100
7) 1,3-Butadiene	0.00	54	0	N.D.		
8) Bromomethane	0.00	94	0	N.D.		
9) Chloroethane	0.00	64	0	N.D.		
10) Ethanol	5.39	45	125	N.D.		
11) Acetonitrile	5.58	41	516	N.D.		
12) Acrolein	5.72	56	400	N.D.		
13) Acetone	5.87	58	9668	0.552	ng	99
14) Trichlorofluoromethane	6.02	101	1009	N.D.		
15) 2-Propanol (Isopropanol)	6.17	45	3560	N.D.		
16) Acrylonitrile	6.54	53	1510	N.D.		
17) 1,1-Dichloroethene	6.71	96	23323	1.242	ng	98
18) 2-Methyl-2-Propanol (t...	6.87	59	37	N.D.		
19) Methylene Chloride	6.85	84	933951	45.811	ng	97
20) 3-Chloro-1-propene (Al...	0.00	41	0	N.D.	d	
21) Trichlorotrifluoroethane	7.18	151	1488760	101.339	ng	100
22) Carbon Disulfide	7.15	76	1305	N.D.		
23) trans-1,2-Dichloroethene	7.89	61	7588	N.D.		
24) 1,1-Dichloroethane	8.10	63	8671	N.D.		
25) Methyl tert-Butyl Ether	8.13	73	601	N.D.		
26) Vinyl Acetate	0.00	86	0	N.D.		
27) 2-Butanone (MEK)	8.54	72	995	N.D.		
28) cis-1,2-Dichloroethene	8.97	61	1823745	58.712	ng	100
29) Diisopropyl Ether	9.27	87	1090	N.D.		
30) Ethyl Acetate	9.27	61	1090	N.D.		
31) n-Hexane	9.22	57	1531	N.D.		
32) Chloroform	9.27	83	10140	N.D.		
34) Tetrahydrofuran (THF)	9.73	72	747	N.D.		
35) Ethyl tert-Butyl Ether	0.00	87	0	N.D.		
36) 1,2-Dichloroethane	10.03	62	32735	1.178	ng	99
38) 1,1,1-Trichloroethane	10.29	97	1138	N.D.		
39) Isopropyl Acetate	0.00	61	0	N.D.		
40) 1-Butanol	10.72	56	1479	N.D.		
41) Benzene	10.76	78	7061	N.D.		
42) Carbon Tetrachloride	10.90	117	2916	N.D.		
43) Cyclohexane	11.04	84	2218	N.D.		
44) tert-Amyl Methyl Ether	0.00	73	0	N.D.		
45) 1,2-Dichloropropane	0.00	63	0	N.D.		
46) Bromodichloromethane	0.00	83	0	N.D.	d	
47) Trichloroethene	11.81	130	2792334	138.853	ng	100
48) 1,4-Dioxane	11.83	88	418	N.D.		
49) 2,2,4-Trimethylpentane...	11.87	57	3902	N.D.		

Data File: I:\MS09\Data\2019 06\12\06121920.D
Acq On : 12 Jun 2019 16:51 Operator: SC
Sample : P1903177-001 (8.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

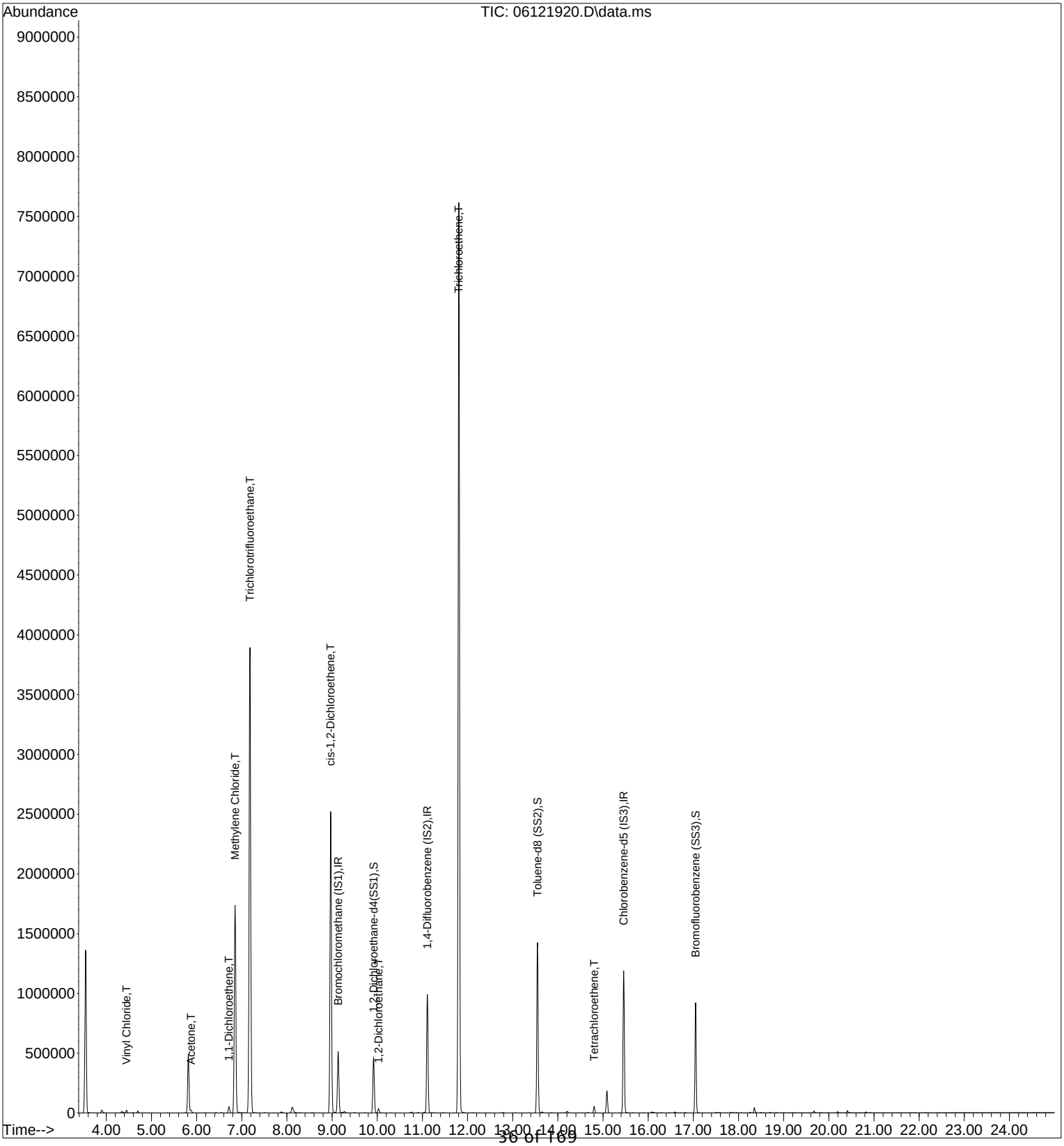
Quant Time: Jun 13 16:02:44 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
50) Methyl Methacrylate	0.00	100	0	N.D. d	
51) n-Heptane	12.13	71	607	N.D.	
52) cis-1,3-Dichloropropene	0.00	75	0	N.D.	
53) 4-Methyl-2-pentanone	0.00	58	0	N.D.	
54) trans-1,3-Dichloropropene	0.00	75	0	N.D.	
55) 1,1,2-Trichloroethane	13.35	97	815	N.D.	
58) Toluene	13.65	91	6704	N.D.	
59) 2-Hexanone	13.91	43	2131	N.D.	
60) Dibromochloromethane	0.00	129	0	N.D.	
61) 1,2-Dibromoethane	0.00	107	0	N.D.	
62) n-Butyl Acetate	14.56	43	145	N.D.	
63) n-Octane	14.67	57	837	N.D.	
64) Tetrachloroethene	14.80	166	18960	0.949 ng	100
65) Chlorobenzene	0.00	112	0	N.D.	
66) Ethylbenzene	15.90	91	2599	N.D.	
67) m- & p-Xylenes	16.08	91	8180	N.D.	
68) Bromoform	0.00	173	0	N.D.	
69) Styrene	16.47	104	1403	N.D.	
70) o-Xylene	16.58	91	4324	N.D.	
71) n-Nonane	16.82	43	2583	N.D.	
72) 1,1,2,2-Tetrachloroethane	16.66	83	158	N.D.	
74) Cumene	17.20	105	326	N.D.	
75) alpha-Pinene	17.60	93	804	N.D.	
76) n-Propylbenzene	17.73	91	782	N.D.	
77) 3-Ethyltoluene	17.83	105	3672	N.D.	
78) 4-Ethyltoluene	17.88	105	1502	N.D.	
79) 1,3,5-Trimethylbenzene	17.96	105	1540	N.D.	
80) alpha-Methylstyrene	0.00	118	0	N.D.	
81) 2-Ethyltoluene	18.16	105	1569	N.D.	
82) 1,2,4-Trimethylbenzene	18.39	105	3702	N.D.	
83) n-Decane	18.50	57	1816	N.D.	
84) Benzyl Chloride	18.38	91	418	N.D.	
85) 1,3-Dichlorobenzene	0.00	146	0	N.D.	
86) 1,4-Dichlorobenzene	0.00	146	0	N.D.	
87) sec-Butylbenzene	18.66	105	210	N.D.	
88) 4-Isopropyltoluene (p-...	18.83	119	988	N.D.	
89) 1,2,3-Trimethylbenzene	18.83	105	1124	N.D.	
90) 1,2-Dichlorobenzene	0.00	146	0	N.D.	
91) d-Limonene	18.99	68	541	N.D.	
92) 1,2-Dibromo-3-Chloropr...	0.00	157	0	N.D.	
93) n-Undecane	19.83	57	1182	N.D.	
94) 1,2,4-Trichlorobenzene	0.00	180	0	N.D.	
95) Naphthalene	20.89	128	868	N.D.	
96) n-Dodecane	20.92	57	1336	N.D.	
97) Hexachlorobutadiene	0.00	225	0	N.D.	
98) Cyclohexanone	16.28	55	954	N.D.	
99) tert-Butylbenzene	18.38	119	391	N.D.	
100) n-Butylbenzene	19.27	91	501	N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Data File: I:\MS09\Data\2019 06\12\06121920.D
Acq On : 12 Jun 2019 16:51 Operator: SC
Sample : P1903177-001 (8.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

Quant Time: Jun 13 16:02:44 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\12\06121920.D
Acq On : 12 Jun 2019 16:51 Operator: SC
Sample : P1903177-001 (8.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

6/13/19

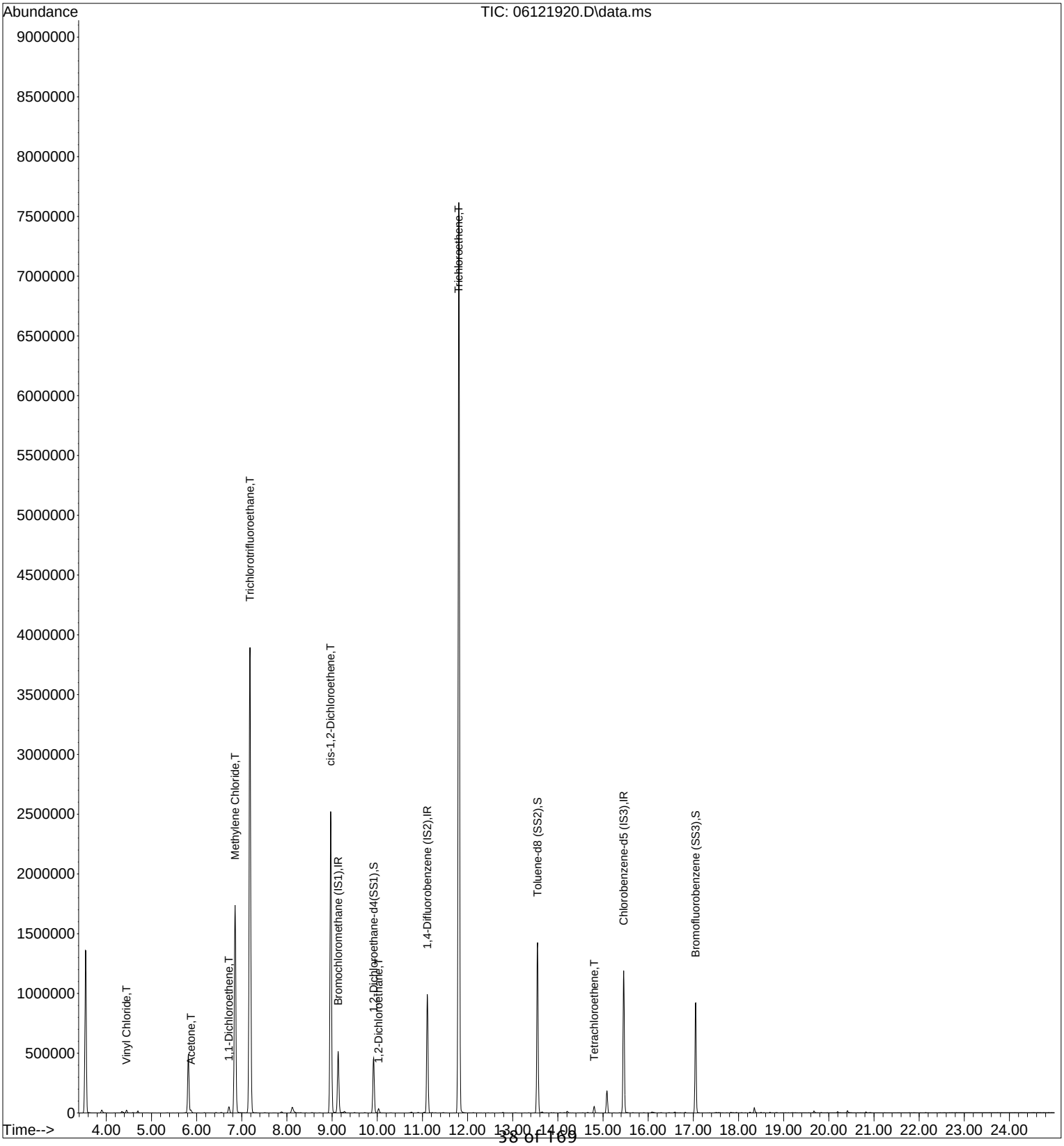
Quant Time: Jun 13 16:02:44 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

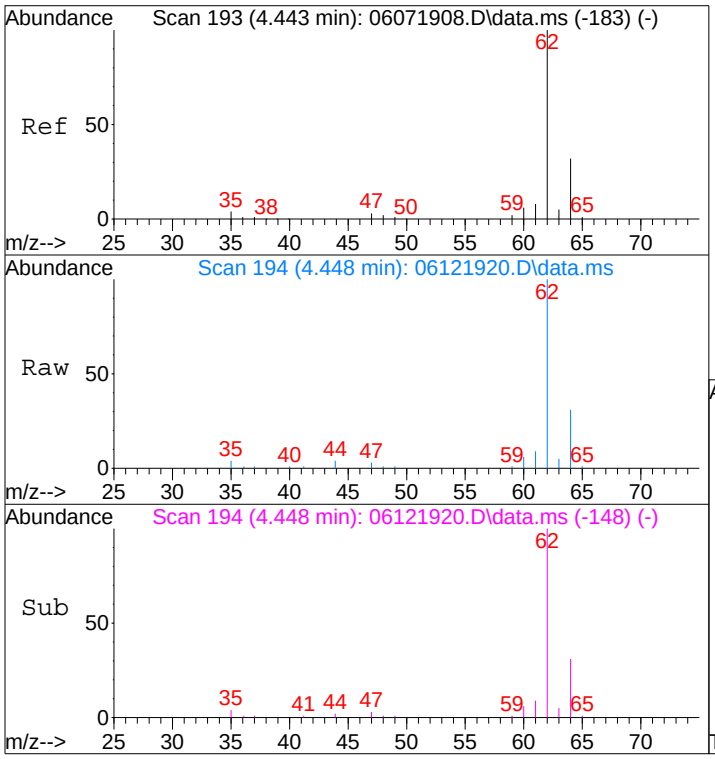
Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	199331	12.500	ng	-0.04
37) 1,4-Difluorobenzene (IS2)	11.11	114	905011	12.500	ng	-0.02
56) Chlorobenzene-d5 (IS3)	15.46	82	471298	12.500	ng	0.00
System Monitoring Compounds						
33) 1,2-Dichloroethane-d4(...	9.92	65	365903	12.595	ng	-0.03
Spiked Amount 12.500	Range 70 - 130		Recovery = 100.80%			
57) Toluene-d8 (SS2)	13.55	98	1097539	12.485	ng	-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 99.84%			
73) Bromofluorobenzene (SS3)	17.05	174	287969	12.211	ng	0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 97.68%			
Target Compounds						Qvalue
6) Vinyl Chloride	4.45	62	24005	0.758	ng	100
13) Acetone	5.87	58	9668	0.552	ng	99
17) 1,1-Dichloroethene	6.71	96	23323	1.242	ng	98
19) Methylene Chloride	6.85	84	933951	45.811	ng	97
21) Trichlorotrifluoroethane	7.18	151	1488760	101.339	ng	100
28) cis-1,2-Dichloroethene	8.97	61	1823745	58.712	ng	100
36) 1,2-Dichloroethane	10.03	62	32735	1.178	ng	99
47) Trichloroethene	11.81	130	2792334	138.853	ng	100
64) Tetrachloroethene	14.80	166	18960	0.949	ng	100

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Data File: I:\MS09\Data\2019 06\12\06121920.D
Acq On : 12 Jun 2019 16:51 Operator: SC
Sample : P1903177-001 (8.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

Quant Time: Jun 13 16:02:44 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

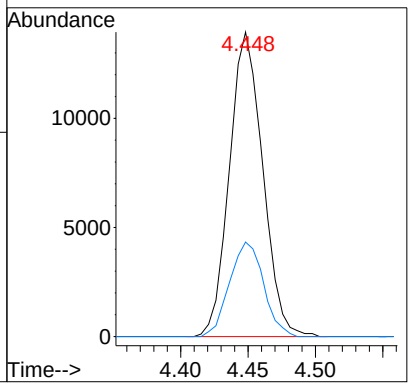


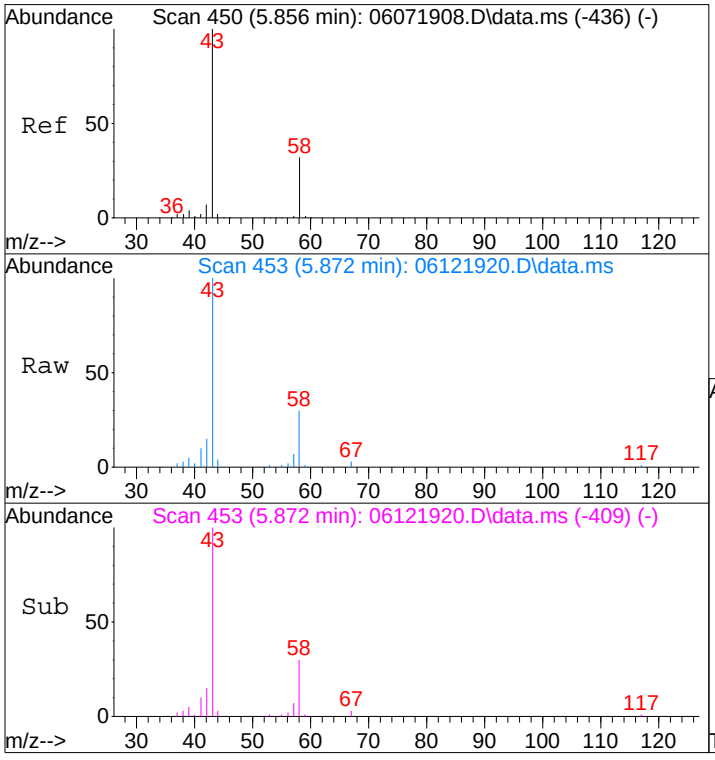


#6
Vinyl Chloride
Concen: 0.76 ng
RT: 4.45 min Scan# 194
Delta R.T. 0.000 min
Lab File: 06121920.D
Acq: 12 Jun 2019 16:51

Tgt Ion: 62 Resp: 24005

Ion	Ratio	Lower	Upper
62	100		
64	31.6	11.6	51.6

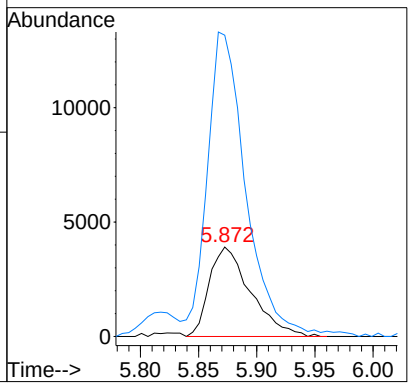


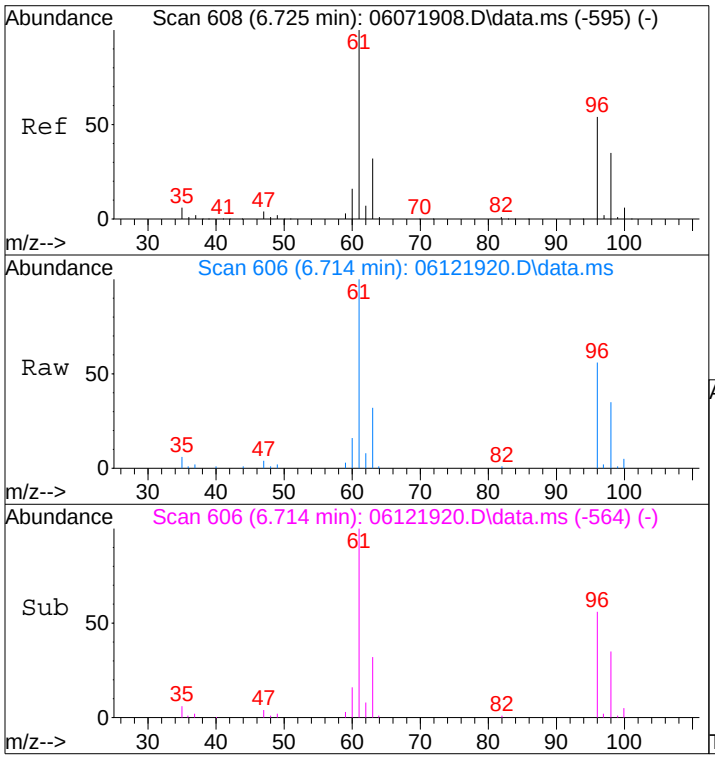


#13
Acetone
Concen: 0.55 ng
RT: 5.87 min Scan# 453
Delta R.T. -0.006 min
Lab File: 06121920.D
Acq: 12 Jun 2019 16:51

Tgt Ion: 58 Resp: 9668

Ion	Ratio	Lower	Upper
58	100		
43	320.5	287.7	347.7

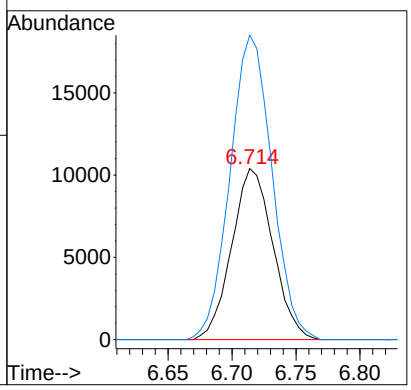


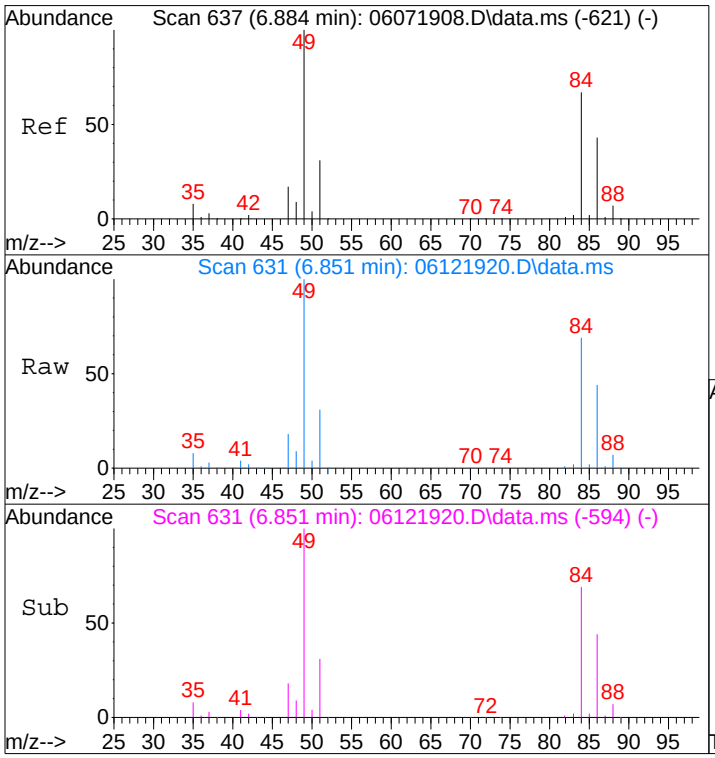


#17
1,1-Dichloroethene
Concen: 1.24 ng
RT: 6.71 min Scan# 606
Delta R.T. -0.022 min
Lab File: 06121920.D
Acq: 12 Jun 2019 16:51

Tgt Ion: 96 Resp: 23323

Ion	Ratio	Lower	Upper
96	100		
61	180.9	163.6	203.6

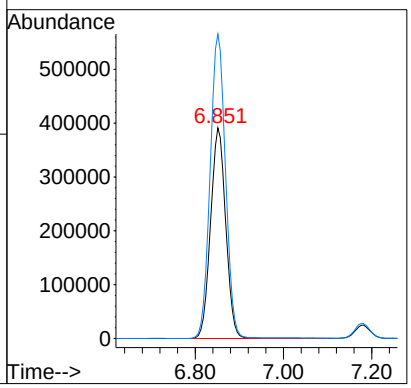


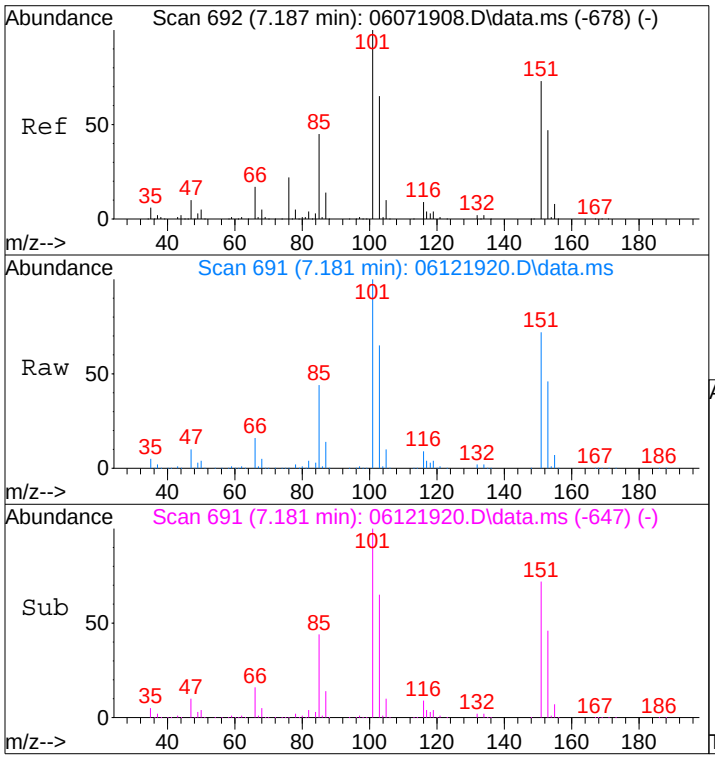


#19
Methylene Chloride
Concen: 45.81 ng
RT: 6.85 min Scan# 631
Delta R.T. -0.049 min
Lab File: 06121920.D
Acq: 12 Jun 2019 16:51

Tgt Ion: 84 Resp: 933951

Ion	Ratio	Lower	Upper
84	100		
49	146.7	125.7	175.7

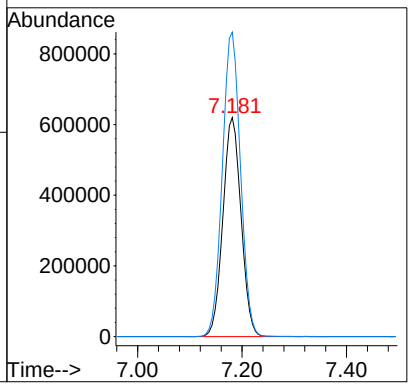


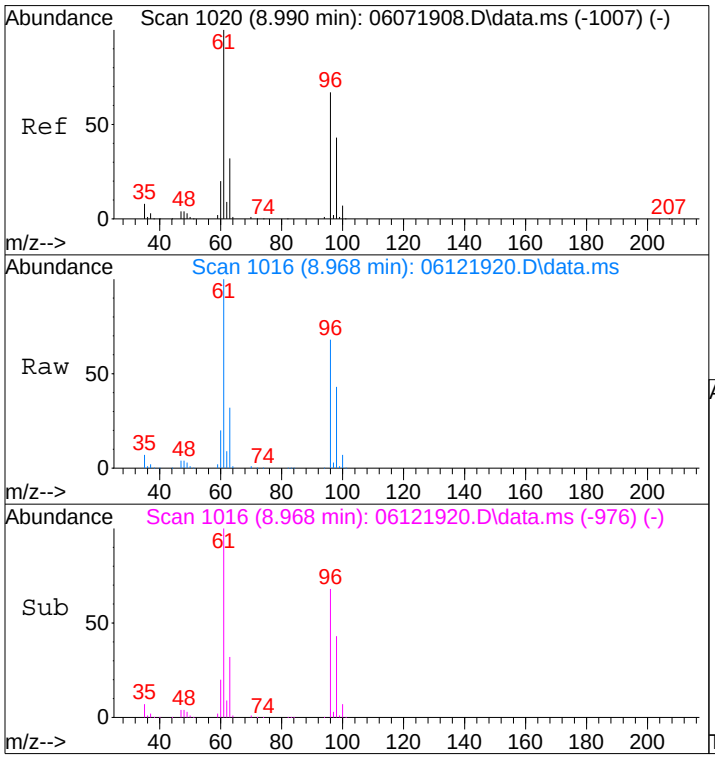


#21
Trichlorotrifluoroethane
Concen: 101.34 ng
RT: 7.18 min Scan# 691
Delta R.T. -0.011 min
Lab File: 06121920.D
Acq: 12 Jun 2019 16:51

Tgt Ion:151 Resp: 1488760

Ion	Ratio	Lower	Upper
151	100		
101	139.6	119.9	159.9

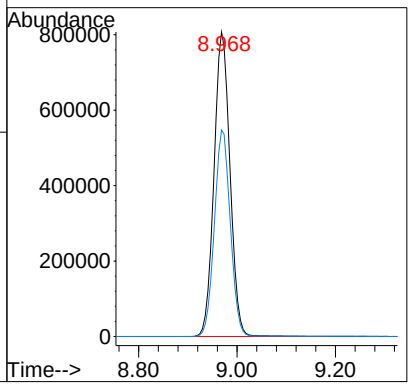


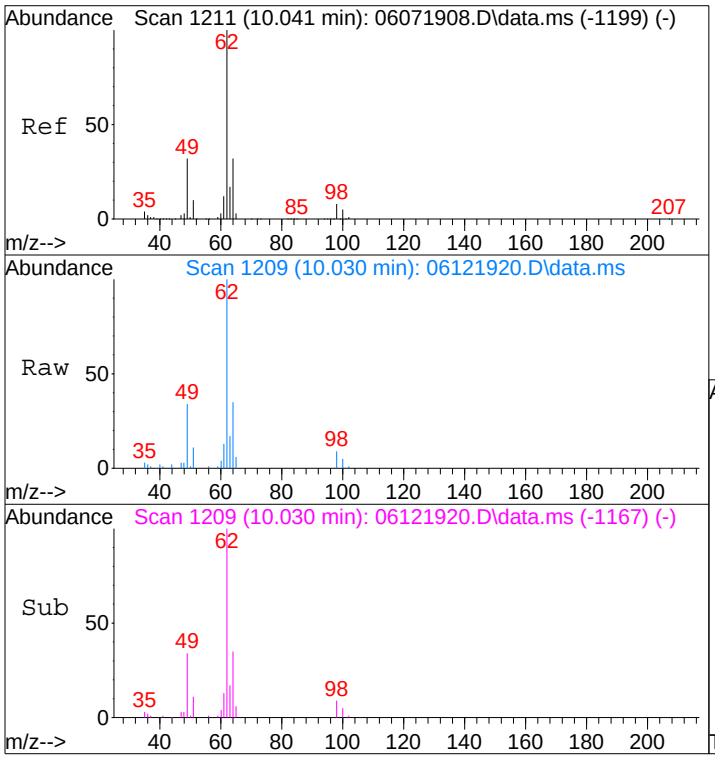


#28
cis-1,2-Dichloroethene
Concen: 58.71 ng
RT: 8.97 min Scan# 1016
Delta R.T. -0.033 min
Lab File: 06121920.D
Acq: 12 Jun 2019 16:51

Tgt Ion: 61 Resp: 1823745

Ion	Ratio	Lower	Upper
61	100		
96	67.8	47.8	87.8

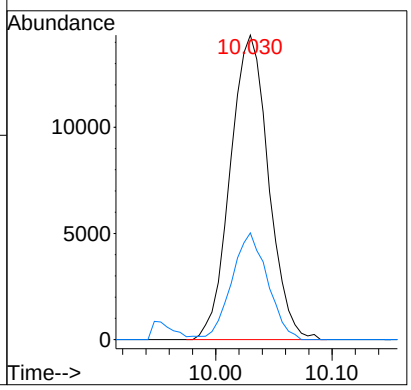


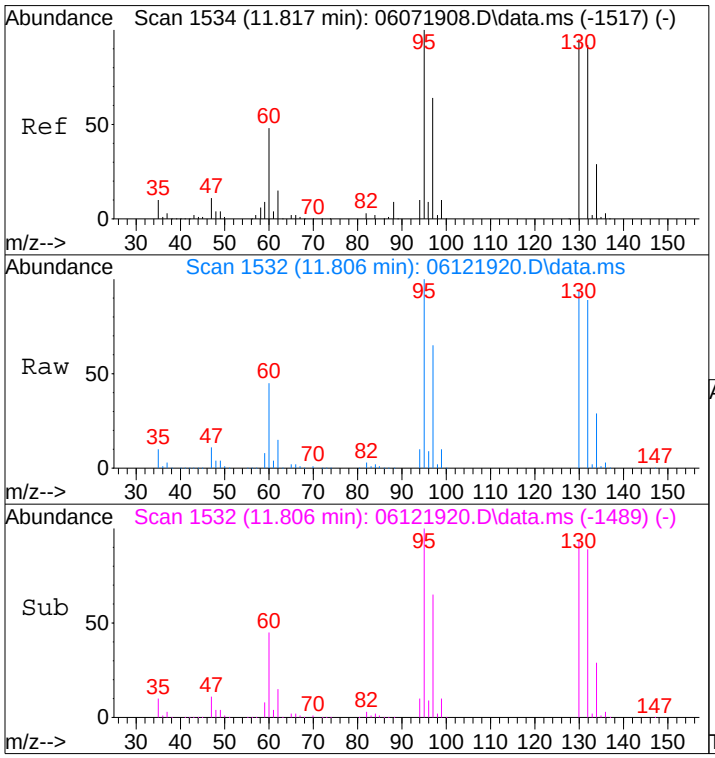


#36
1,2-Dichloroethane
Concen: 1.18 ng
RT: 10.03 min Scan# 1209
Delta R.T. -0.022 min
Lab File: 06121920.D
Acq: 12 Jun 2019 16:51

Tgt Ion: 62 Resp: 32735

Ion	Ratio	Lower	Upper
62	100		
64	32.9	12.3	52.3

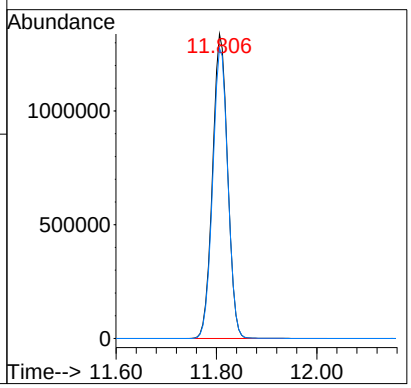


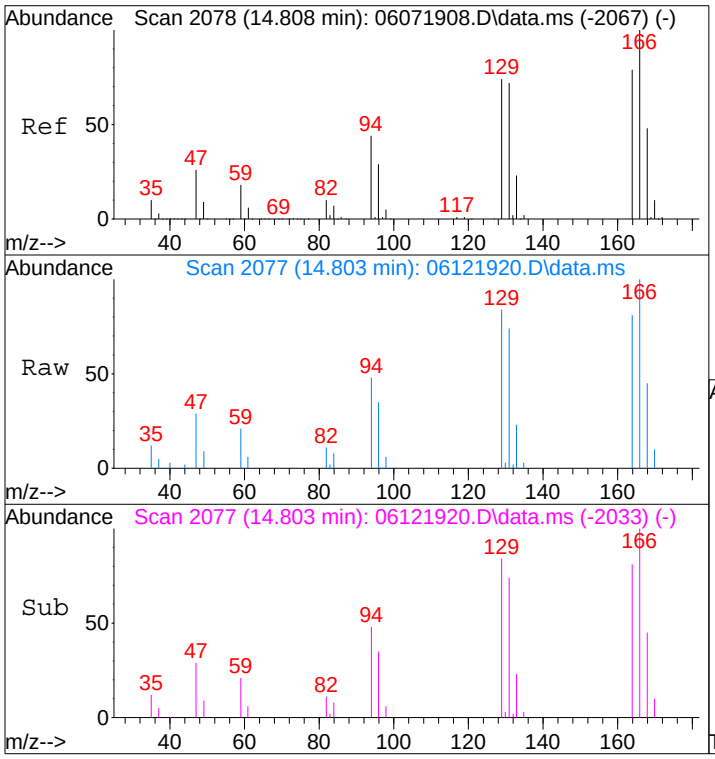


#47
Trichloroethene
Concen: 138.85 ng
RT: 11.81 min Scan# 1532
Delta R.T. -0.016 min
Lab File: 06121920.D
Acq: 12 Jun 2019 16:51

Tgt Ion:130 Resp: 2792334

Ion	Ratio	Lower	Upper
130	100		
132	96.1	75.9	115.9

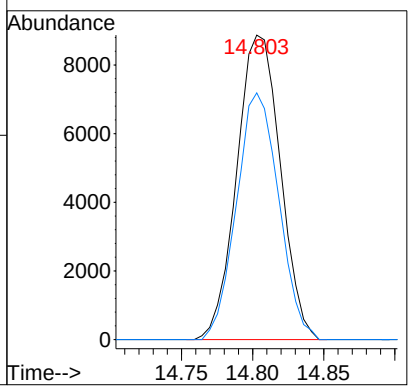




#64
Tetrachloroethene
Concen: 0.95 ng
RT: 14.80 min Scan# 2077
Delta R.T. -0.011 min
Lab File: 06121920.D
Acq: 12 Jun 2019 16:51

Tgt Ion:166 Resp: 18960

Ion	Ratio	Lower	Upper
166	100		
164	78.6	58.7	98.7



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\13\06131908.D
Acq On : 13 Jun 2019 10:00 Operator: SC
Sample : P1903177-001Dil (4.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

6/13/19

Quant Time: Jun 13 10:52:28 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	189523	12.500 ng	-0.04
37) 1,4-Difluorobenzene (IS2)	11.11	114	857075	12.500 ng	-0.02
56) Chlorobenzene-d5 (IS3)	15.46	82	447294	12.500 ng	0.00
System Monitoring Compounds					
33) 1,2-Dichloroethane-d4(...	9.91	65	351543	12.727 ng	-0.03
Spiked Amount 12.500	Range 70 - 130		Recovery = 101.84%		
57) Toluene-d8 (SS2)	13.55	98	1035679	12.413 ng	-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 99.28%		
73) Bromofluorobenzene (SS3)	17.05	174	270003	12.064 ng	0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 96.48%		
Target Compounds					Qvalue
2) Propene	3.89	42	798	N.D.	
3) Dichlorodifluoromethan...	3.90	85	938	N.D.	
4) Chloromethane	4.18	50	330	N.D.	
5) 1,2-Dichloro-1,1,2,2-t...	0.00	135	0	N.D.	
6) Vinyl Chloride	4.45	62	11456	N.D.	
7) 1,3-Butadiene	0.00	54	0	N.D.	
8) Bromomethane	0.00	94	0	N.D.	
9) Chloroethane	0.00	64	0	N.D.	
10) Ethanol	5.35	45	2041	N.D.	
11) Acetonitrile	5.58	41	710	N.D.	
12) Acrolein	5.72	56	289	N.D.	
13) Acetone	5.87	58	7313	N.D.	
14) Trichlorofluoromethane	6.02	101	388	N.D.	
15) 2-Propanol (Isopropanol)	6.17	45	3085	N.D.	
16) Acrylonitrile	6.55	53	690	N.D.	
17) 1,1-Dichloroethene	6.71	96	11205	0.627 ng	97
18) 2-Methyl-2-Propanol (t...	6.91	59	33	N.D.	
19) Methylene Chloride	6.85	84	440986	22.750 ng	99
20) 3-Chloro-1-propene (Al...	0.00	41	0	N.D. d	
21) Trichlorotrifluoroethane	7.18	151	695033	49.759 ng	99
22) Carbon Disulfide	7.15	76	1044	N.D.	
23) trans-1,2-Dichloroethene	7.88	61	3469	N.D.	
24) 1,1-Dichloroethane	8.10	63	4064	N.D.	
25) Methyl tert-Butyl Ether	8.12	73	471	N.D.	
26) Vinyl Acetate	0.00	86	0	N.D.	
27) 2-Butanone (MEK)	8.57	72	459	N.D.	
28) cis-1,2-Dichloroethene	8.97	61	860082	29.122 ng	99
29) Diisopropyl Ether	9.28	87	422	N.D.	
30) Ethyl Acetate	0.00	61	0	N.D.	
31) n-Hexane	9.23	57	515	N.D.	
32) Chloroform	9.28	83	4961	N.D.	
34) Tetrahydrofuran (THF)	9.72	72	387	N.D.	
35) Ethyl tert-Butyl Ether	0.00	87	0	N.D.	
36) 1,2-Dichloroethane	10.03	62	15547	0.588 ng	100
38) 1,1,1-Trichloroethane	10.29	97	477	N.D.	
39) Isopropyl Acetate	0.00	61	0	N.D.	
40) 1-Butanol	10.71	56	1306	N.D.	
41) Benzene	10.76	78	4988	N.D.	
42) Carbon Tetrachloride	10.90	117	1303	N.D.	
43) Cyclohexane	11.04	84	1120	N.D.	
44) tert-Amyl Methyl Ether	0.00	73	0	N.D.	
45) 1,2-Dichloropropane	0.00	63	0	N.D.	
46) Bromodichloromethane	0.00	83	0	N.D. d	
47) Trichloroethene	11.81	130	1264053	66.373 ng	100
48) 1,4-Dioxane	0.00	88	0	N.D.	
49) 2,2,4-Trimethylpentane...	11.87	57	2394	N.D.	

Data File: I:\MS09\Data\2019 06\13\06131908.D
Acq On : 13 Jun 2019 10:00 Operator: SC
Sample : P1903177-001Dil (4.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

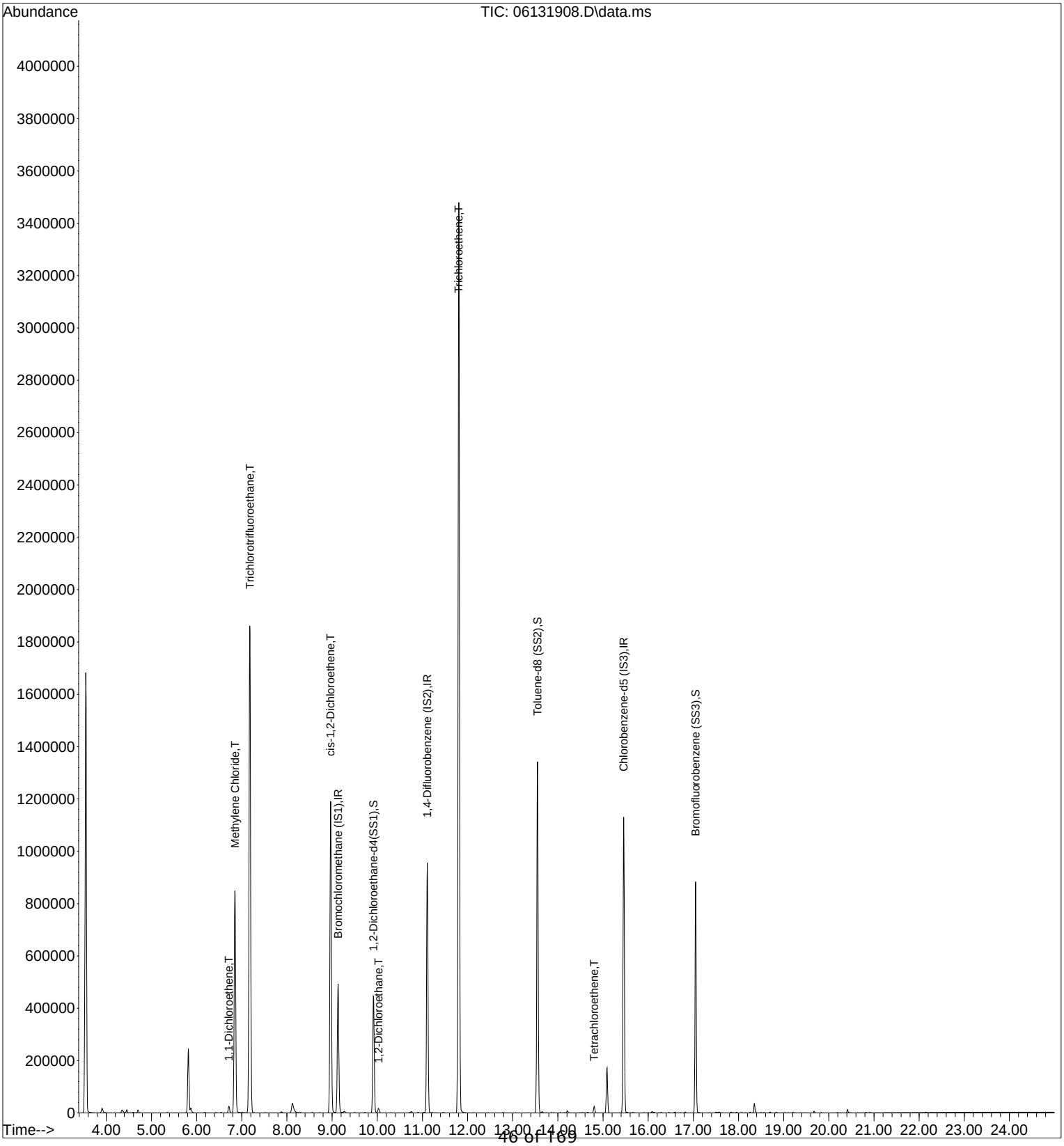
Quant Time: Jun 13 10:52:28 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
50) Methyl Methacrylate	11.81	100	3059	N.D.	
51) n-Heptane	12.12	71	190	N.D.	
52) cis-1,3-Dichloropropene	0.00	75	0	N.D.	
53) 4-Methyl-2-pentanone	0.00	58	0	N.D.	
54) trans-1,3-Dichloropropene	0.00	75	0	N.D.	
55) 1,1,2-Trichloroethane	13.36	97	384	N.D.	
58) Toluene	13.65	91	3471	N.D.	
59) 2-Hexanone	13.91	43	1185	N.D.	
60) Dibromochloromethane	0.00	129	0	N.D.	
61) 1,2-Dibromoethane	0.00	107	0	N.D.	
62) n-Butyl Acetate	14.67	43	1367	N.D.	
63) n-Octane	14.65	57	402	N.D.	
64) Tetrachloroethene	14.80	166	8784	0.463 ng	100
65) Chlorobenzene	0.00	112	0	N.D.	
66) Ethylbenzene	15.90	91	1301	N.D.	
67) m- & p-Xylenes	16.08	91	4896	N.D.	
68) Bromoform	0.00	173	0	N.D.	
69) Styrene	16.48	104	687	N.D.	
70) o-Xylene	16.58	91	2555	N.D.	
71) n-Nonane	16.82	43	1487	N.D.	
72) 1,1,2,2-Tetrachloroethane	0.00	83	0	N.D.	
74) Cumene	17.19	105	221	N.D.	
75) alpha-Pinene	17.61	93	411	N.D.	
76) n-Propylbenzene	17.73	91	523	N.D.	
77) 3-Ethyltoluene	17.83	105	2448	N.D.	
78) 4-Ethyltoluene	17.88	105	931	N.D.	
79) 1,3,5-Trimethylbenzene	17.95	105	1007	N.D.	
80) alpha-Methylstyrene	0.00	118	0	N.D.	
81) 2-Ethyltoluene	18.16	105	1003	N.D.	
82) 1,2,4-Trimethylbenzene	18.39	105	2380	N.D.	
83) n-Decane	18.50	57	681	N.D.	
84) Benzyl Chloride	18.39	91	306	N.D.	
85) 1,3-Dichlorobenzene	0.00	146	0	N.D.	
86) 1,4-Dichlorobenzene	0.00	146	0	N.D.	
87) sec-Butylbenzene	18.83	105	740	N.D.	
88) 4-Isopropyltoluene (p-...	18.83	119	677	N.D.	
89) 1,2,3-Trimethylbenzene	18.83	105	740	N.D.	
90) 1,2-Dichlorobenzene	0.00	146	0	N.D.	
91) d-Limonene	18.98	68	365	N.D.	
92) 1,2-Dibromo-3-Chloropr...	0.00	157	0	N.D.	
93) n-Undecane	19.83	57	622	N.D.	
94) 1,2,4-Trichlorobenzene	0.00	180	0	N.D.	
95) Naphthalene	20.90	128	1050	N.D.	
96) n-Dodecane	20.92	57	454	N.D.	
97) Hexachlorobutadiene	0.00	225	0	N.D.	
98) Cyclohexanone	16.28	55	677	N.D.	
99) tert-Butylbenzene	18.35	119	1066	N.D.	
100) n-Butylbenzene	19.27	91	209	N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

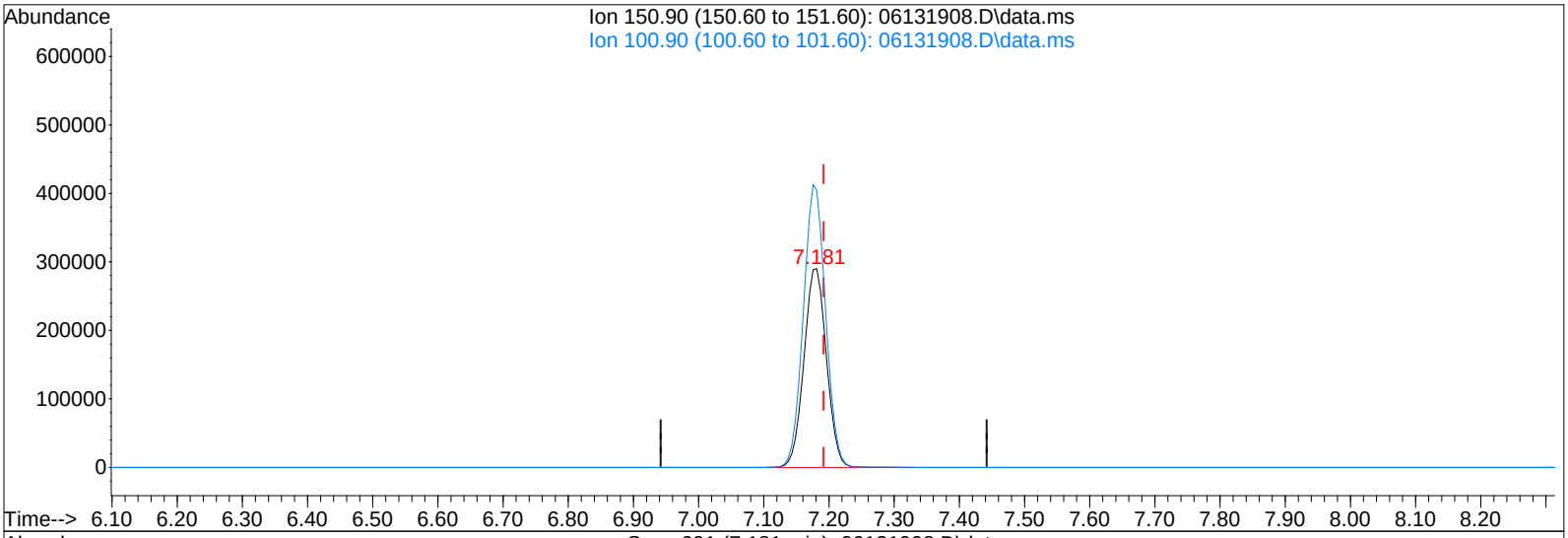
Data File: I:\MS09\Data\2019 06\13\06131908.D
Acq On : 13 Jun 2019 10:00 Operator: SC
Sample : P1903177-001Dil (4.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

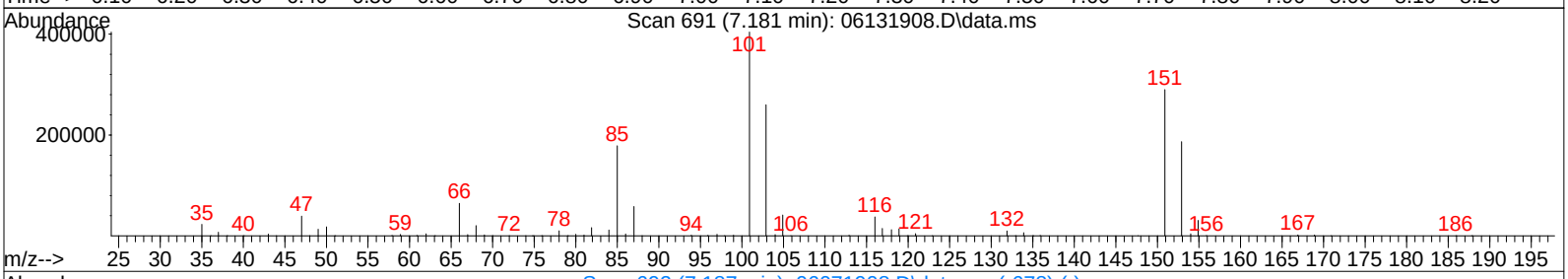
Quant Time: Jun 13 10:52:28 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

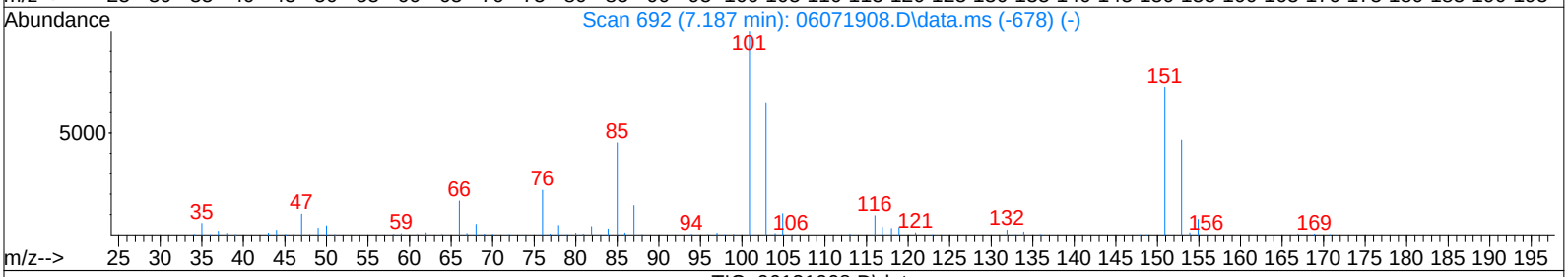


Data File: I:\MS09\Data\2019 06\13\06131908.D
Acq On : 13 Jun 2019 10:00 Operator: SC
Sample : P1903177-001Dil (4.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

Quant Time: Jun 13 10:51:52 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M







TIC: 06131908.D\data.ms

(21) Trichlorotrifluoroethane (T)

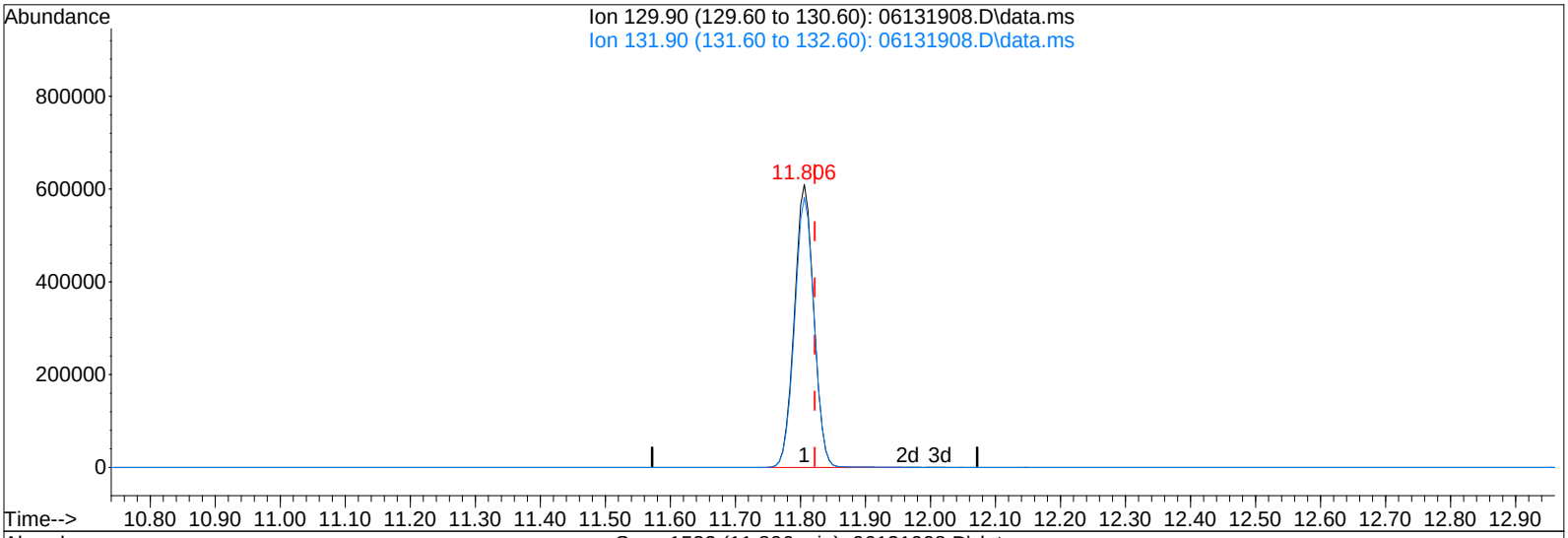
7.181min (-0.011) 49.76ng

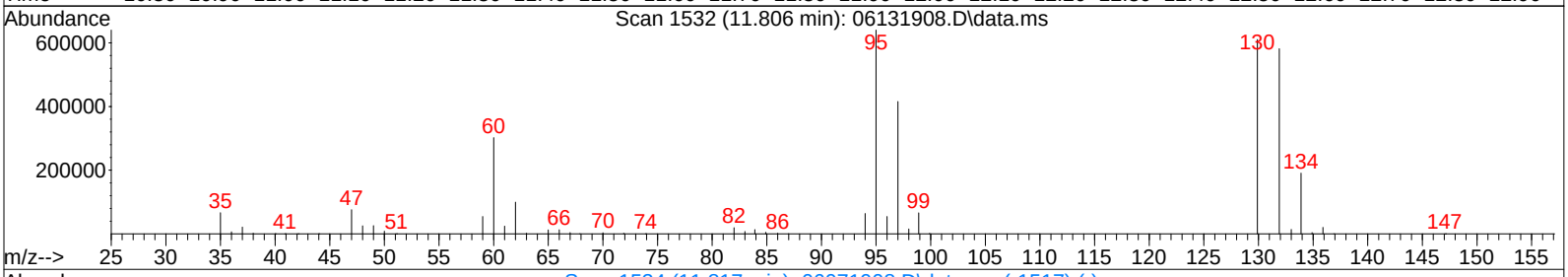
response 695033

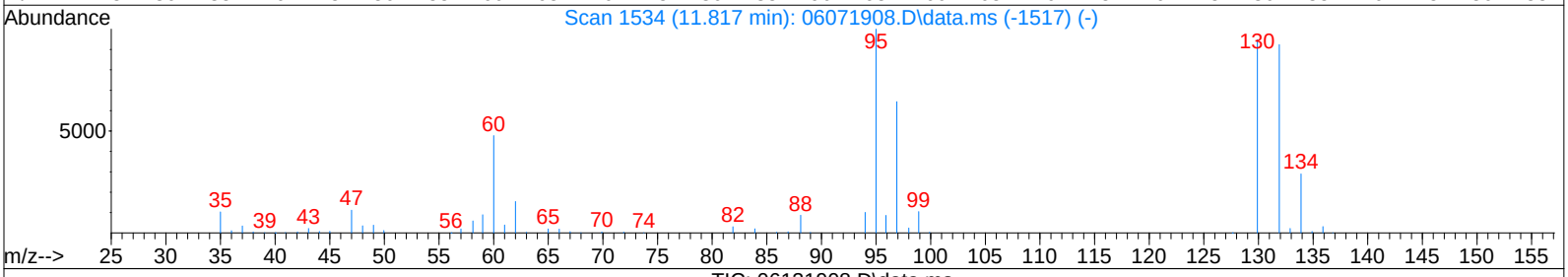
Ion	Exp%	Act%
150.90	100	100
100.90	139.90	140.58
0.00	0.00	0.00
0.00	0.00	0.00

Data File: I:\MS09\Data\2019 06\13\06131908.D
Acq On : 13 Jun 2019 10:00 Operator: SC
Sample : P1903177-001Dil (4.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

Quant Time: Jun 13 10:51:52 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M







TIC: 06131908.D\data.ms

(47) Trichloroethene (T)

11.806min (-0.016) 66.37ng

response 1264053

Ion	Exp%	Act%
129.90	100	100
131.90	95.90	95.76
0.00	0.00	0.00
0.00	0.00	0.00

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\12\06121921.D
Acq On : 12 Jun 2019 17:25 Operator: SC
Sample : P1903177-002 (8.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

6/13/19

Quant Time: Jun 13 16:05:10 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	194774	12.500	ng	-0.04
37) 1,4-Difluorobenzene (IS2)	11.11	114	883357	12.500	ng	-0.02
56) Chlorobenzene-d5 (IS3)	15.46	82	462420	12.500	ng	0.00
System Monitoring Compounds						
33) 1,2-Dichloroethane-d4(...	9.92	65	357395	12.590	ng	-0.03
Spiked Amount 12.500	Range 70 - 130		Recovery = 100.72%			
57) Toluene-d8 (SS2)	13.55	98	1072863	12.438	ng	-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 99.52%			
73) Bromofluorobenzene (SS3)	17.05	174	281935	12.185	ng	0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 97.44%			
Target Compounds						Qvalue
2) Propene	3.88	42	1120	N.D.		
3) Dichlorodifluoromethan...	3.98	85	3553	N.D.		
4) Chloromethane	4.17	50	479	N.D.		
5) 1,2-Dichloro-1,1,2,2-t...	0.00	135	0	N.D.		
6) Vinyl Chloride	4.45	62	21538	0.696	ng	99
7) 1,3-Butadiene	0.00	54	0	N.D.		
8) Bromomethane	0.00	94	0	N.D.		
9) Chloroethane	0.00	64	0	N.D.		
10) Ethanol	5.34	45	1989	N.D.		
11) Acetonitrile	5.58	41	304	N.D.		
12) Acrolein	5.72	56	373	N.D.		
13) Acetone	5.87	58	11871	0.694	ng	95
14) Trichlorofluoromethane	6.02	101	2971	N.D.		
15) 2-Propanol (Isopropanol)	6.17	45	3191	N.D.		
16) Acrylonitrile	6.54	53	1501	N.D.		
17) 1,1-Dichloroethene	6.71	96	21094	1.149	ng	100
18) 2-Methyl-2-Propanol (t...	6.87	59	42	N.D.		
19) Methylene Chloride	6.85	84	816594	40.992	ng	98
20) 3-Chloro-1-propene (Al...	0.00	41	0	N.D.	d	
21) Trichlorotrifluoroethane	7.18	151	1305572	90.949	ng	100
22) Carbon Disulfide	7.15	76	1165	N.D.		
23) trans-1,2-Dichloroethene	7.88	61	4791	N.D.		
24) 1,1-Dichloroethane	8.10	63	7466	N.D.		
25) Methyl tert-Butyl Ether	8.12	73	479	N.D.		
26) Vinyl Acetate	0.00	86	0	N.D.		
27) 2-Butanone (MEK)	8.56	72	1971	N.D.		
28) cis-1,2-Dichloroethene	8.97	61	1634893	53.864	ng	100
29) Diisopropyl Ether	9.28	87	834	N.D.		
30) Ethyl Acetate	9.40	61	152	N.D.		
31) n-Hexane	9.22	57	1677	N.D.		
32) Chloroform	9.28	83	8950	N.D.		
34) Tetrahydrofuran (THF)	9.71	72	2444	N.D.		
35) Ethyl tert-Butyl Ether	0.00	87	0	N.D.		
36) 1,2-Dichloroethane	10.03	62	28794	1.060	ng	99
38) 1,1,1-Trichloroethane	10.30	97	1066	N.D.		
39) Isopropyl Acetate	0.00	61	0	N.D.		
40) 1-Butanol	10.72	56	1171	N.D.		
41) Benzene	10.76	78	7177	N.D.		
42) Carbon Tetrachloride	10.91	117	2644	N.D.		
43) Cyclohexane	11.03	84	2079	N.D.		
44) tert-Amyl Methyl Ether	0.00	73	0	N.D.		
45) 1,2-Dichloropropane	0.00	63	0	N.D.		
46) Bromodichloromethane	0.00	83	0	N.D.	d	
47) Trichloroethene	11.81	130	2472873	125.982	ng	100
48) 1,4-Dioxane	11.82	88	382	N.D.		
49) 2,2,4-Trimethylpentane...	11.87	57	6429	N.D.		

Data File: I:\MS09\Data\2019 06\12\06121921.D
Acq On : 12 Jun 2019 17:25 Operator: SC
Sample : P1903177-002 (8.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

Quant Time: Jun 13 16:05:10 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

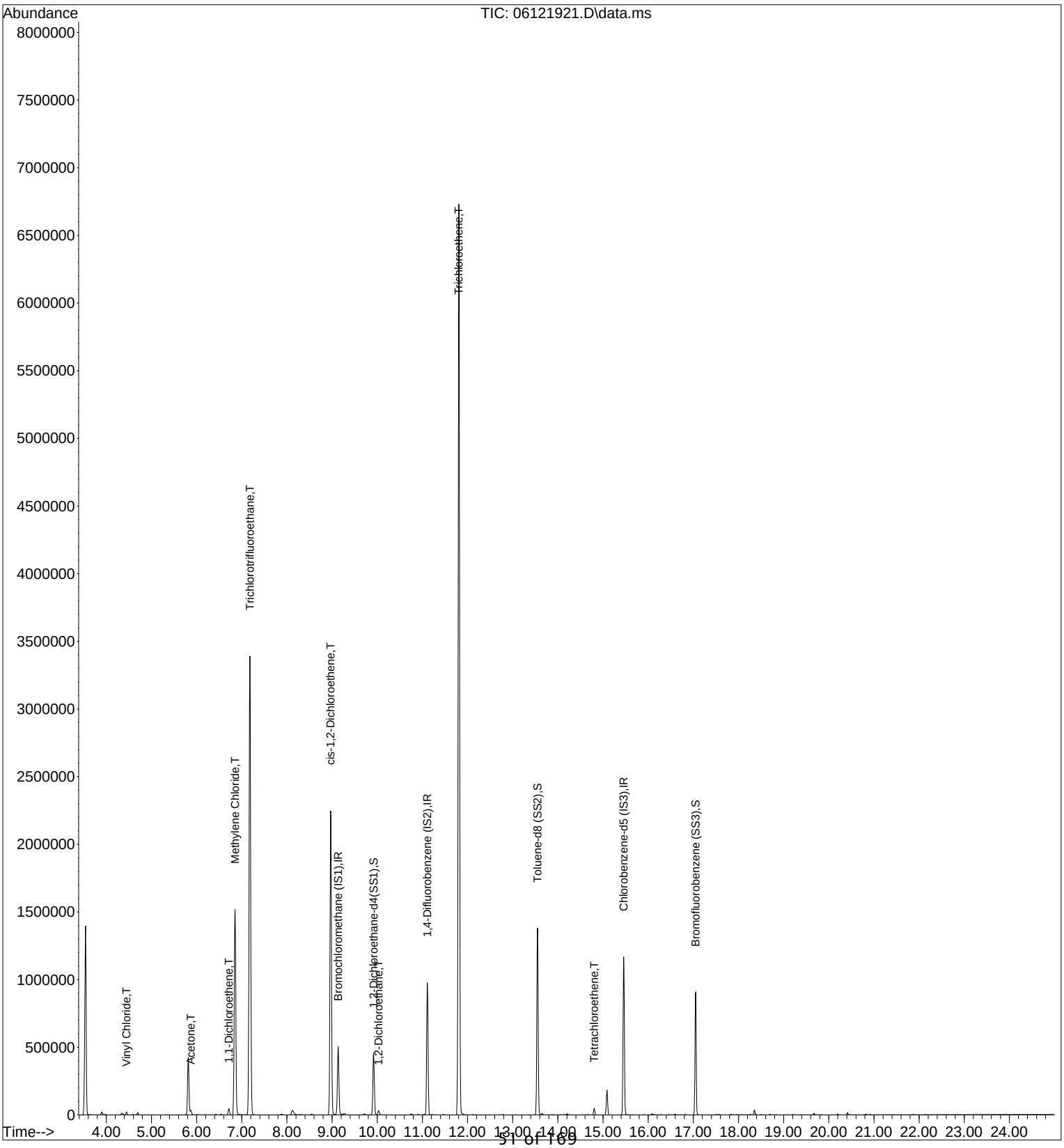
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
50) Methyl Methacrylate	0.00	100	0	N.D. d	
51) n-Heptane	12.12	71	521	N.D.	
52) cis-1,3-Dichloropropene	0.00	75	0	N.D.	
53) 4-Methyl-2-pentanone	0.00	58	0	N.D.	
54) trans-1,3-Dichloropropene	0.00	75	0	N.D.	
55) 1,1,2-Trichloroethane	13.36	97	713	N.D.	
58) Toluene	13.65	91	8070	N.D.	
59) 2-Hexanone	13.91	43	2151	N.D.	
60) Dibromochloromethane	0.00	129	0	N.D.	
61) 1,2-Dibromoethane	0.00	107	0	N.D.	
62) n-Butyl Acetate	14.67	43	1824	N.D.	
63) n-Octane	14.67	57	642	N.D.	
64) Tetrachloroethene	14.80	166	16626	0.848 ng	100
65) Chlorobenzene	0.00	112	0	N.D.	
66) Ethylbenzene	15.91	91	2701	N.D.	
67) m- & p-Xylenes	16.08	91	7719	N.D.	
68) Bromoform	0.00	173	0	N.D.	
69) Styrene	16.47	104	1284	N.D.	
70) o-Xylene	16.58	91	3709	N.D.	
71) n-Nonane	16.82	43	2019	N.D.	
72) 1,1,2,2-Tetrachloroethane	0.00	83	0	N.D.	
74) Cumene	17.20	105	159	N.D.	
75) alpha-Pinene	17.61	93	571	N.D.	
76) n-Propylbenzene	17.72	91	689	N.D.	
77) 3-Ethyltoluene	17.83	105	3122	N.D.	
78) 4-Ethyltoluene	17.88	105	1278	N.D.	
79) 1,3,5-Trimethylbenzene	17.96	105	1207	N.D.	
80) alpha-Methylstyrene	0.00	118	0	N.D.	
81) 2-Ethyltoluene	18.16	105	1236	N.D.	
82) 1,2,4-Trimethylbenzene	18.38	105	3365	N.D.	
83) n-Decane	18.50	57	1319	N.D.	
84) Benzyl Chloride	18.38	91	352	N.D.	
85) 1,3-Dichlorobenzene	0.00	146	0	N.D.	
86) 1,4-Dichlorobenzene	0.00	146	0	N.D.	
87) sec-Butylbenzene	18.67	105	106	N.D.	
88) 4-Isopropyltoluene (p-...	18.83	119	729	N.D.	
89) 1,2,3-Trimethylbenzene	18.83	105	1040	N.D.	
90) 1,2-Dichlorobenzene	0.00	146	0	N.D.	
91) d-Limonene	18.98	68	385	N.D.	
92) 1,2-Dibromo-3-Chloropr...	0.00	157	0	N.D.	
93) n-Undecane	19.83	57	1120	N.D.	
94) 1,2,4-Trichlorobenzene	0.00	180	0	N.D.	
95) Naphthalene	20.90	128	594	N.D.	
96) n-Dodecane	20.92	57	1325	N.D.	
97) Hexachlorobutadiene	0.00	225	0	N.D.	
98) Cyclohexanone	16.26	55	570	N.D.	
99) tert-Butylbenzene	18.39	119	352	N.D.	
100) n-Butylbenzene	19.26	91	357	N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

00942854

Data File: I:\MS09\Data\2019 06\12\06121921.D
Acq On : 12 Jun 2019 17:25 Operator: SC
Sample : P1903177-002 (8.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

Quant Time: Jun 13 16:05:10 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\12\06121921.D
Acq On : 12 Jun 2019 17:25 Operator: SC
Sample : P1903177-002 (8.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

6/13/19

Quant Time: Jun 13 16:05:10 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

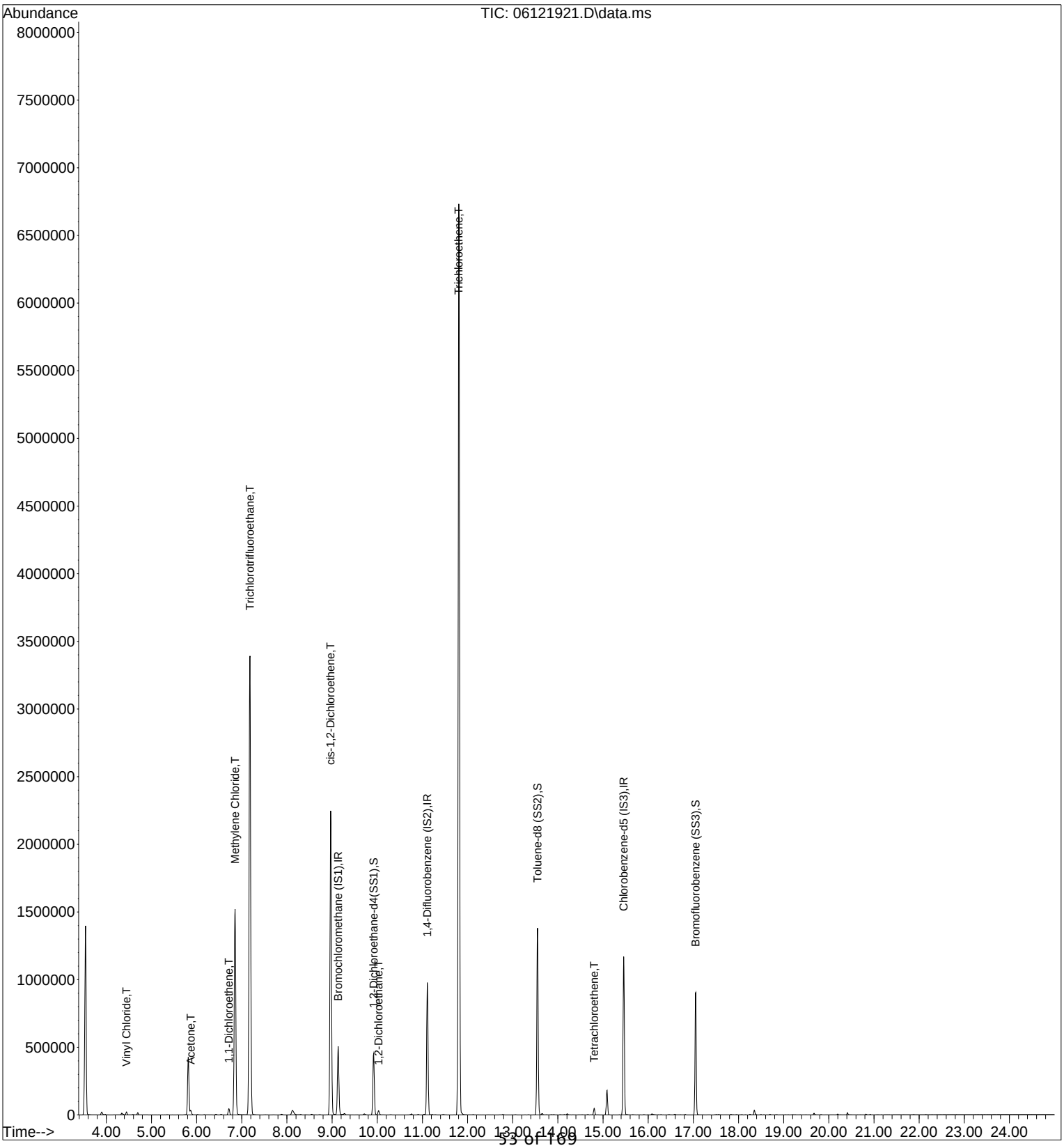
Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	194774	12.500	ng	-0.04
37) 1,4-Difluorobenzene (IS2)	11.11	114	883357	12.500	ng	-0.02
56) Chlorobenzene-d5 (IS3)	15.46	82	462420	12.500	ng	0.00
System Monitoring Compounds						
33) 1,2-Dichloroethane-d4(...	9.92	65	357395	12.590	ng	-0.03
Spiked Amount 12.500	Range 70 - 130		Recovery = 100.72%			
57) Toluene-d8 (SS2)	13.55	98	1072863	12.438	ng	-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 99.52%			
73) Bromofluorobenzene (SS3)	17.05	174	281935	12.185	ng	0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 97.44%			
Target Compounds						Qvalue
6) Vinyl Chloride	4.45	62	21538	0.696	ng	99
13) Acetone	5.87	58	11871	0.694	ng	95
17) 1,1-Dichloroethene	6.71	96	21094	1.149	ng	100
19) Methylene Chloride	6.85	84	816594	40.992	ng	98
21) Trichlorotrifluoroethane	7.18	151	1305572	90.949	ng	100
28) cis-1,2-Dichloroethene	8.97	61	1634893	53.864	ng	100
36) 1,2-Dichloroethane	10.03	62	28794	1.060	ng	99
47) Trichloroethene	11.81	130	2472873	125.982	ng	100
64) Tetrachloroethene	14.80	166	16626	0.848	ng	100

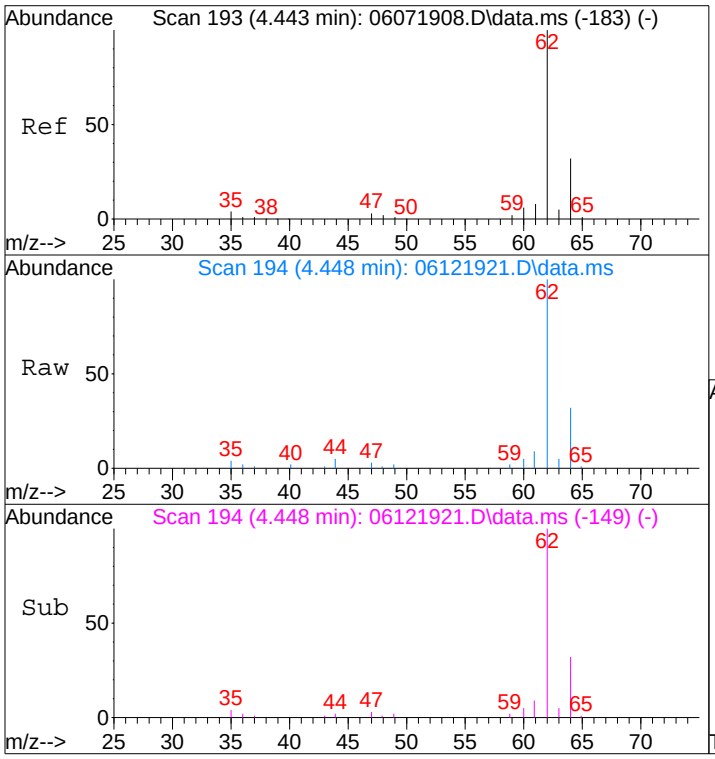
(#) = qualifier out of range (m) = manual integration (+) = signals summed

00942856

Data File: I:\MS09\Data\2019 06\12\06121921.D
Acq On : 12 Jun 2019 17:25 Operator: SC
Sample : P1903177-002 (8.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

Quant Time: Jun 13 16:05:10 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

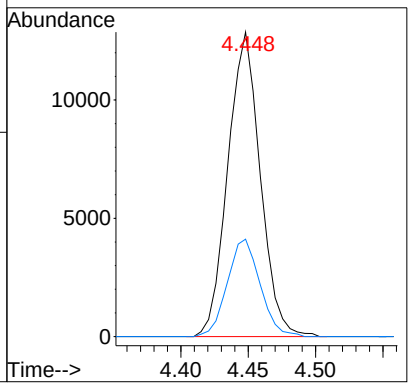


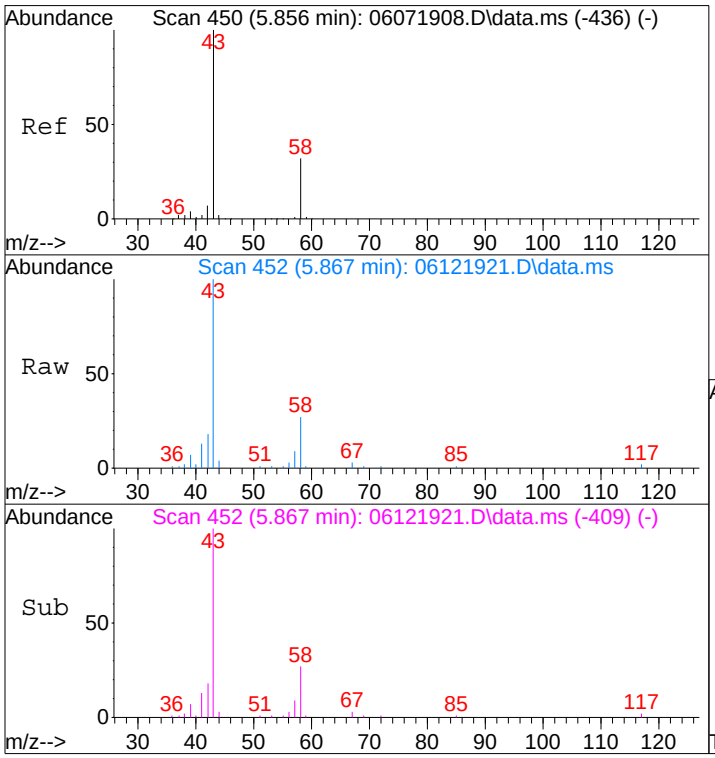


#6
Vinyl Chloride
Concen: 0.70 ng
RT: 4.45 min Scan# 194
Delta R.T. 0.000 min
Lab File: 06121921.D
Acq: 12 Jun 2019 17:25

Tgt Ion: 62 Resp: 21538

Ion	Ratio	Lower	Upper
62	100		
64	32.3	11.6	51.6

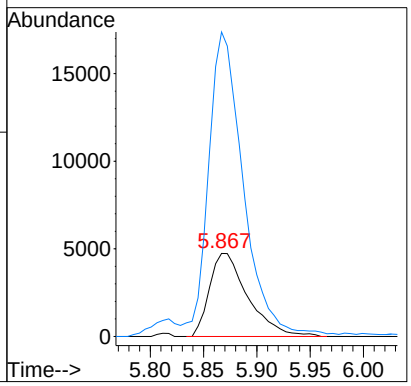


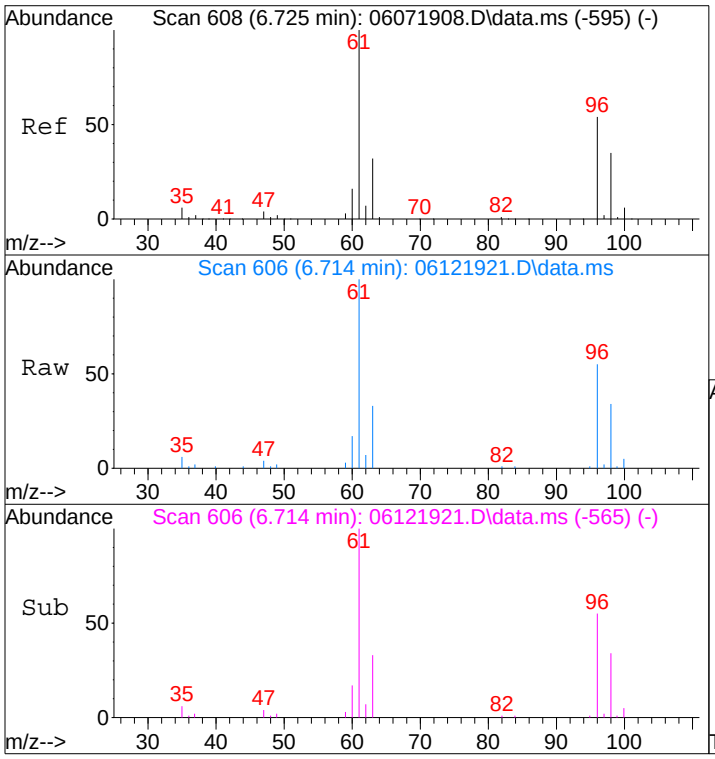


#13
Acetone
Concen: 0.69 ng
RT: 5.87 min Scan# 452
Delta R.T. -0.011 min
Lab File: 06121921.D
Acq: 12 Jun 2019 17:25

Tgt Ion: 58 Resp: 11871

Ion	Ratio	Lower	Upper
58	100		
43	327.2	287.7	347.7

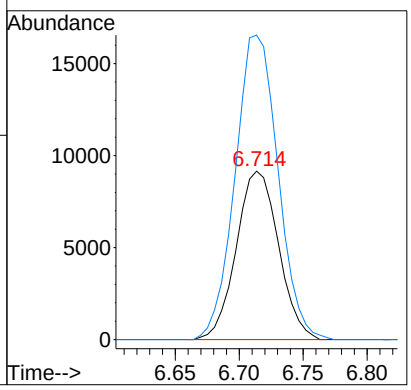


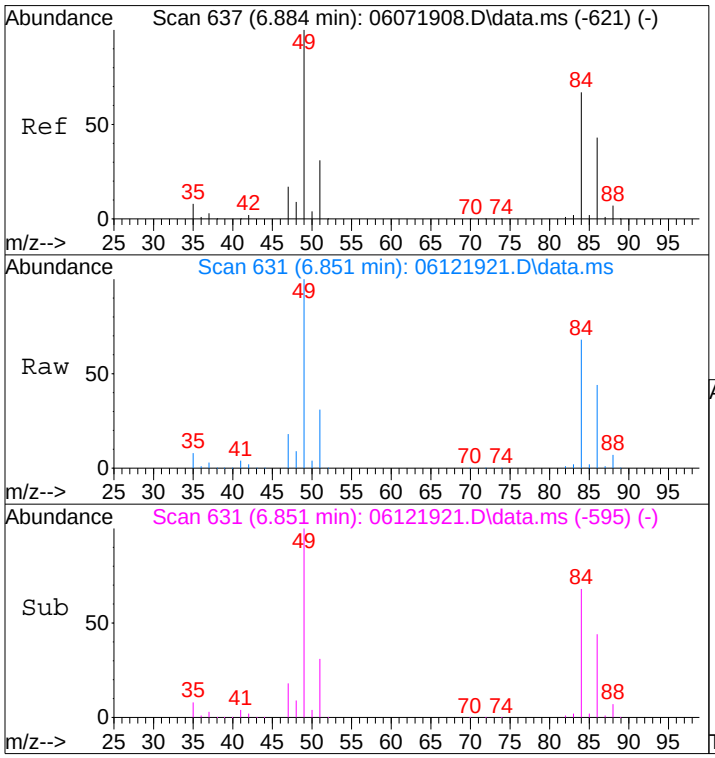


#17
1,1-Dichloroethene
Concen: 1.15 ng
RT: 6.71 min Scan# 606
Delta R.T. -0.022 min
Lab File: 06121921.D
Acq: 12 Jun 2019 17:25

Tgt Ion: 96 Resp: 21094

Ion	Ratio	Lower	Upper
96	100		
61	183.6	163.6	203.6

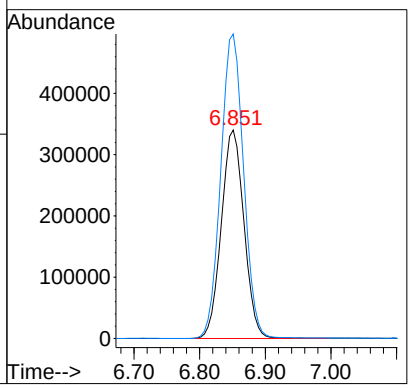


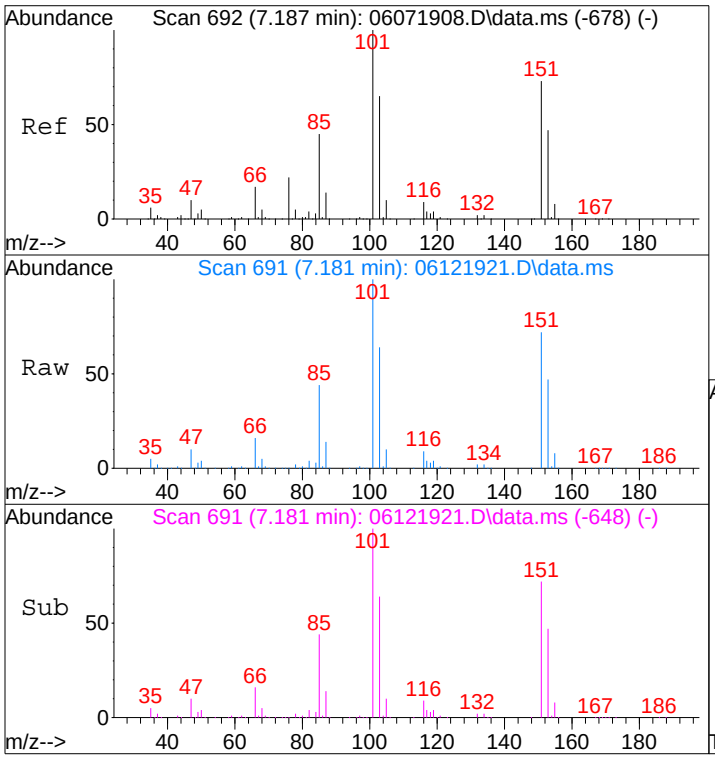


#19
Methylene Chloride
Concen: 40.99 ng
RT: 6.85 min Scan# 631
Delta R.T. -0.049 min
Lab File: 06121921.D
Acq: 12 Jun 2019 17:25

Tgt Ion: 84 Resp: 816594

Ion	Ratio	Lower	Upper
84	100		
49	147.6	125.7	175.7

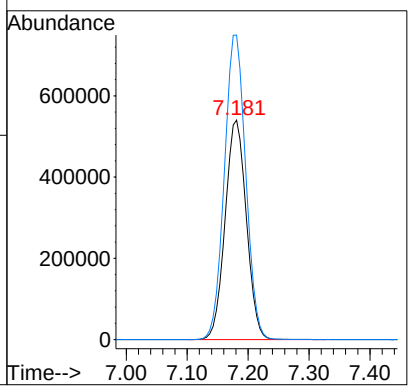


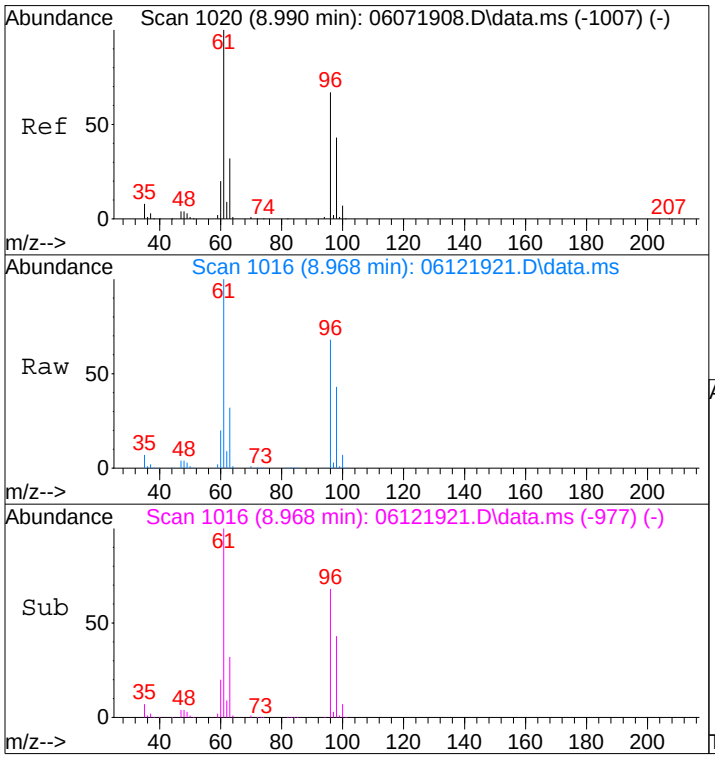


#21
Trichlorotrifluoroethane
Concen: 90.95 ng
RT: 7.18 min Scan# 691
Delta R.T. -0.011 min
Lab File: 06121921.D
Acq: 12 Jun 2019 17:25

Tgt Ion:151 Resp: 1305572

Ion	Ratio	Lower	Upper
151	100		
101	139.7	119.9	159.9

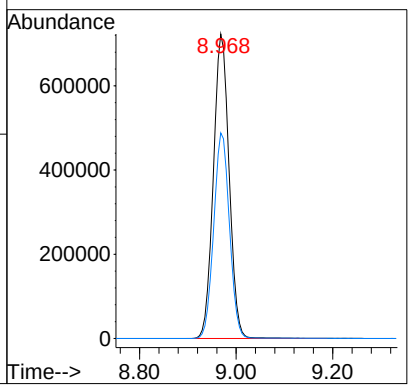


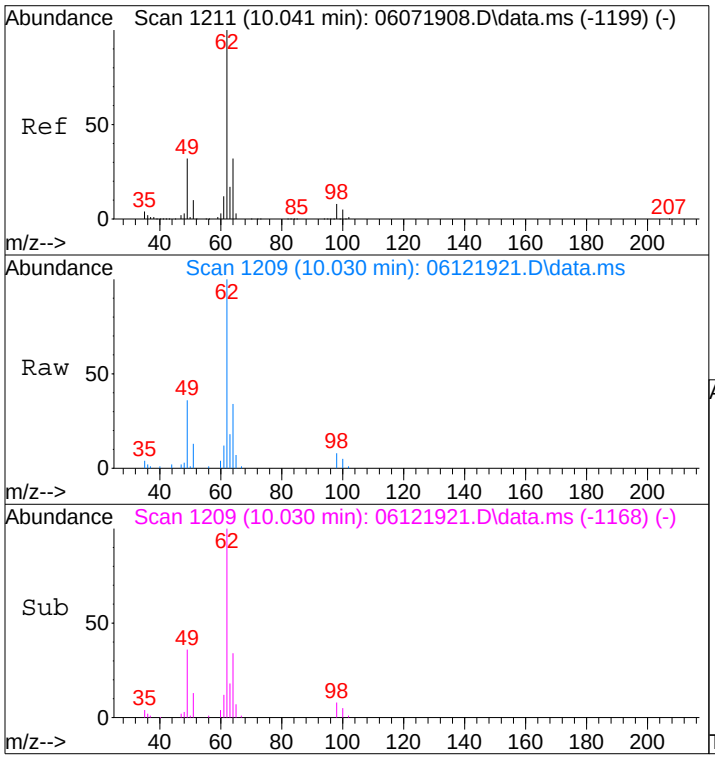


#28
cis-1,2-Dichloroethene
Concen: 53.86 ng
RT: 8.97 min Scan# 1016
Delta R.T. -0.033 min
Lab File: 06121921.D
Acq: 12 Jun 2019 17:25

Tgt Ion: 61 Resp: 1634893

Ion	Ratio	Lower	Upper
61	100		
96	67.8	47.8	87.8

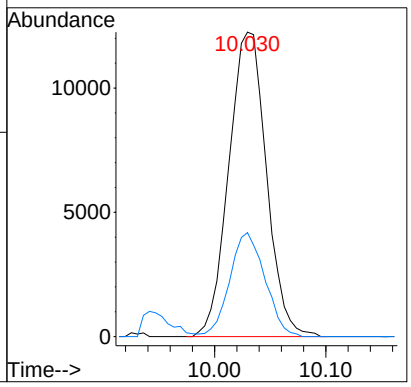


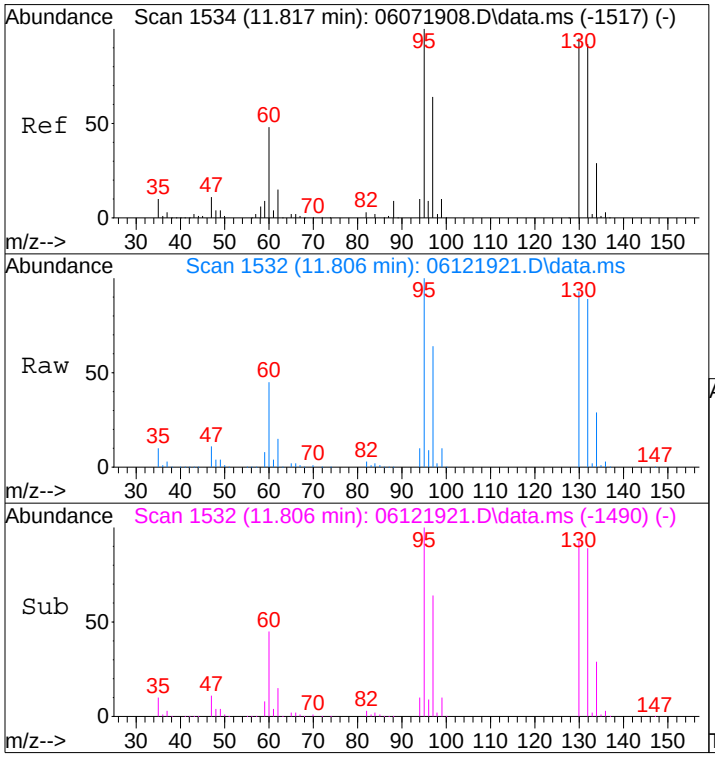


#36
1,2-Dichloroethane
Concen: 1.06 ng
RT: 10.03 min Scan# 1209
Delta R.T. -0.022 min
Lab File: 06121921.D
Acq: 12 Jun 2019 17:25

Tgt Ion: 62 Resp: 28794

Ion	Ratio	Lower	Upper
62	100		
64	31.9	12.3	52.3

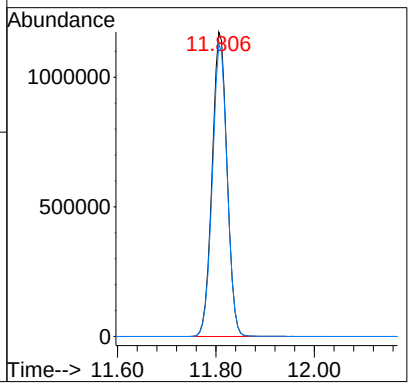


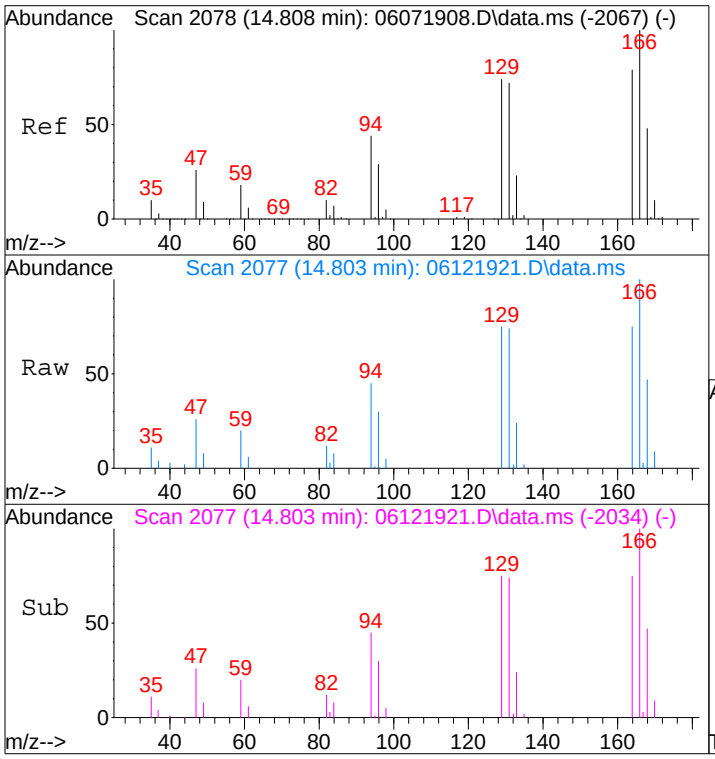


#47
Trichloroethene
Concen: 125.98 ng
RT: 11.81 min Scan# 1532
Delta R.T. -0.016 min
Lab File: 06121921.D
Acq: 12 Jun 2019 17:25

Tgt Ion:130 Resp: 2472873

Ion	Ratio	Lower	Upper
130	100		
132	95.9	75.9	115.9

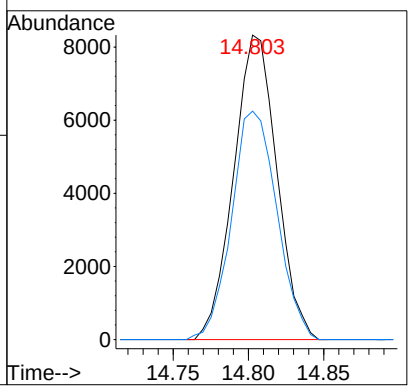




#64
Tetrachloroethene
Concen: 0.85 ng
RT: 14.80 min Scan# 2077
Delta R.T. -0.011 min
Lab File: 06121921.D
Acq: 12 Jun 2019 17:25

Tgt Ion:166 Resp: 16626

Ion	Ratio	Lower	Upper
166	100		
164	78.6	58.7	98.7



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\13\06131909.D
Acq On : 13 Jun 2019 10:33 Operator: SC
Sample : P1903177-002Dil (4.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

6/13/19

Quant Time: Jun 13 11:03:01 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	182299	12.500	ng	-0.04
37) 1,4-Difluorobenzene (IS2)	11.11	114	833276	12.500	ng	-0.02
56) Chlorobenzene-d5 (IS3)	15.46	82	436528	12.500	ng	0.00
System Monitoring Compounds						
33) 1,2-Dichloroethane-d4(...	9.91	65	344829	12.979	ng	-0.03
Spiked Amount 12.500	Range 70 - 130		Recovery = 103.84%			
57) Toluene-d8 (SS2)	13.55	98	1008758	12.389	ng	-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 99.12%			
73) Bromofluorobenzene (SS3)	17.05	174	265456	12.153	ng	0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 97.20%			
Target Compounds						Qvalue
2) Propene	3.88	42	798	N.D.		
3) Dichlorodifluoromethan...	3.98	85	1705	N.D.		
4) Chloromethane	4.18	50	291	N.D.		
5) 1,2-Dichloro-1,1,2,2-t...	0.00	135	0	N.D.		
6) Vinyl Chloride	4.45	62	10309	N.D.		
7) 1,3-Butadiene	0.00	54	0	N.D.		
8) Bromomethane	0.00	94	0	N.D.		
9) Chloroethane	0.00	64	0	N.D.		
10) Ethanol	5.45	45	37	N.D.		
11) Acetonitrile	5.58	41	603	N.D.		
12) Acrolein	5.71	56	249	N.D.		
13) Acetone	5.87	58	8015	0.501	ng	89
14) Trichlorofluoromethane	6.02	101	1430	N.D.		
15) 2-Propanol (Isopropanol)	6.17	45	2796	N.D.		
16) Acrylonitrile	6.54	53	657	N.D.		
17) 1,1-Dichloroethene	6.71	96	9927	0.578	ng	99
18) 2-Methyl-2-Propanol (t...	6.71	59	499	N.D.		
19) Methylene Chloride	6.85	84	382576	20.519	ng	99
20) 3-Chloro-1-propene (Al...	6.94	41	116	N.D.		
21) Trichlorotrifluoroethane	7.18	151	606577	45.147	ng	99
22) Carbon Disulfide	7.14	76	813	N.D.		
23) trans-1,2-Dichloroethene	7.87	61	2186	N.D.		
24) 1,1-Dichloroethane	8.10	63	3576	N.D.		
25) Methyl tert-Butyl Ether	8.14	73	201	N.D.		
26) Vinyl Acetate	0.00	86	0	N.D.		
27) 2-Butanone (MEK)	8.54	72	1077	N.D.		
28) cis-1,2-Dichloroethene	8.97	61	767007	26.999	ng	99
29) Diisopropyl Ether	9.27	87	336	N.D.		
30) Ethyl Acetate	9.22	61	763	N.D.		
31) n-Hexane	9.22	57	960	N.D.		
32) Chloroform	9.27	83	4208	N.D.		
34) Tetrahydrofuran (THF)	9.71	72	1252	N.D.		
35) Ethyl tert-Butyl Ether	0.00	87	0	N.D.		
36) 1,2-Dichloroethane	10.03	62	14143	0.556	ng	98
38) 1,1,1-Trichloroethane	10.29	97	413	N.D.		
39) Isopropyl Acetate	0.00	61	0	N.D.		
40) 1-Butanol	10.72	56	1016	N.D.		
41) Benzene	10.76	78	5046	N.D.		
42) Carbon Tetrachloride	10.90	117	1214	N.D.		
43) Cyclohexane	11.04	84	1033	N.D.		
44) tert-Amyl Methyl Ether	0.00	73	0	N.D.		
45) 1,2-Dichloropropane	0.00	63	0	N.D.		
46) Bromodichloromethane	0.00	83	0	N.D.	d	
47) Trichloroethene	11.81	130	1117360	60.346	ng	100
48) 1,4-Dioxane	0.00	88	0	N.D.		
49) 2,2,4-Trimethylpentane...	11.87	57	3535	N.D.		

Data File: I:\MS09\Data\2019 06\13\06131909.D
Acq On : 13 Jun 2019 10:33 Operator: SC
Sample : P1903177-002Dil (4.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

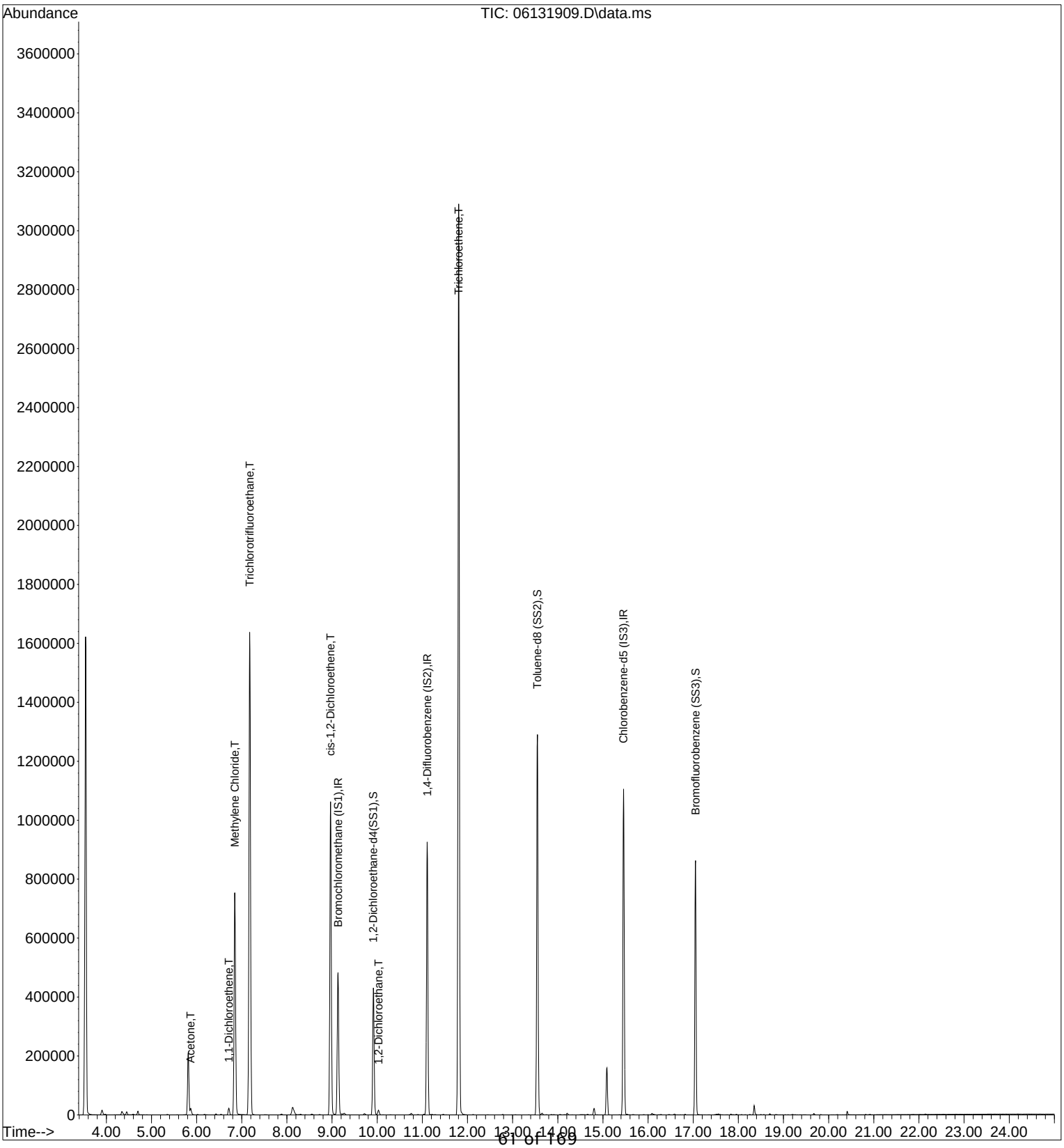
Quant Time: Jun 13 11:03:01 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc Units Dev(Min)
50) Methyl Methacrylate	11.80	100	2673	N.D.
51) n-Heptane	12.12	71	189	N.D.
52) cis-1,3-Dichloropropene	0.00	75	0	N.D.
53) 4-Methyl-2-pentanone	0.00	58	0	N.D.
54) trans-1,3-Dichloropropene	0.00	75	0	N.D.
55) 1,1,2-Trichloroethane	13.35	97	293	N.D.
58) Toluene	13.65	91	4191	N.D.
59) 2-Hexanone	13.91	43	1251	N.D.
60) Dibromochloromethane	0.00	129	0	N.D.
61) 1,2-Dibromoethane	0.00	107	0	N.D.
62) n-Butyl Acetate	14.67	43	1238	N.D.
63) n-Octane	14.67	57	411	N.D.
64) Tetrachloroethene	14.80	166	7684	N.D.
65) Chlorobenzene	0.00	112	0	N.D.
66) Ethylbenzene	15.91	91	1439	N.D.
67) m- & p-Xylenes	16.08	91	4534	N.D.
68) Bromoform	0.00	173	0	N.D.
69) Styrene	16.47	104	578	N.D.
70) o-Xylene	16.58	91	2295	N.D.
71) n-Nonane	16.82	43	1248	N.D.
72) 1,1,2,2-Tetrachloroethane	0.00	83	0	N.D.
74) Cumene	17.20	105	110	N.D.
75) alpha-Pinene	17.60	93	353	N.D.
76) n-Propylbenzene	17.73	91	404	N.D.
77) 3-Ethyltoluene	17.83	105	2160	N.D.
78) 4-Ethyltoluene	17.87	105	808	N.D.
79) 1,3,5-Trimethylbenzene	17.95	105	836	N.D.
80) alpha-Methylstyrene	0.00	118	0	N.D.
81) 2-Ethyltoluene	18.16	105	818	N.D.
82) 1,2,4-Trimethylbenzene	18.38	105	2171	N.D.
83) n-Decane	18.49	57	628	N.D.
84) Benzyl Chloride	18.38	91	177	N.D.
85) 1,3-Dichlorobenzene	0.00	146	0	N.D.
86) 1,4-Dichlorobenzene	0.00	146	0	N.D.
87) sec-Butylbenzene	18.83	105	651	N.D.
88) 4-Isopropyltoluene (p-...	18.83	119	578	N.D.
89) 1,2,3-Trimethylbenzene	18.83	105	651	N.D.
90) 1,2-Dichlorobenzene	0.00	146	0	N.D.
91) d-Limonene	18.99	68	211	N.D.
92) 1,2-Dibromo-3-Chloropr...	0.00	157	0	N.D.
93) n-Undecane	19.82	57	410	N.D.
94) 1,2,4-Trichlorobenzene	0.00	180	0	N.D.
95) Naphthalene	20.90	128	750	N.D.
96) n-Dodecane	20.92	57	522	N.D.
97) Hexachlorobutadiene	0.00	225	0	N.D.
98) Cyclohexanone	16.27	55	508	N.D.
99) tert-Butylbenzene	18.35	119	1030	N.D.
100) n-Butylbenzene	0.00	91	0	N.D.

(#) = qualifier out of range (m) = manual integration (+) = signals summed

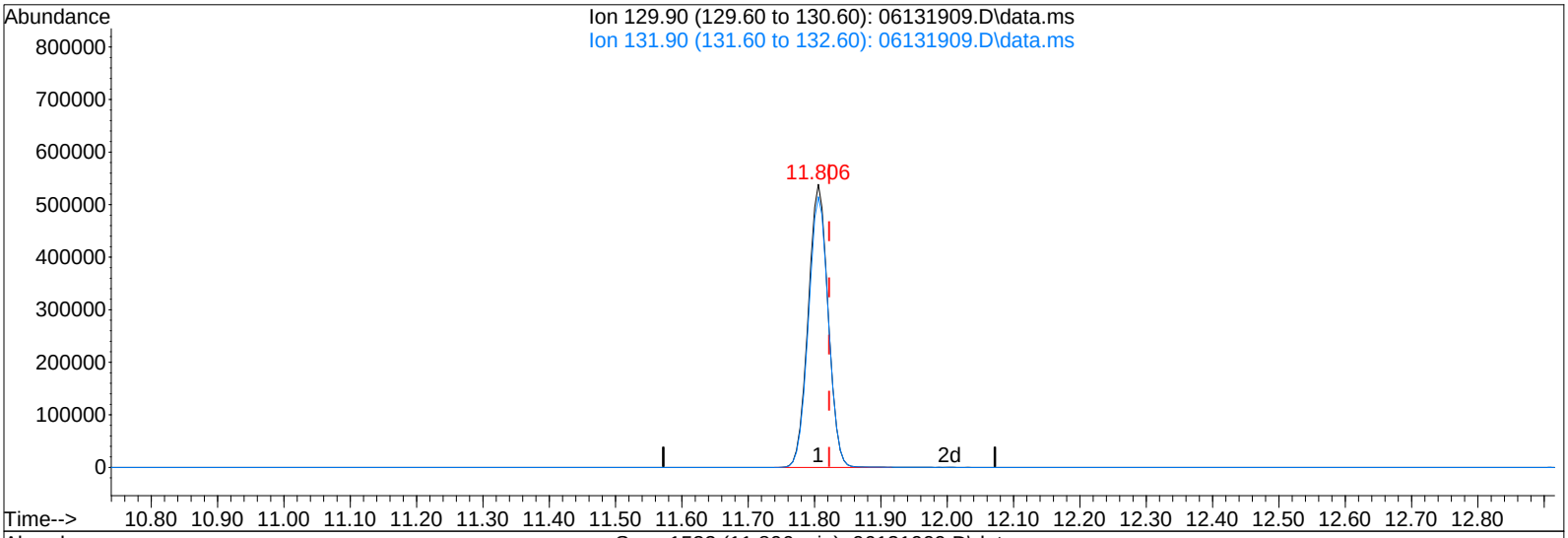
Data File: I:\MS09\Data\2019 06\13\06131909.D
Acq On : 13 Jun 2019 10:33 Operator: SC
Sample : P1903177-002Dil (4.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

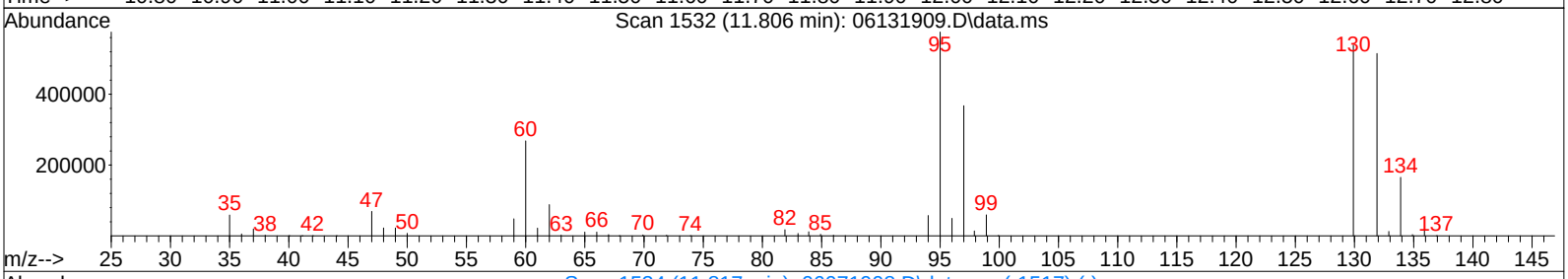
Quant Time: Jun 13 11:03:01 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

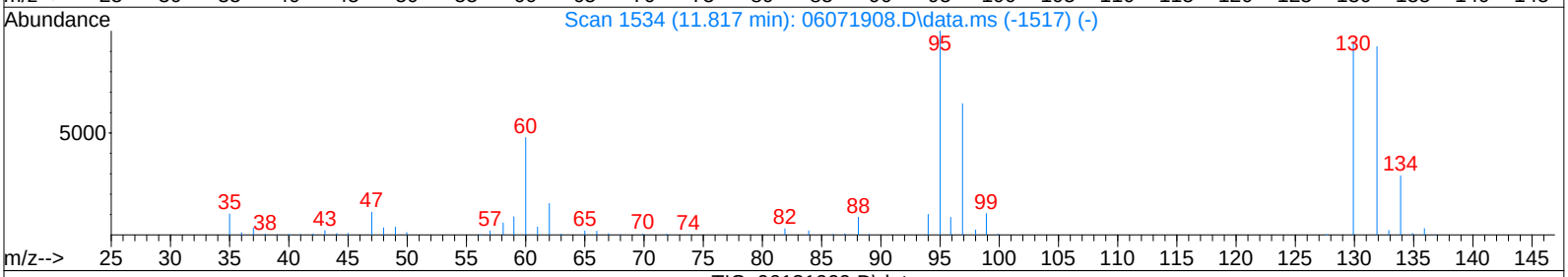


Data File: I:\MS09\Data\2019 06\13\06131909.D
Acq On : 13 Jun 2019 10:33 Operator: SC
Sample : P1903177-002Dil (4.0mL)
Misc : S31-05131901
ALS Vial : 1 Sample Multiplier: 1

Quant Time: Jun 13 11:02:35 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M







TIC: 06131909.D\data.ms

(47) Trichloroethene (T)

11.806min (-0.016) 60.35ng

response 1117360

Ion	Exp%	Act%
129.90	100	100
131.90	95.90	96.15
0.00	0.00	0.00
0.00	0.00	0.00

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\12\06121923.D
Acq On : 12 Jun 2019 18:32 Operator: SC
Sample : P1903177-003 (1000mL)
Misc : S31-05131901
ALS Vial : 9 Sample Multiplier: 1

6/13/19

Quant Time: Jun 13 16:08:43 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	169351	12.500	ng		-0.04
37) 1,4-Difluorobenzene (IS2)	11.11	114	794745	12.500	ng		-0.02
56) Chlorobenzene-d5 (IS3)	15.46	82	415955	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.91	65	330265	13.381	ng		-0.03
Spiked Amount 12.500	Range 70 - 130		Recovery = 107.04%				
57) Toluene-d8 (SS2)	13.55	98	964721	12.434	ng		-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 99.44%				
73) Bromofluorobenzene (SS3)	17.05	174	255185	12.261	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 98.08%				
Target Compounds							Qvalue
2) Propene	3.85	42	24321m	1.120	ng		
3) Dichlorodifluoromethan...	3.96	85	58803	1.848	ng		100
4) Chloromethane	4.16	50	7373	N.D.			
5) 1,2-Dichloro-1,1,2,2-t...	4.34	135	909	N.D.			
6) Vinyl Chloride	4.44	62	2289	N.D.			
7) 1,3-Butadiene	4.63	54	853	N.D.			
8) Bromomethane	4.93	94	356	N.D.			
9) Chloroethane	0.00	64	0	N.D.			
10) Ethanol	5.34	45	97955	5.831	ng		100
11) Acetonitrile	5.55	41	14442	N.D.			
12) Acrolein	5.69	56	4988	N.D.			
13) Acetone	5.84	58	110205	7.413	ng	#	1
14) Trichlorofluoromethane	6.02	101	29257	1.095	ng		98
15) 2-Propanol (Isopropanol)	6.15	45	89413	1.637	ng		100
16) Acrylonitrile	6.36	53	439	N.D.			
17) 1,1-Dichloroethene	6.71	96	2023	N.D.			
18) 2-Methyl-2-Propanol (t...	6.82	59	6278	N.D.			
19) Methylene Chloride	6.85	84	24784	1.431	ng		100
20) 3-Chloro-1-propene (Al...	6.98	41	164	N.D.			
21) Trichlorotrifluoroethane	7.18	151	196351	15.732	ng		99
22) Carbon Disulfide	7.14	76	7032	N.D.			
23) trans-1,2-Dichloroethene	7.89	61	432	N.D.			
24) 1,1-Dichloroethane	8.08	63	348	N.D.			
25) Methyl tert-Butyl Ether	8.12	73	307	N.D.			
26) Vinyl Acetate	8.30	86	663	N.D.			
27) 2-Butanone (MEK)	8.51	72	72918	5.095	ng		93
28) cis-1,2-Dichloroethene	8.97	61	75379	2.856	ng		99
29) Diisopropyl Ether	9.22	87	218	N.D.			
30) Ethyl Acetate	9.22	61	13966	1.959	ng		97
31) n-Hexane	9.22	57	19794	0.582	ng		99
32) Chloroform	9.28	83	2740	N.D.			
34) Tetrahydrofuran (THF)	9.69	72	9394	0.737	ng		92
35) Ethyl tert-Butyl Ether	0.00	87	0	N.D.			
36) 1,2-Dichloroethane	10.02	62	6868	N.D.			
38) 1,1,1-Trichloroethane	0.00	97	0	N.D.			
39) Isopropyl Acetate	10.67	61	320	N.D.			
40) 1-Butanol	0.00	56	0	N.D.	d		
41) Benzene	10.75	78	27614	N.D.			
42) Carbon Tetrachloride	10.90	117	6514	N.D.			
43) Cyclohexane	11.03	84	8184	N.D.			
44) tert-Amyl Methyl Ether	0.00	73	0	N.D.			
45) 1,2-Dichloropropane	11.56	63	545	N.D.			
46) Bromodichloromethane	11.70	83	329	N.D.			
47) Trichloroethene	11.81	130	138521	7.844	ng		99
48) 1,4-Dioxane	11.82	88	263	N.D.			
49) 2,2,4-Trimethylpentane...	11.87	57	31254	N.D.			

Data File: I:\MS09\Data\2019 06\12\06121923.D
Acq On : 12 Jun 2019 18:32 Operator: SC
Sample : P1903177-003 (1000mL)
Misc : S31-05131901
ALS Vial : 9 Sample Multiplier: 1

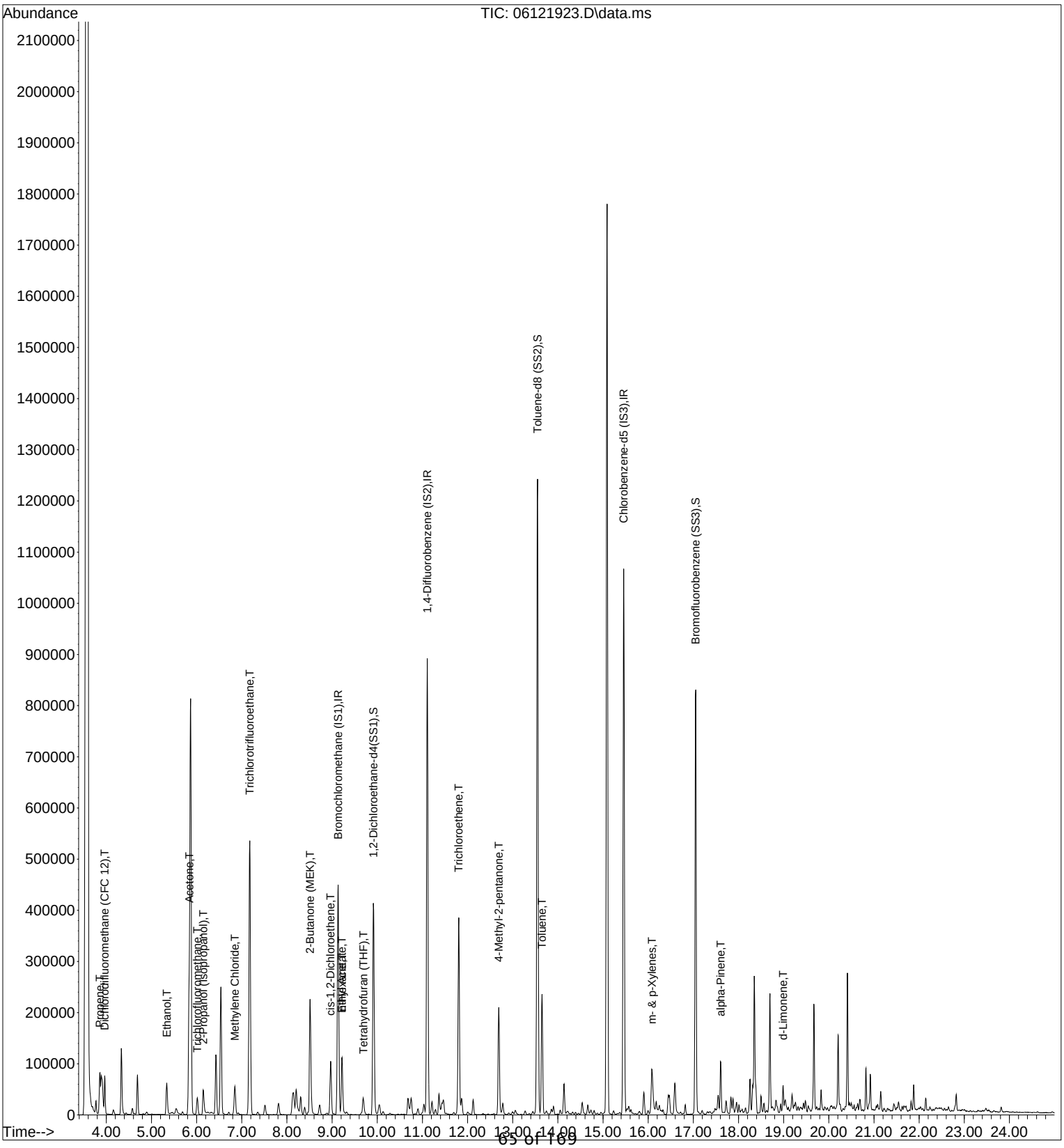
Quant Time: Jun 13 16:08:43 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
50) Methyl Methacrylate	12.00	100	639	N.D.	
51) n-Heptane	12.12	71	7182	N.D.	
52) cis-1,3-Dichloropropene	0.00	75	0	N.D.	
53) 4-Methyl-2-pentanone	12.69	58	65862	3.426 ng	95
54) trans-1,3-Dichloropropene	0.00	75	0	N.D.	
55) 1,1,2-Trichloroethane	0.00	97	0	N.D.	
58) Toluene	13.65	91	189685	2.454 ng	99
59) 2-Hexanone	13.90	43	9598	N.D.	
60) Dibromochloromethane	0.00	129	0	N.D.	
61) 1,2-Dibromoethane	0.00	107	0	N.D.	
62) n-Butyl Acetate	14.54	43	19273	N.D.	
63) n-Octane	14.67	57	4009	N.D.	
64) Tetrachloroethene	14.80	166	2463	N.D.	
65) Chlorobenzene	15.50	112	506	N.D.	
66) Ethylbenzene	15.90	91	37200	N.D.	
67) m- & p-Xylenes	16.08	91	73996	1.107 ng	98
68) Bromoform	16.17	173	339	N.D.	
69) Styrene	16.47	104	18514	N.D.	
70) o-Xylene	16.58	91	28804	N.D.	
71) n-Nonane	16.82	43	8049	N.D.	
72) 1,1,2,2-Tetrachloroethane	16.60	83	446	N.D.	
74) Cumene	17.20	105	2580	N.D.	
75) alpha-Pinene	17.61	93	44916	1.062 ng	99
76) n-Propylbenzene	17.73	91	8213	N.D.	
77) 3-Ethyltoluene	17.83	105	18769	N.D.	
78) 4-Ethyltoluene	17.88	105	7943	N.D.	
79) 1,3,5-Trimethylbenzene	17.96	105	6512	N.D.	
80) alpha-Methylstyrene	18.12	118	1207	N.D.	
81) 2-Ethyltoluene	18.15	105	7410	N.D.	
82) 1,2,4-Trimethylbenzene	18.38	105	28793	N.D.	
83) n-Decane	18.50	57	12644	N.D.	
84) Benzyl Chloride	18.53	91	121	N.D.	
85) 1,3-Dichlorobenzene	18.61	146	649	N.D.	
86) 1,4-Dichlorobenzene	18.61	146	649	N.D.	
87) sec-Butylbenzene	18.67	105	1722	N.D.	
88) 4-Isopropyltoluene (p-...	18.83	119	5410	N.D.	
89) 1,2,3-Trimethylbenzene	18.83	105	7895	N.D.	
90) 1,2-Dichlorobenzene	0.00	146	0	N.D.	
91) d-Limonene	18.99	68	14432m	0.494 ng	
92) 1,2-Dibromo-3-Chloropr...	0.00	157	0	N.D.	
93) n-Undecane	19.83	57	13949	N.D.	
94) 1,2,4-Trichlorobenzene	0.00	180	0	N.D.	
95) Naphthalene	20.89	128	8097	N.D.	
96) n-Dodecane	0.00	57	0	N.D. d	
97) Hexachlorobutadiene	0.00	225	0	N.D.	
98) Cyclohexanone	16.24	55	9414	N.D.	
99) tert-Butylbenzene	18.35	119	6804	N.D.	
100) n-Butylbenzene	19.27	91	5885	N.D.	

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Data File: I:\MS09\Data\2019 06\12\06121923.D
Acq On : 12 Jun 2019 18:32 Operator: SC
Sample : P1903177-003 (1000mL)
Misc : S31-05131901
ALS Vial : 9 Sample Multiplier: 1

Quant Time: Jun 13 16:08:43 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\12\06121923.D
Acq On : 12 Jun 2019 18:32 Operator: SC
Sample : P1903177-003 (1000mL)
Misc : S31-05131901
ALS Vial : 9 Sample Multiplier: 1

6/13/19

Quant Time: Jun 13 16:08:43 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	169351	12.500	ng		-0.04
37) 1,4-Difluorobenzene (IS2)	11.11	114	794745	12.500	ng		-0.02
56) Chlorobenzene-d5 (IS3)	15.46	82	415955	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.91	65	330265	13.381	ng		-0.03
Spiked Amount 12.500	Range 70 - 130		Recovery = 107.04%				
57) Toluene-d8 (SS2)	13.55	98	964721	12.434	ng		-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 99.44%				
73) Bromofluorobenzene (SS3)	17.05	174	255185	12.261	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 98.08%				
Target Compounds							Qvalue
2) Propene	3.85	42	24321m	1.120	ng		
3) Dichlorodifluoromethan...	3.96	85	58803	1.848	ng		100
10) Ethanol	5.34	45	97955	5.831	ng		100
13) Acetone	5.84	58	110205	7.413	ng	#	1
14) Trichlorofluoromethane	6.02	101	29257	1.095	ng		98
15) 2-Propanol (Isopropanol)	6.15	45	89413	1.637	ng		100
19) Methylene Chloride	6.85	84	24784	1.431	ng		100
21) Trichlorotrifluoroethane	7.18	151	196351	15.732	ng		99
27) 2-Butanone (MEK)	8.51	72	72918	5.095	ng		93
28) cis-1,2-Dichloroethene	8.97	61	75379	2.856	ng		99
30) Ethyl Acetate	9.22	61	13966	1.959	ng		97
31) n-Hexane	9.22	57	19794	0.582	ng		99
34) Tetrahydrofuran (THF)	9.69	72	9394	0.737	ng		92
47) Trichloroethene	11.81	130	138521	7.844	ng		99
53) 4-Methyl-2-pentanone	12.69	58	65862	3.426	ng		95
58) Toluene	13.65	91	189685	2.454	ng		99
67) m- & p-Xylenes	16.08	91	73996	1.107	ng		98
75) alpha-Pinene	17.61	93	44916	1.062	ng		99
91) d-Limonene	18.99	68	14432m	0.494	ng		

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Data File: I:\MS09\Data\2019 06\12\06121923.D
Acq On : 12 Jun 2019 18:32 Operator: SC
Sample : P1903177-003 (1000mL)
Misc : S31-05131901
ALS Vial : 9 Sample Multiplier: 1

Quant Time: Jun 13 16:08:43 2019
Quant Method : I:\MS09\Methods\R9060719.M
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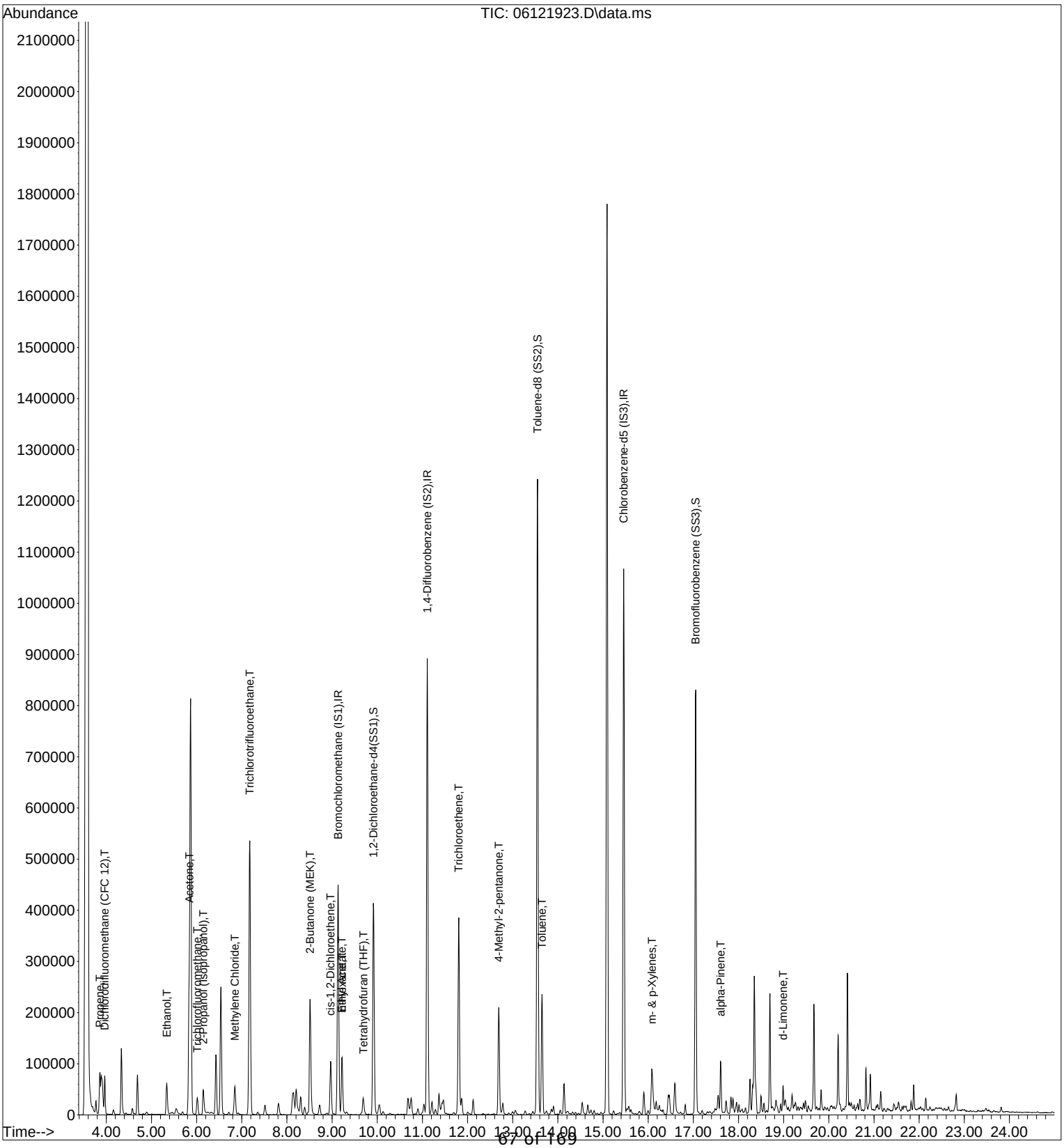
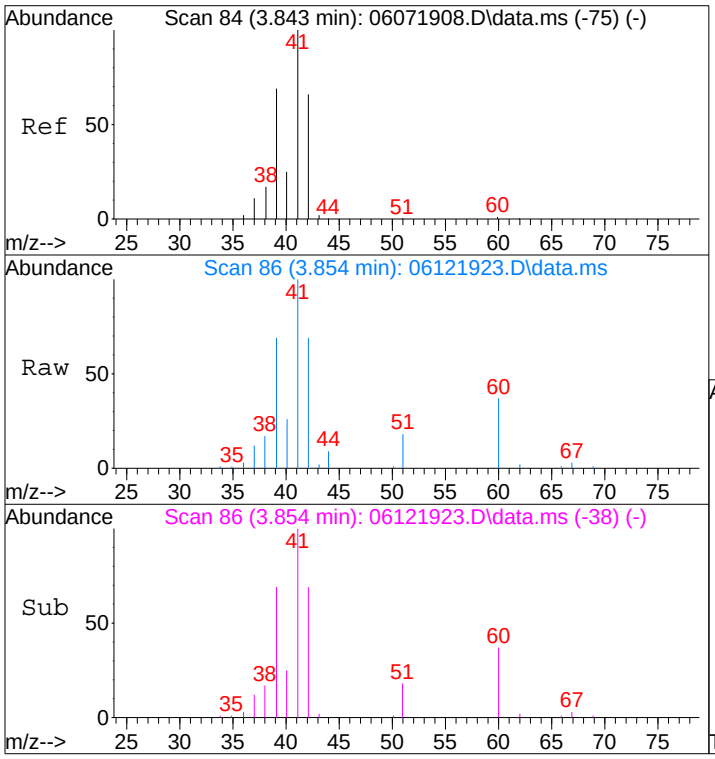
DataAcq Meth:TO15.M

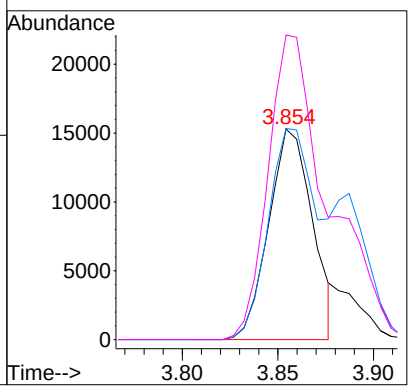


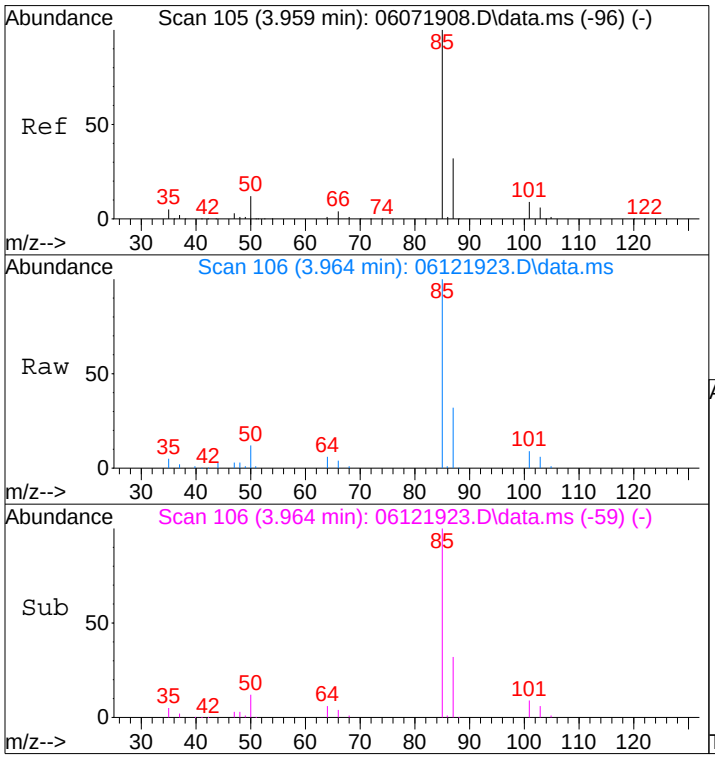


#2
Propene
Concen: 1.12 ng m
RT: 3.85 min Scan# 86
Delta R.T. 0.011 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 42 Resp: 24321

Ion	Ratio	Lower	Upper
42	100		
39	164.8	84.8	124.8#
41	200.2	130.3	170.3#

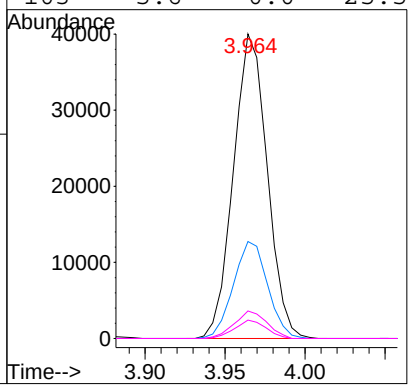


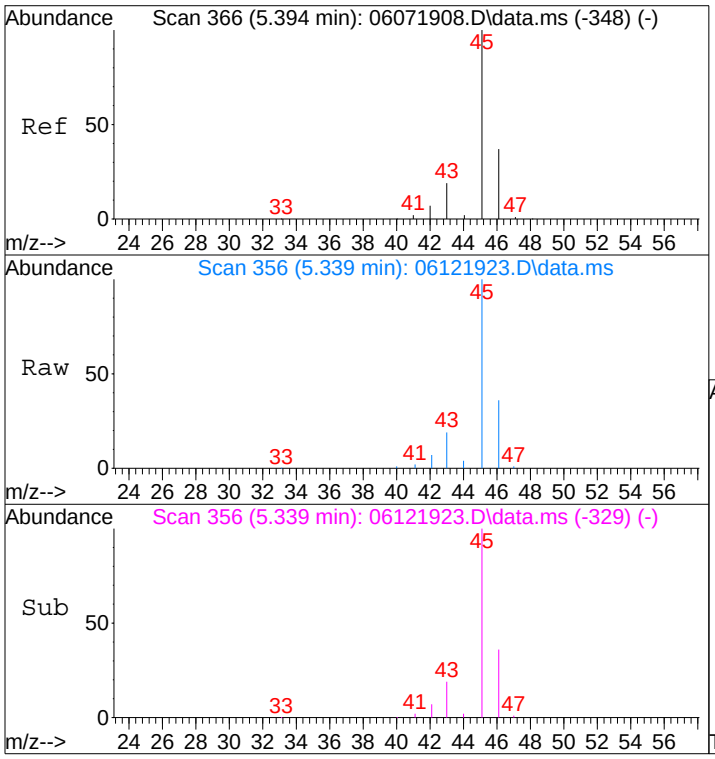


#3
Dichlorodifluoromethane (CFC 12)
Concen: 1.85 ng
RT: 3.96 min Scan# 106
Delta R.T. 0.006 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 85 Resp: 58803

Ion	Ratio	Lower	Upper
85	100		
87	32.3	12.3	52.3
101	8.7	0.0	28.6
103	5.6	0.0	25.5

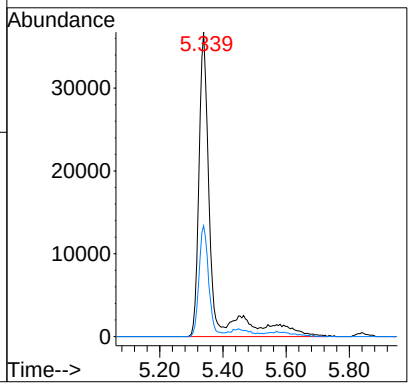


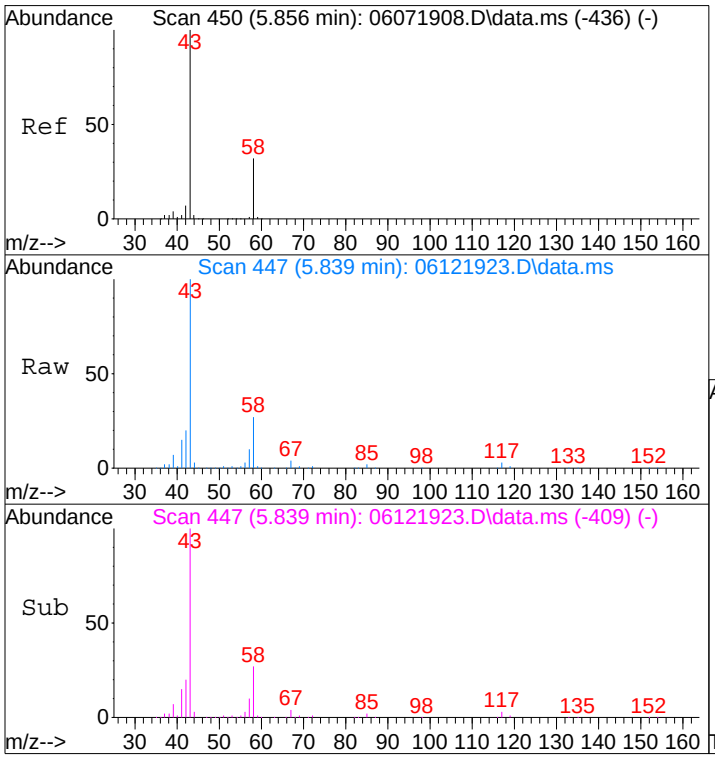


#10
Ethanol
Concen: 5.83 ng
RT: 5.34 min Scan# 356
Delta R.T. -0.099 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 45 Resp: 97955

Ion	Ratio	Lower	Upper
45	100		
46	37.0	17.1	57.1

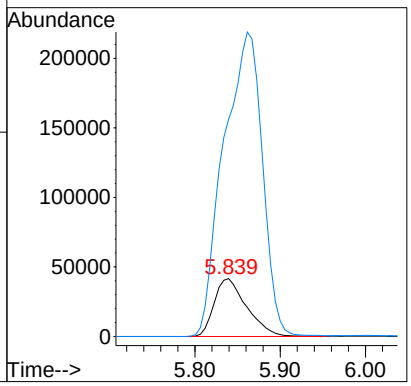


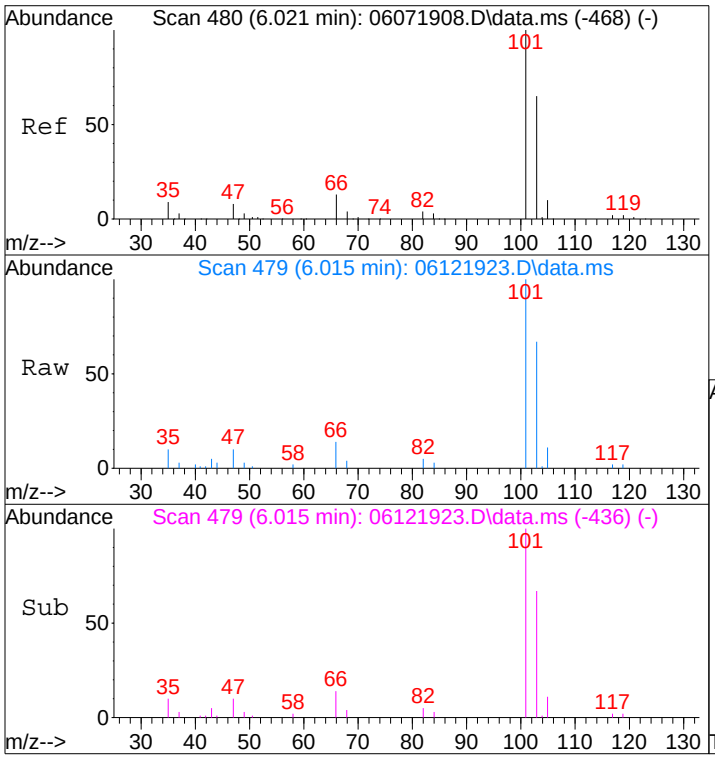


#13
Acetone
Concen: 7.41 ng
RT: 5.84 min Scan# 447
Delta R.T. -0.039 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 58 Resp: 110205

Ion	Ratio	Lower	Upper
58	100		
43	626.4	287.7	347.7#

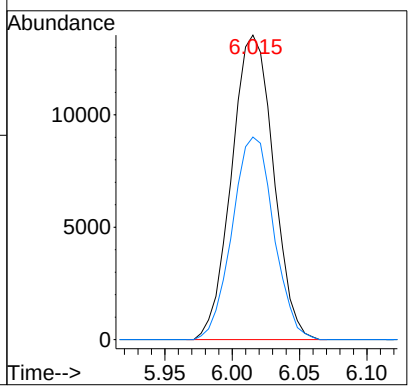


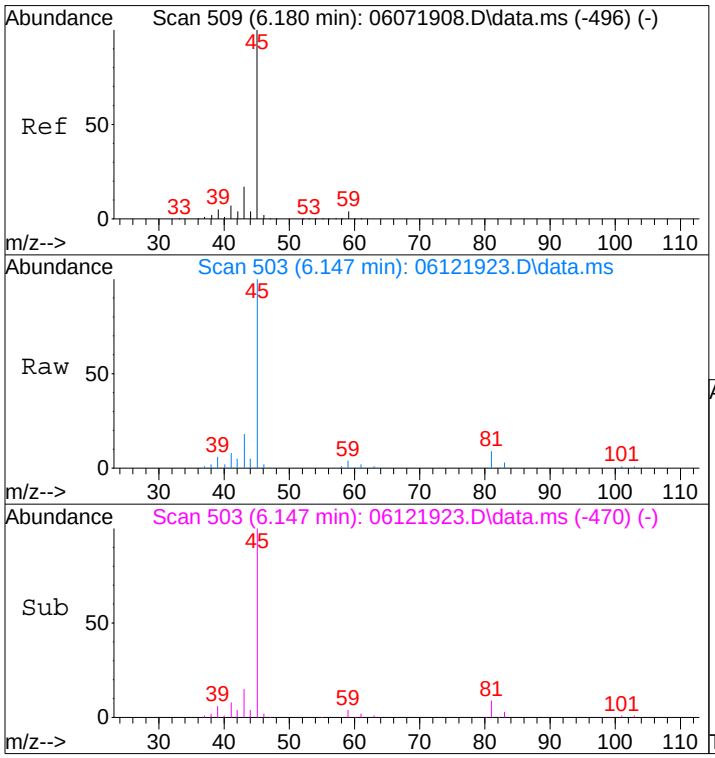


#14
Trichlorofluoromethane
Concen: 1.09 ng
RT: 6.02 min Scan# 479
Delta R.T. -0.016 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion:101 Resp: 29257

Ion	Ratio	Lower	Upper
101	100		
103	66.1	44.7	84.7

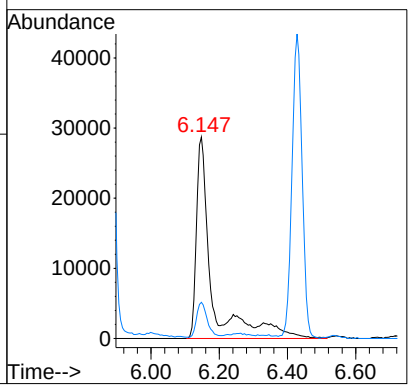


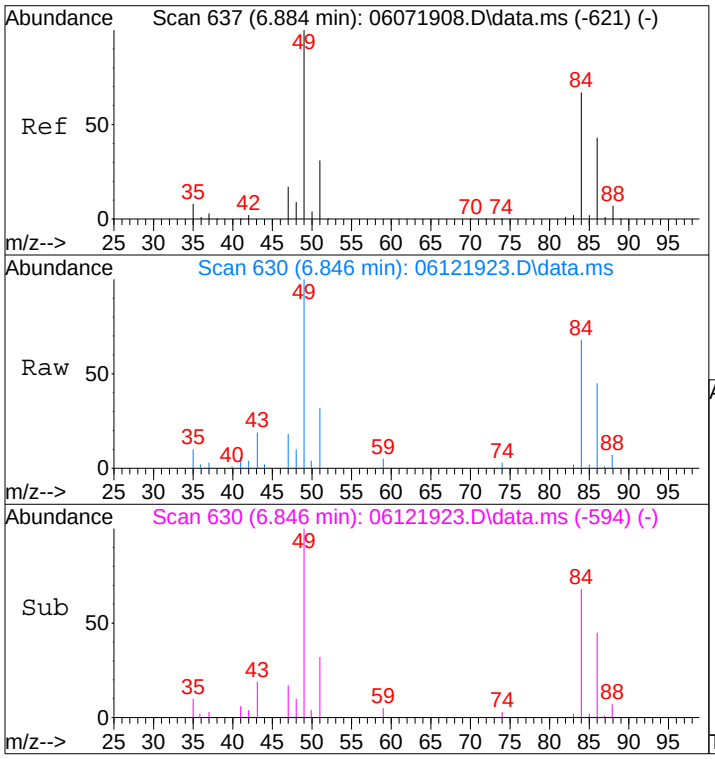


#15
2-Propanol (Isopropanol)
Concen: 1.64 ng
RT: 6.15 min Scan# 503
Delta R.T. -0.071 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 45 Resp: 89413

Ion	Ratio	Lower	Upper
45	100		
43	17.5	0.0	37.3

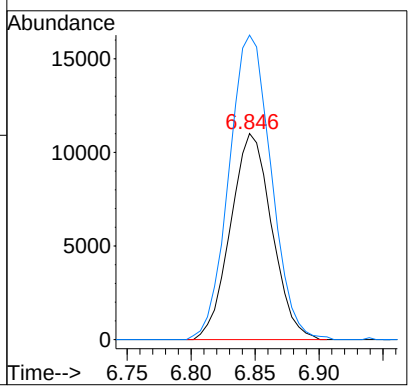


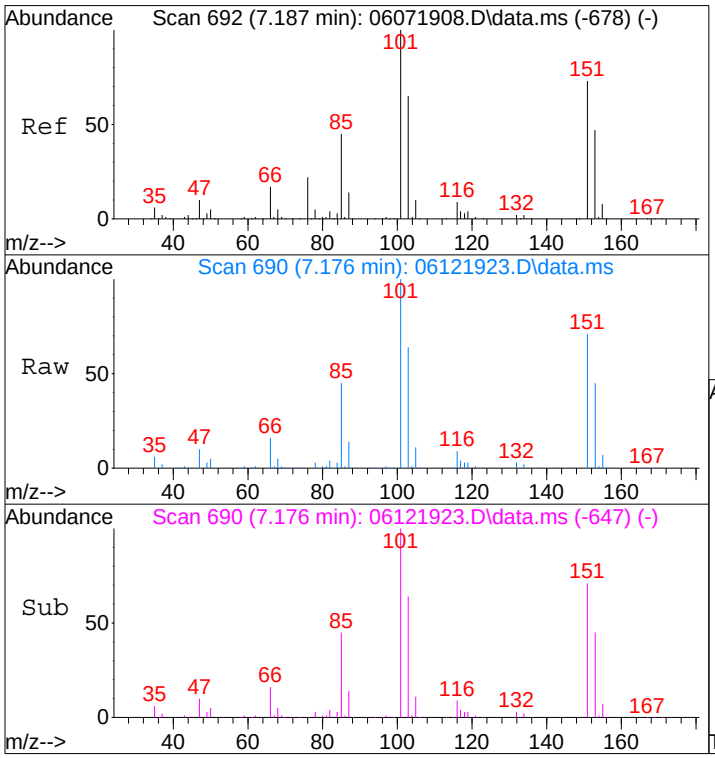


#19
Methylene Chloride
Concen: 1.43 ng
RT: 6.85 min Scan# 630
Delta R.T. -0.055 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 84 Resp: 24784

Ion	Ratio	Lower	Upper
84	100		
49	151.0	125.7	175.7

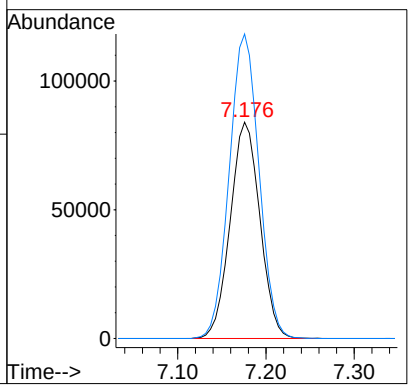


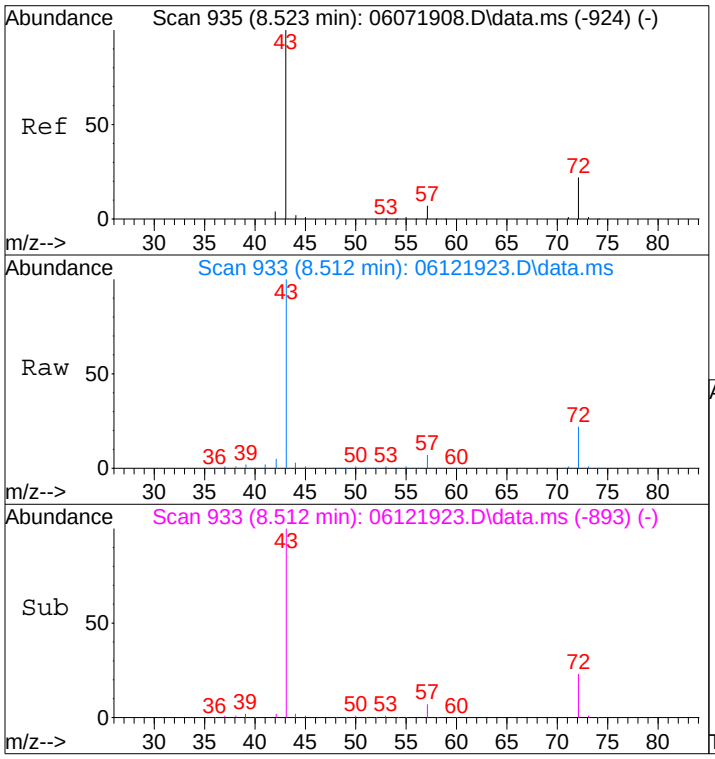


#21
Trichlorotrifluoroethane
Concen: 15.73 ng
RT: 7.18 min Scan# 690
Delta R.T. -0.016 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion:151 Resp: 196351

Ion	Ratio	Lower	Upper
151	100		
101	141.0	119.9	159.9

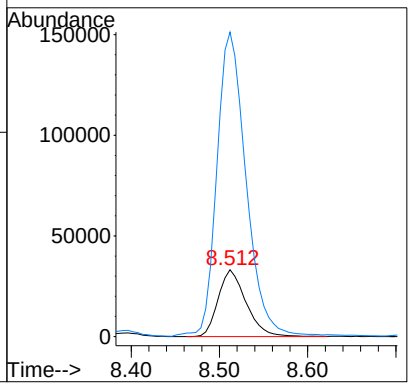


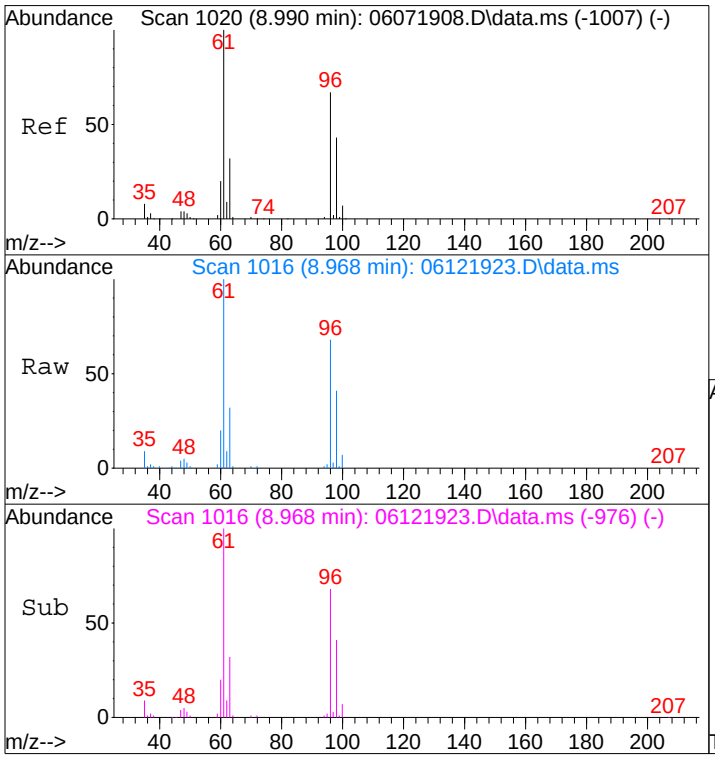


#27
2-Butanone (MEK)
Concen: 5.09 ng
RT: 8.51 min Scan# 933
Delta R.T. -0.033 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 72 Resp: 72918

Ion	Ratio	Lower	Upper
72	100		
43	475.4	436.0	476.0

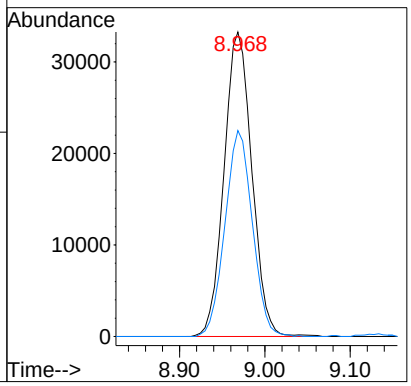


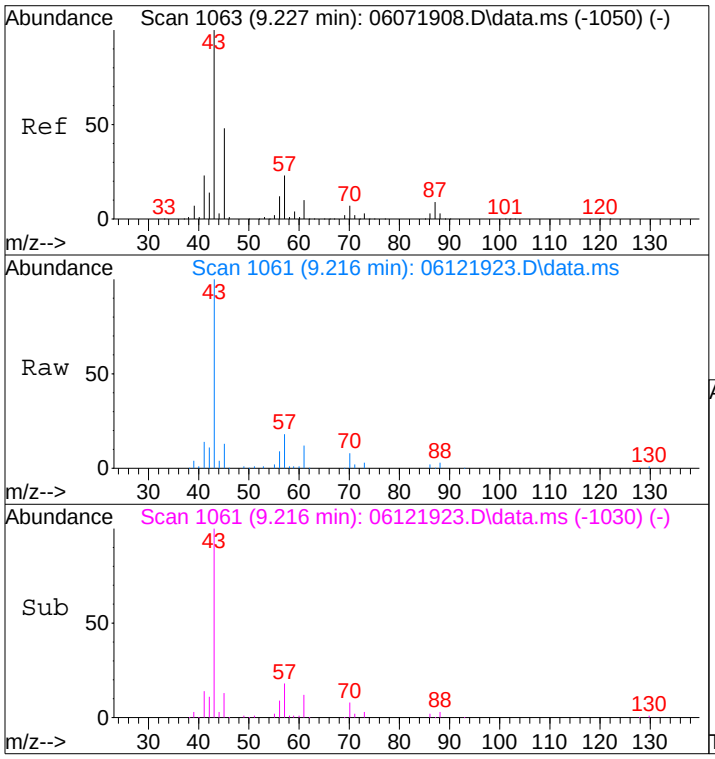


#28
cis-1,2-Dichloroethene
Concen: 2.86 ng
RT: 8.97 min Scan# 1016
Delta R.T. -0.033 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 61 Resp: 75379

Ion	Ratio	Lower	Upper
61	100		
96	66.6	47.8	87.8

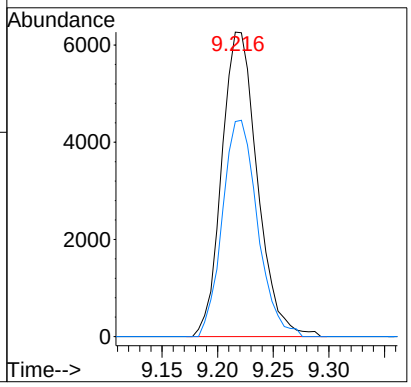


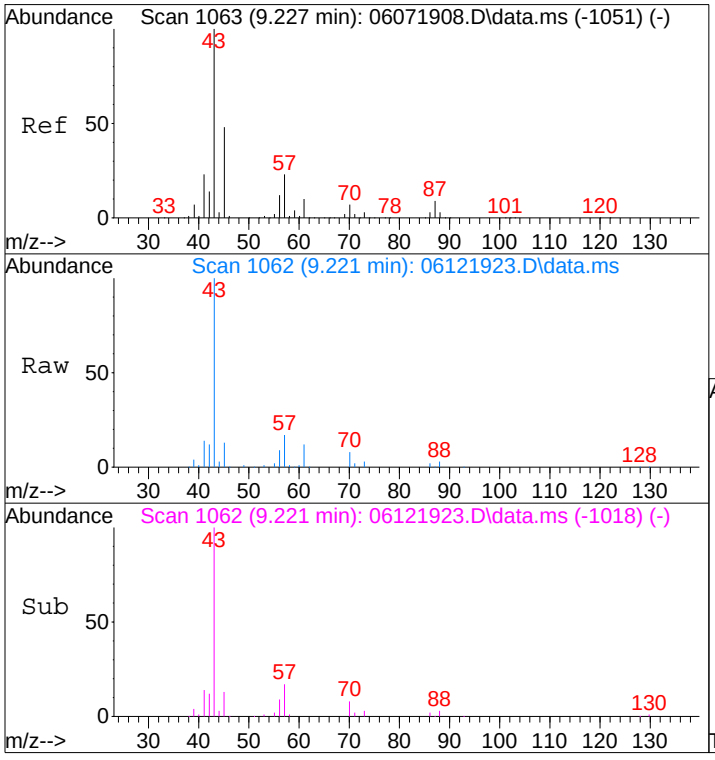


#30
Ethyl Acetate
Concen: 1.96 ng
RT: 9.22 min Scan# 1061
Delta R.T. -0.027 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 61 Resp: 13966

Ion	Ratio	Lower	Upper
61	100		
70	70.0	52.1	92.1

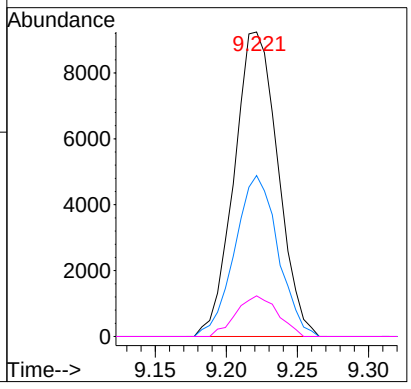


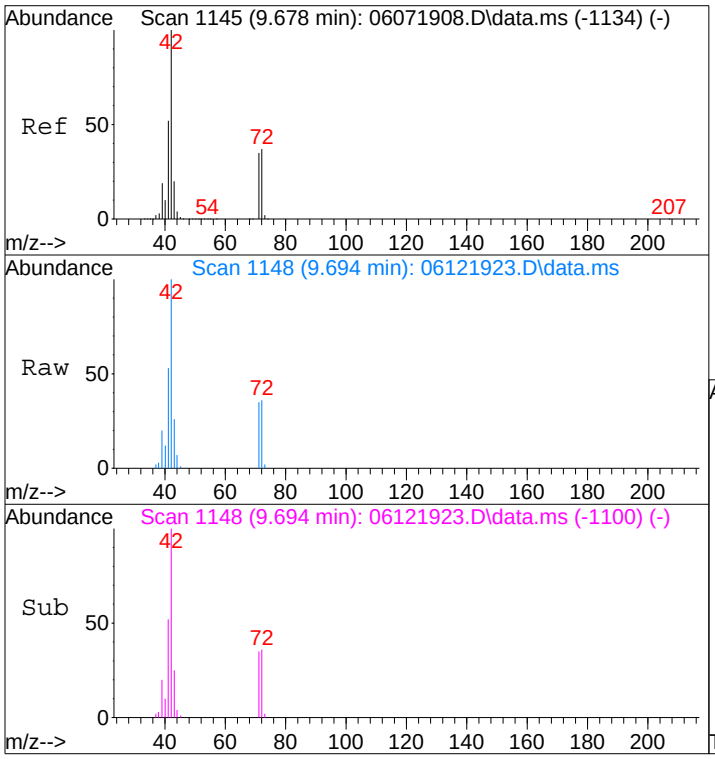


#31
n-Hexane
Concen: 0.58 ng
RT: 9.22 min Scan# 1062
Delta R.T. -0.011 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 57 Resp: 19794

Ion	Ratio	Lower	Upper
57	100		
56	52.1	40.8	61.2
86	12.7	10.3	15.5

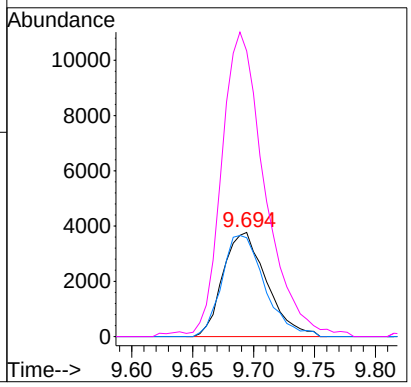


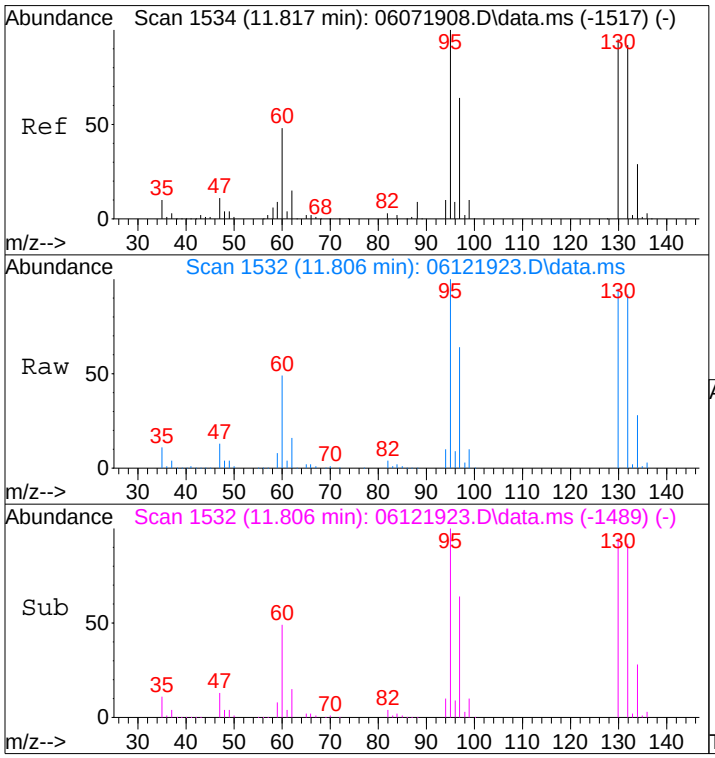


#34
Tetrahydrofuran (THF)
Concen: 0.74 ng
RT: 9.69 min Scan# 1148
Delta R.T. 0.011 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 72 Resp: 9394

Ion	Ratio	Lower	Upper
72	100		
71	95.3	76.8	116.8
42	292.3	253.3	293.3

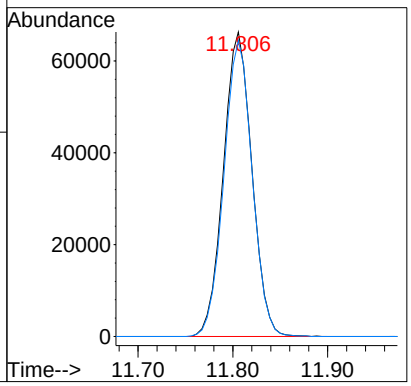


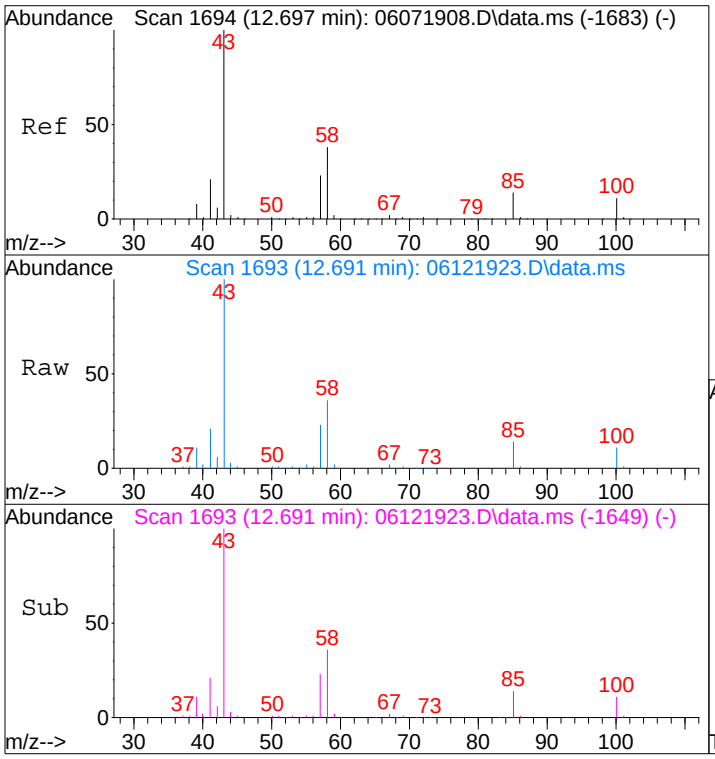


#47
Trichloroethene
Concen: 7.84 ng
RT: 11.81 min Scan# 1532
Delta R.T. -0.016 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion:130 Resp: 138521

Ion	Ratio	Lower	Upper
130	100		
132	96.6	75.9	115.9

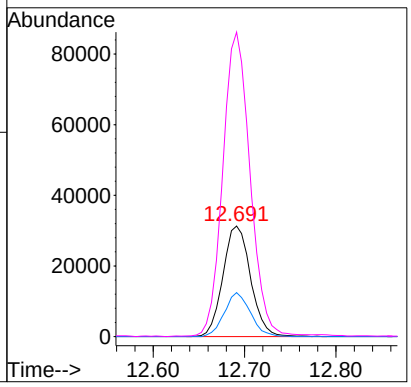


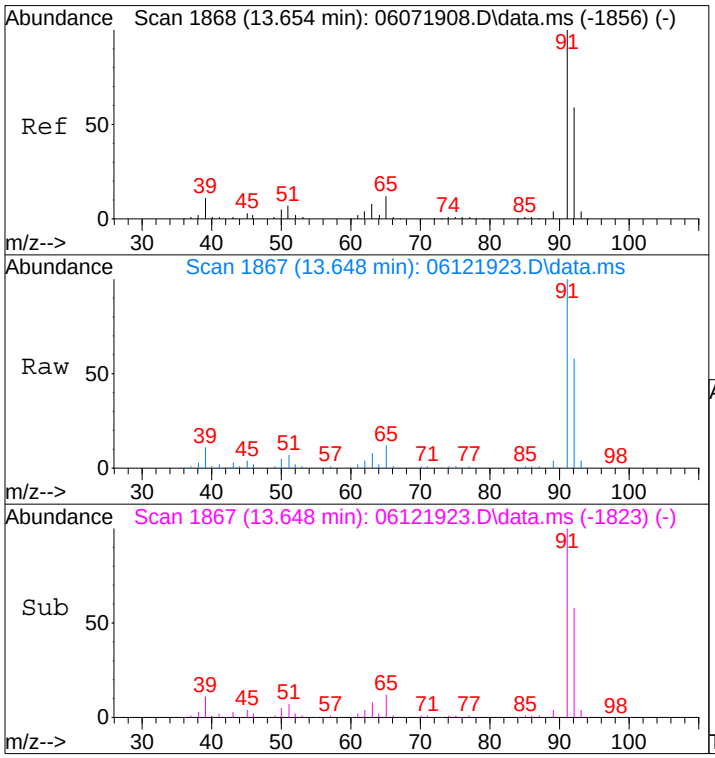


#53
4-Methyl-2-pentanone
Concen: 3.43 ng
RT: 12.69 min Scan# 1693
Delta R.T. -0.011 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 58 Resp: 65862

Ion	Ratio	Lower	Upper
58	100		
85	37.4	31.5	47.3
43	273.7	211.1	316.7

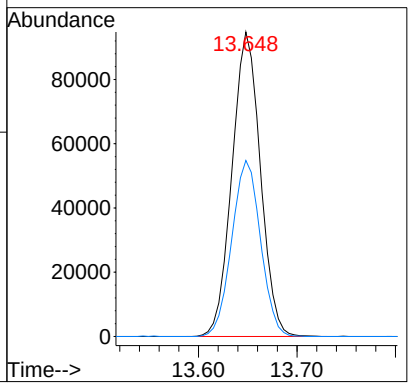


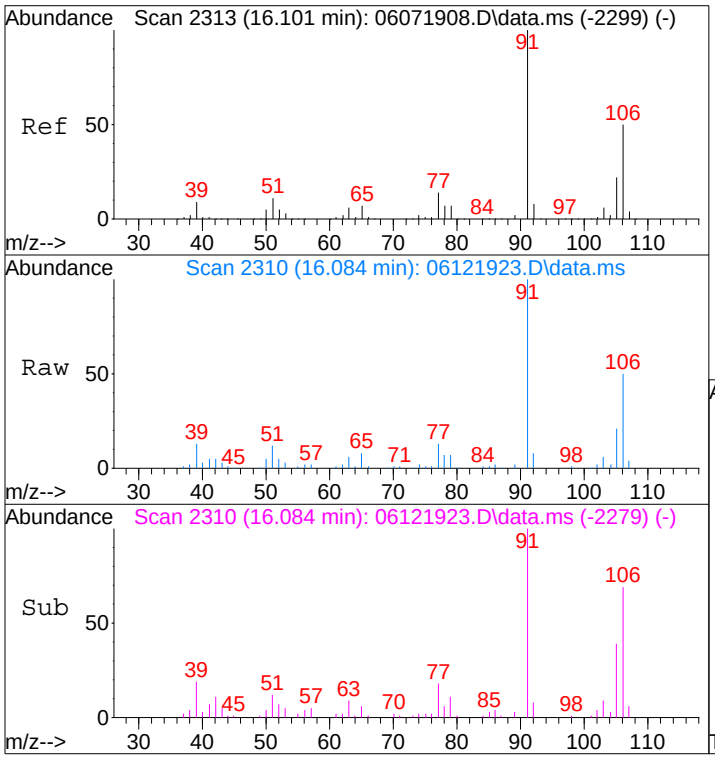


#58
Toluene
Concen: 2.45 ng
RT: 13.65 min Scan# 1867
Delta R.T. -0.011 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 91 Resp: 189685

Ion	Ratio	Lower	Upper
91	100		
92	58.6	39.0	79.0

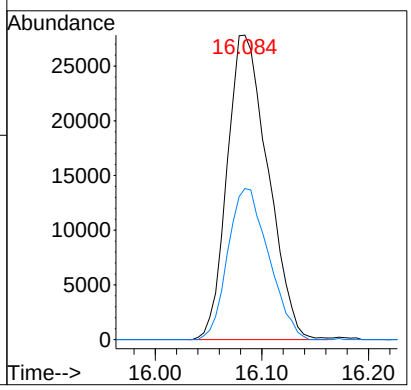


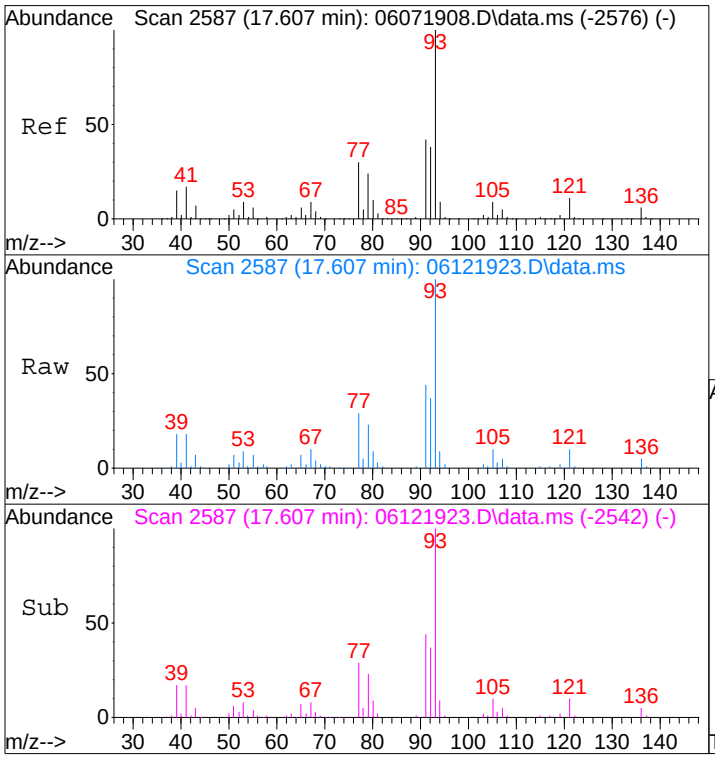


#67
m- & p-Xylenes
Concen: 1.11 ng
RT: 16.08 min Scan# 2310
Delta R.T. -0.027 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 91 Resp: 73996

Ion	Ratio	Lower	Upper
91	100		
106	49.6	28.1	68.1

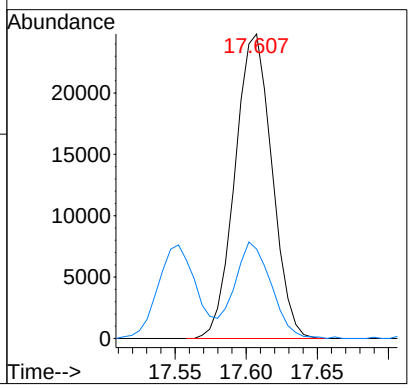


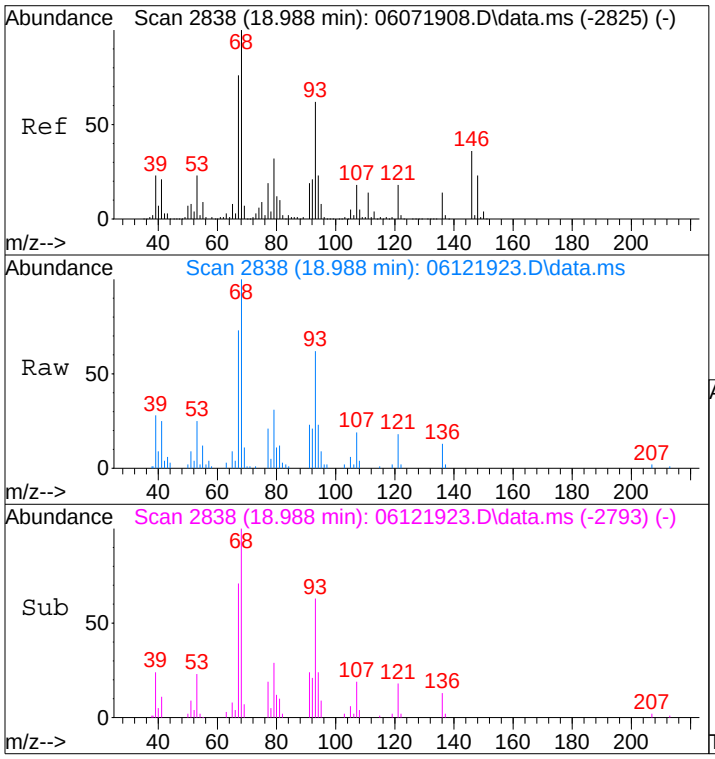


#75
alpha-Pinene
Concen: 1.06 ng
RT: 17.61 min Scan# 2587
Delta R.T. -0.005 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

Tgt Ion: 93 Resp: 44916

Ion	Ratio	Lower	Upper
93	100		
77	31.1	10.4	50.4

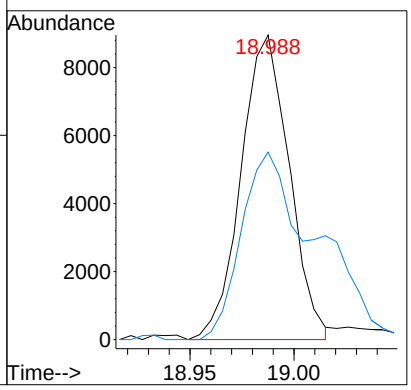




#91
d-Limonene
Concen: 0.49 ng m
RT: 18.99 min Scan# 2838
Delta R.T. -0.005 min
Lab File: 06121923.D
Acq: 12 Jun 2019 18:32

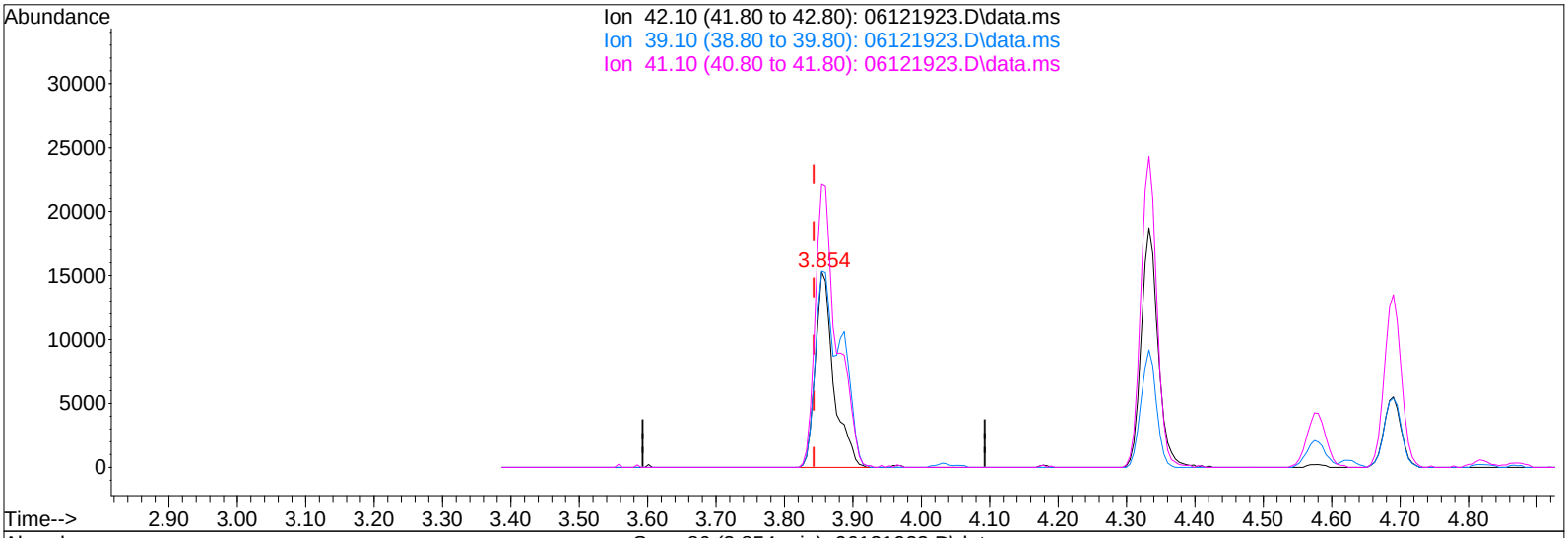
Tgt Ion: 68 Resp: 14432

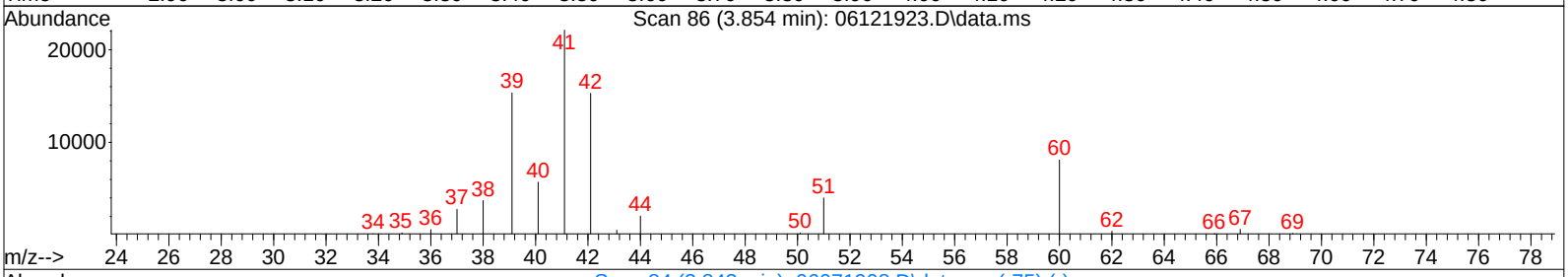
Ion	Ratio	Lower	Upper
68	100		
93	98.2	43.1	83.1#

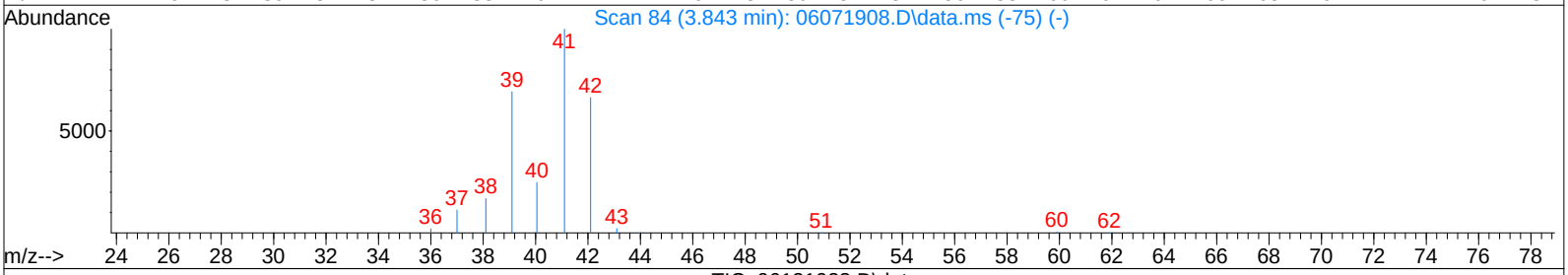


Data File: I:\MS09\Data\2019 06\12\06121923.D
Acq On : 12 Jun 2019 18:32 Operator: SC
Sample : P1903177-003 (1000mL)
Misc : S31-05131901
ALS Vial : 9 Sample Multiplier: 1

Quant Time: Jun 13 08:51:46 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M







TIC: 06121923.D\data.ms

(2) Propene (T)

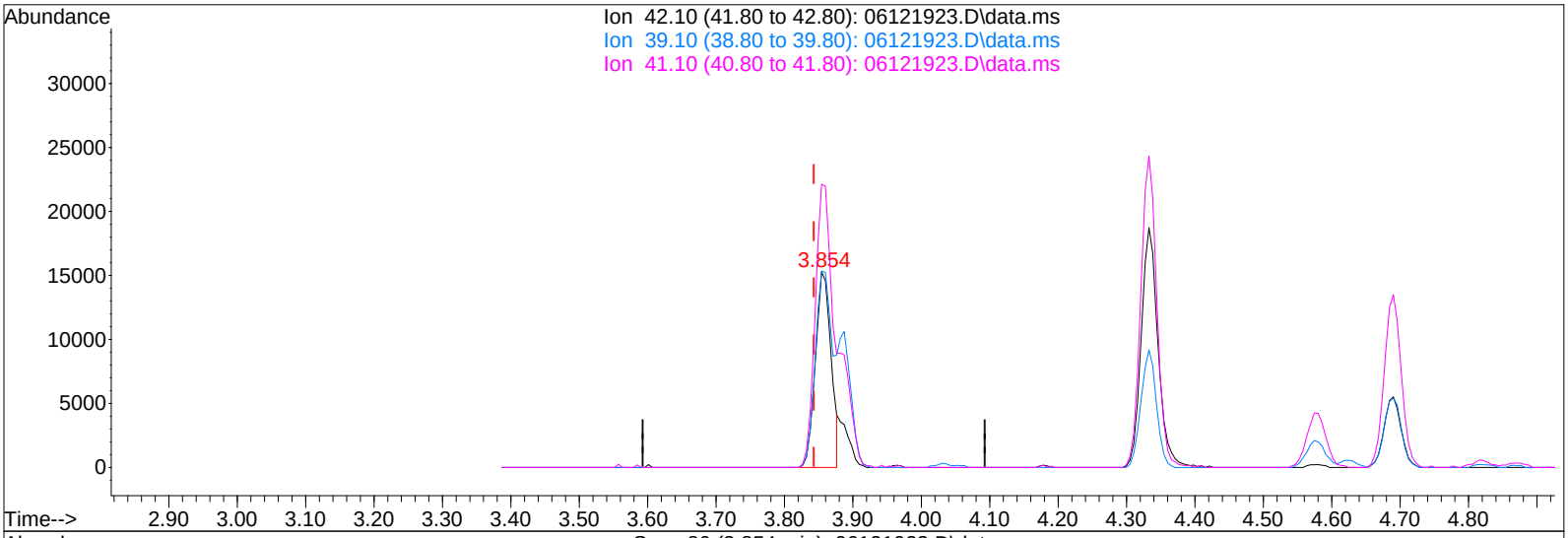
3.854min (+0.011) 1.30ng

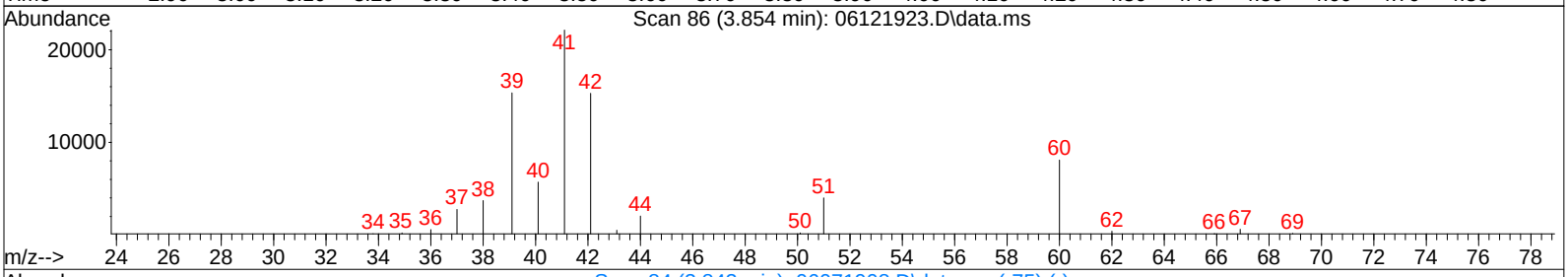
response 28265

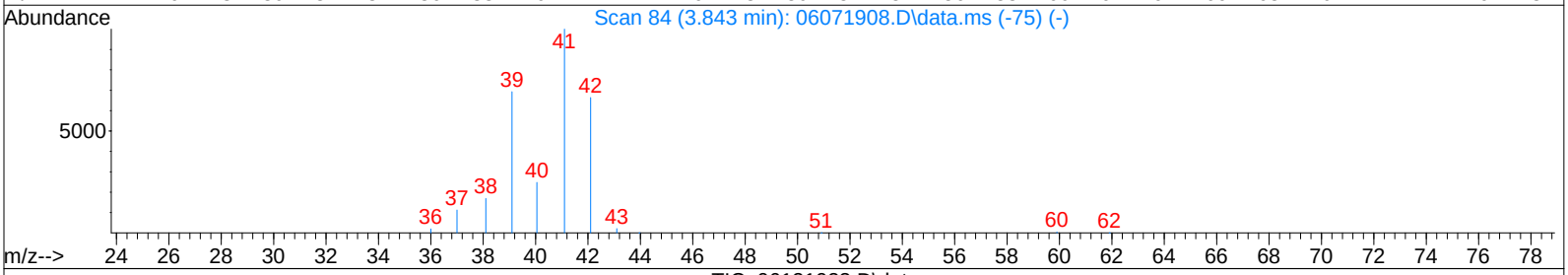
Ion	Exp%	Act%
42.10	100	100
39.10	104.80	141.84#
41.10	150.30	172.24#
0.00	0.00	0.00

Data File: I:\MS09\Data\2019 06\12\06121923.D
Acq On : 12 Jun 2019 18:32 Operator: SC
Sample : P1903177-003 (1000mL)
Misc : S31-05131901
ALS Vial : 9 Sample Multiplier: 1

Quant Time: Jun 13 08:51:46 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M







TIC: 06121923.D\data.ms

(2) Propene (T)

3.854min (+0.011) 1.12ng m

response 24321

Ion	Exp%	Act%
42.10	100	100
39.10	104.80	164.84#
41.10	150.30	200.18#
0.00	0.00	0.00

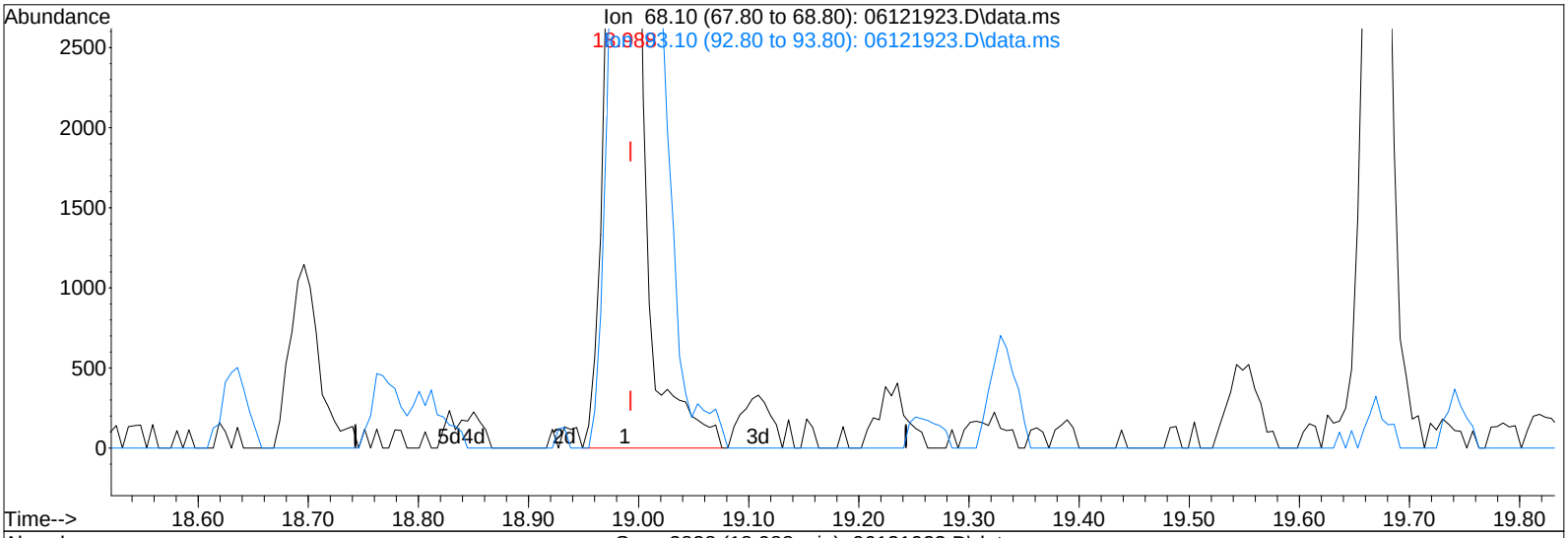
IPC

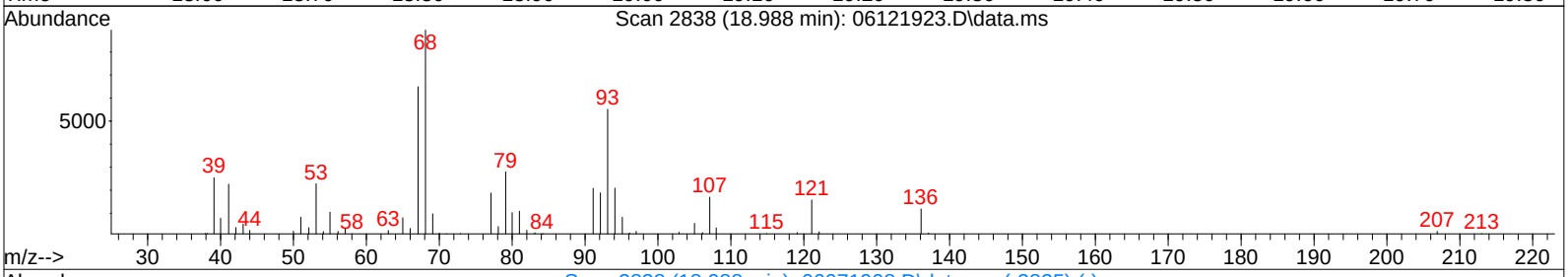
6/13/19

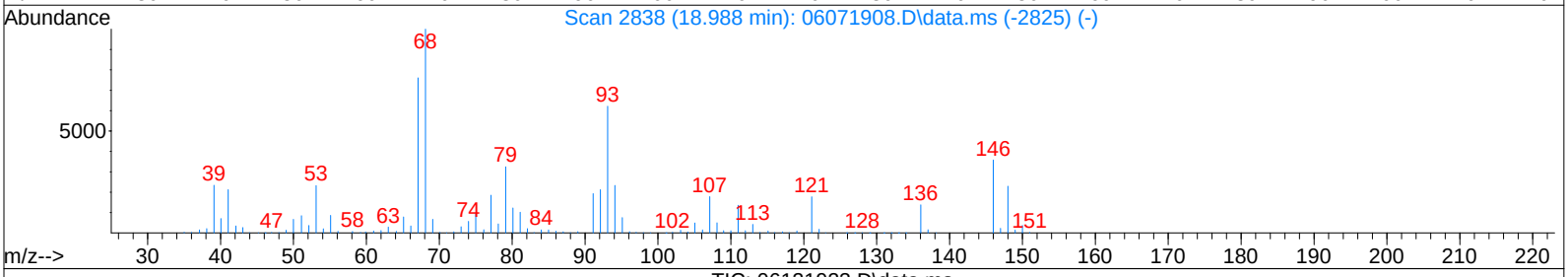
6/14/19

Data File: I:\MS09\Data\2019 06\12\06121923.D
Acq On : 12 Jun 2019 18:32 Operator: SC
Sample : P1903177-003 (1000mL)
Misc : S31-05131901
ALS Vial : 9 Sample Multiplier: 1

Quant Time: Jun 13 08:51:46 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M







TIC: 06121923.D\data.ms

(91) d-Limonene (T)

18.988min (-0.005) 0.52ng

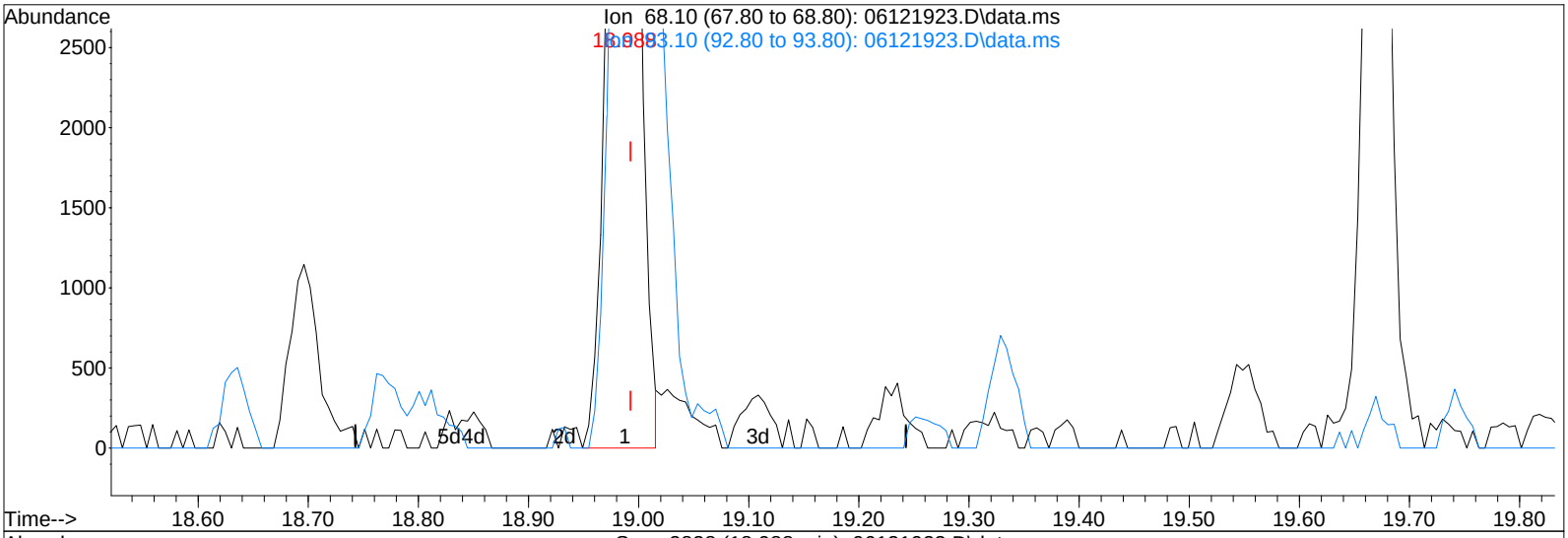
response 15223

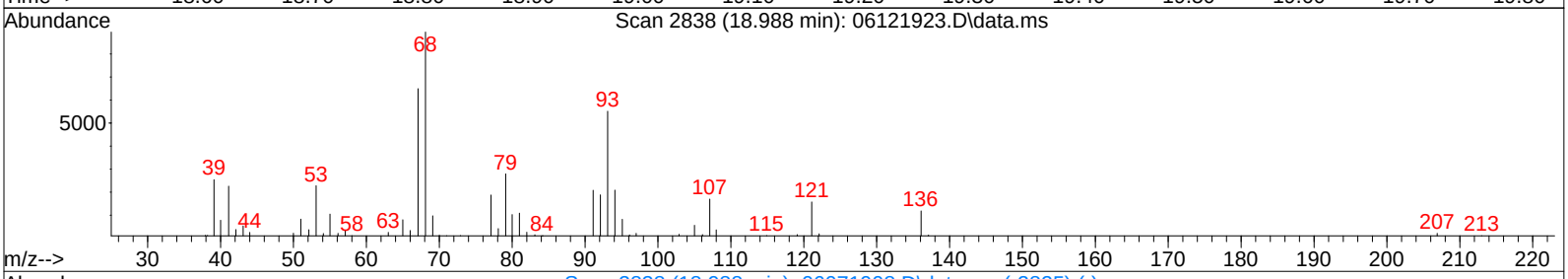
Ion	Exp%	Act%
68.10	100	100
93.10	63.10	93.12#
0.00	0.00	0.00
0.00	0.00	0.00

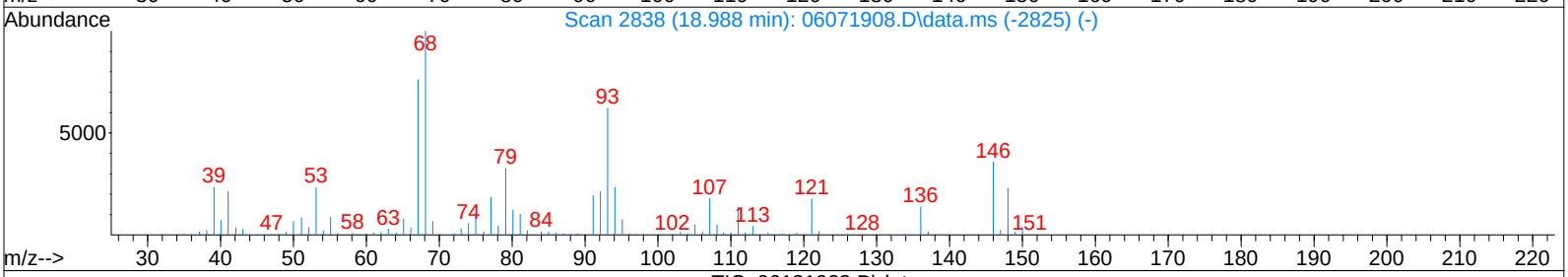
00942884

Data File: I:\MS09\Data\2019 06\12\06121923.D
Acq On : 12 Jun 2019 18:32 Operator: SC
Sample : P1903177-003 (1000mL)
Misc : S31-05131901
ALS Vial : 9 Sample Multiplier: 1

Quant Time: Jun 13 08:51:46 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M







TIC: 06121923.D\data.ms

(91) d-Limonene (T)

18.988min (-0.005) 0.49ng m

response 14432

Ion	Exp%	Act%
68.10	100	100
93.10	63.10	98.23#
0.00	0.00	0.00
0.00	0.00	0.00

IPC

6/13/19

6/14/19

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\12\06121925.D
Acq On : 12 Jun 2019 19:39 Operator: SC
Sample : P1903177-004 (1000mL)
Misc : S31-05131901
ALS Vial : 10 Sample Multiplier: 1

6/13/19

Quant Time: Jun 13 16:12:52 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.14	130	168656	12.500	ng		-0.03
37) 1,4-Difluorobenzene (IS2)	11.11	114	781505	12.500	ng		-0.02
56) Chlorobenzene-d5 (IS3)	15.46	82	422001	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.92	65	327369	13.319	ng		-0.03
Spiked Amount 12.500	Range 70 - 130		Recovery = 106.56%				
57) Toluene-d8 (SS2)	13.55	98	958750	12.180	ng		-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 97.44%				
73) Bromofluorobenzene (SS3)	17.05	174	259264	12.278	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 98.24%				
Target Compounds							Qvalue
2) Propene	3.84	42	68425m	3.164	ng		
3) Dichlorodifluoromethan...	3.95	85	356386	11.247	ng		99
4) Chloromethane	4.15	50	8433	N.D.			
5) 1,2-Dichloro-1,1,2,2-t...	4.32	135	1085	N.D.			
6) Vinyl Chloride	4.43	62	264	N.D.			
7) 1,3-Butadiene	4.61	54	535	N.D.			
8) Bromomethane	4.92	94	439	N.D.			
9) Chloroethane	5.13	64	236	N.D.			
10) Ethanol	5.35	45	510767	30.529	ng		100
11) Acetonitrile	5.55	41	30005	0.734	ng		97
12) Acrolein	5.69	56	21250	1.610	ng		99
13) Acetone	5.82	58	392290	26.495	ng		95
14) Trichlorofluoromethane	6.02	101	286459	10.761	ng		99
15) 2-Propanol (Isopropanol)	6.15	45	319842	5.879	ng		98
16) Acrylonitrile	0.00	53	0	N.D.	d		
17) 1,1-Dichloroethene	0.00	96	0	N.D.			
18) 2-Methyl-2-Propanol (t...	0.00	59	0	N.D.	d		
19) Methylene Chloride	6.86	84	7036	N.D.			
20) 3-Chloro-1-propene (Al...	6.92	41	11917	N.D.			
21) Trichlorotrifluoroethane	7.18	151	6746	0.543	ng		99
22) Carbon Disulfide	7.14	76	171134	2.563	ng		98
23) trans-1,2-Dichloroethene	7.88	61	611	N.D.			
24) 1,1-Dichloroethane	8.10	63	469	N.D.			
25) Methyl tert-Butyl Ether	8.13	73	441	N.D.			
26) Vinyl Acetate	0.00	86	0	N.D.	d		
27) 2-Butanone (MEK)	8.51	72	146629	10.287	ng	#	91
28) cis-1,2-Dichloroethene	8.97	61	3709	N.D.			
29) Diisopropyl Ether	0.00	87	0	N.D.	d		
30) Ethyl Acetate	9.21	61	388239	54.680	ng		97
31) n-Hexane	9.22	57	244440	7.221	ng		99
32) Chloroform	9.29	83	17161	0.598	ng		100
34) Tetrahydrofuran (THF)	9.67	72	215553	16.982	ng		97
35) Ethyl tert-Butyl Ether	0.00	87	0	N.D.			
36) 1,2-Dichloroethane	10.04	62	29204	1.242	ng		100
38) 1,1,1-Trichloroethane	0.00	97	0	N.D.			
39) Isopropyl Acetate	10.67	61	652	N.D.			
40) 1-Butanol	0.00	56	0	N.D.	d		
41) Benzene	10.76	78	113337	1.414	ng		99
42) Carbon Tetrachloride	10.90	117	7626	N.D.			
43) Cyclohexane	11.04	84	44280	1.562	ng		99
44) tert-Amyl Methyl Ether	0.00	73	0	N.D.			
45) 1,2-Dichloropropane	11.57	63	2328	N.D.			
46) Bromodichloromethane	11.78	83	4734	N.D.			
47) Trichloroethene	11.81	130	3324	N.D.			
48) 1,4-Dioxane	11.82	88	321	N.D.			
49) 2,2,4-Trimethylpentane...	0.00	57	0	N.D.	d		

Data File: I:\MS09\Data\2019 06\12\06121925.D
Acq On : 12 Jun 2019 19:39 Operator: SC
Sample : P1903177-004 (1000mL)
Misc : S31-05131901
ALS Vial : 10 Sample Multiplier: 1

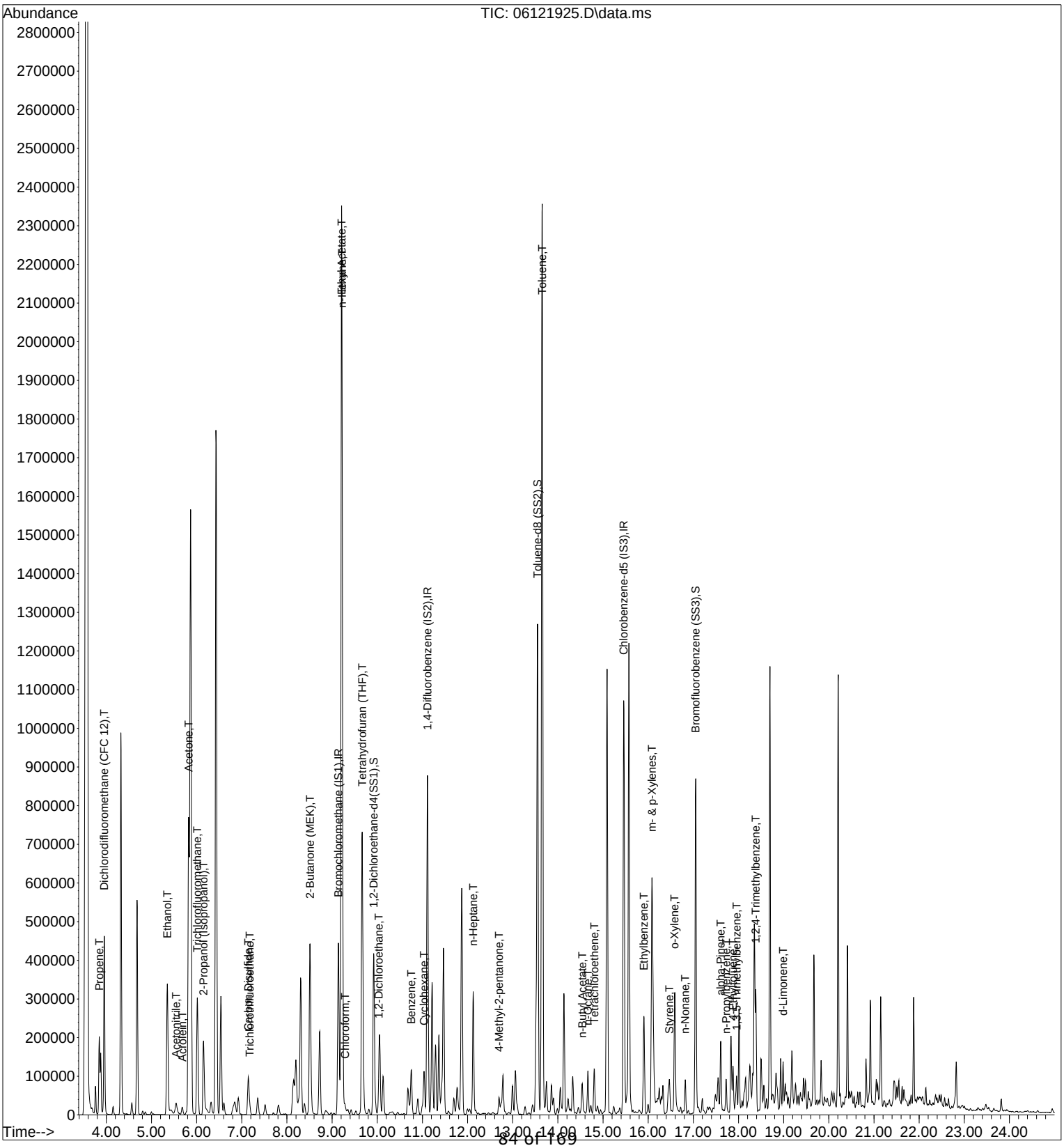
Quant Time: Jun 13 16:12:52 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc Units		Dev(Min)
50) Methyl Methacrylate	12.00	100	1476	N.D.		
51) n-Heptane	12.12	71	76778	3.964 ng		100
52) cis-1,3-Dichloropropene	12.56	75	227	N.D.		
53) 4-Methyl-2-pentanone	12.70	58	14110	0.746 ng		94
54) trans-1,3-Dichloropropene	0.00	75	0	N.D.		
55) 1,1,2-Trichloroethane	13.35	97	106	N.D.		
58) Toluene	13.65	91	1893877	24.147 ng		100
59) 2-Hexanone	13.90	43	20959	N.D.		
60) Dibromochloromethane	0.00	129	0	N.D.		
61) 1,2-Dibromoethane	0.00	107	0	N.D.		
62) n-Butyl Acetate	14.54	43	63463	1.133 ng		97
63) n-Octane	14.67	57	22565	1.207 ng		96
64) Tetrachloroethene	14.81	166	39614	2.215 ng		99
65) Chlorobenzene	15.51	112	6512	N.D.		
66) Ethylbenzene	15.90	91	218795	2.486 ng		99
67) m- & p-Xylenes	16.08	91	547393	8.074 ng		99
68) Bromoform	16.16	173	330	N.D.		
69) Styrene	16.47	104	35227	0.707 ng		98
70) o-Xylene	16.58	91	188964	2.830 ng		99
71) n-Nonane	16.82	43	40695	0.877 ng		94
72) 1,1,2,2-Tetrachloroethane	16.51	83	860	N.D.		
74) Cumene	17.20	105	14760	N.D.		
75) alpha-Pinene	17.61	93	77977	1.817 ng		99
76) n-Propylbenzene	17.73	91	51853	0.506 ng		91
77) 3-Ethyltoluene	0.00	105	0	N.D. d		
78) 4-Ethyltoluene	17.88	105	55504	0.714 ng		98
79) 1,3,5-Trimethylbenzene	17.96	105	41839	0.611 ng		99
80) alpha-Methylstyrene	18.11	118	9565	N.D.		
81) 2-Ethyltoluene	0.00	105	0	N.D. d		
82) 1,2,4-Trimethylbenzene	18.38	105	170363	2.455 ng		88
83) n-Decane	0.00	57	0	N.D. d		
84) Benzyl Chloride	18.51	91	519	N.D.		
85) 1,3-Dichlorobenzene	18.54	146	182	N.D.		
86) 1,4-Dichlorobenzene	18.61	146	5002	N.D.		
87) sec-Butylbenzene	18.67	105	5318	N.D.		
88) 4-Isopropyltoluene (p-...	18.83	119	15931	N.D.		
89) 1,2,3-Trimethylbenzene	0.00	105	0	N.D. d		
90) 1,2-Dichlorobenzene	18.98	146	144	N.D.		
91) d-Limonene	18.99	68	32011	1.081 ng	#	67
92) 1,2-Dibromo-3-Chloropr...	0.00	157	0	N.D.		
93) n-Undecane	0.00	57	0	N.D. d		
94) 1,2,4-Trichlorobenzene	20.77	180	130	N.D.		
95) Naphthalene	20.90	128	16723	N.D.		
96) n-Dodecane	0.00	57	0	N.D. d		
97) Hexachlorobutadiene	0.00	225	0	N.D.		
98) Cyclohexanone	0.00	55	0	N.D. d		
99) tert-Butylbenzene	18.38	119	18643	N.D.		
100) n-Butylbenzene	19.27	91	15982	N.D.		

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Data File: I:\MS09\Data\2019 06\12\06121925.D
Acq On : 12 Jun 2019 19:39 Operator: SC
Sample : P1903177-004 (1000mL)
Misc : S31-05131901
ALS Vial : 10 Sample Multiplier: 1

Quant Time: Jun 13 16:12:52 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\12\06121925.D
Acq On : 12 Jun 2019 19:39 Operator: SC
Sample : P1903177-004 (1000mL)
Misc : S31-05131901
ALS Vial : 10 Sample Multiplier: 1

6/13/19

Quant Time: Jun 13 16:12:52 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.14	130	168656	12.500	ng		-0.03
37) 1,4-Difluorobenzene (IS2)	11.11	114	781505	12.500	ng		-0.02
56) Chlorobenzene-d5 (IS3)	15.46	82	422001	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.92	65	327369	13.319	ng		-0.03
Spiked Amount 12.500	Range 70 - 130		Recovery = 106.56%				
57) Toluene-d8 (SS2)	13.55	98	958750	12.180	ng		-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 97.44%				
73) Bromofluorobenzene (SS3)	17.05	174	259264	12.278	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 98.24%				
Target Compounds							Qvalue
2) Propene	3.84	42	68425m	3.164	ng		
3) Dichlorodifluoromethan...	3.95	85	356386	11.247	ng		99
10) Ethanol	5.35	45	510767	30.529	ng		100
11) Acetonitrile	5.55	41	30005	0.734	ng		97
12) Acrolein	5.69	56	21250	1.610	ng		99
13) Acetone	5.82	58	392290	26.495	ng		95
14) Trichlorofluoromethane	6.02	101	286459	10.761	ng		99
15) 2-Propanol (Isopropanol)	6.15	45	319842	5.879	ng		98
21) Trichlorotrifluoroethane	7.18	151	6746	0.543	ng		99
22) Carbon Disulfide	7.14	76	171134	2.563	ng		98
27) 2-Butanone (MEK)	8.51	72	146629	10.287	ng	#	91
30) Ethyl Acetate	9.21	61	388239	54.680	ng		97
31) n-Hexane	9.22	57	244440	7.221	ng		99
32) Chloroform	9.29	83	17161	0.598	ng		100
34) Tetrahydrofuran (THF)	9.67	72	215553	16.982	ng		97
36) 1,2-Dichloroethane	10.04	62	29204	1.242	ng		100
41) Benzene	10.76	78	113337	1.414	ng		99
43) Cyclohexane	11.04	84	44280	1.562	ng		99
51) n-Heptane	12.12	71	76778	3.964	ng		100
53) 4-Methyl-2-pentanone	12.70	58	14110	0.746	ng		94
58) Toluene	13.65	91	1893877	24.147	ng		100
62) n-Butyl Acetate	14.54	43	63463	1.133	ng		97
63) n-Octane	14.67	57	22565	1.207	ng		96
64) Tetrachloroethene	14.81	166	39614	2.215	ng		99
66) Ethylbenzene	15.90	91	218795	2.486	ng		99
67) m- & p-Xylenes	16.08	91	547393	8.074	ng		99
69) Styrene	16.47	104	35227	0.707	ng		98
70) o-Xylene	16.58	91	188964	2.830	ng		99
71) n-Nonane	16.82	43	40695	0.877	ng		94
75) alpha-Pinene	17.61	93	77977	1.817	ng		99
76) n-Propylbenzene	17.73	91	51853	0.506	ng		91
78) 4-Ethyltoluene	17.88	105	55504	0.714	ng		98
79) 1,3,5-Trimethylbenzene	17.96	105	41839	0.611	ng		99
82) 1,2,4-Trimethylbenzene	18.38	105	170363	2.455	ng		88
91) d-Limonene	18.99	68	32011	1.081	ng	#	67

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Data File: I:\MS09\Data\2019 06\12\06121925.D
Acq On : 12 Jun 2019 19:39 Operator: SC
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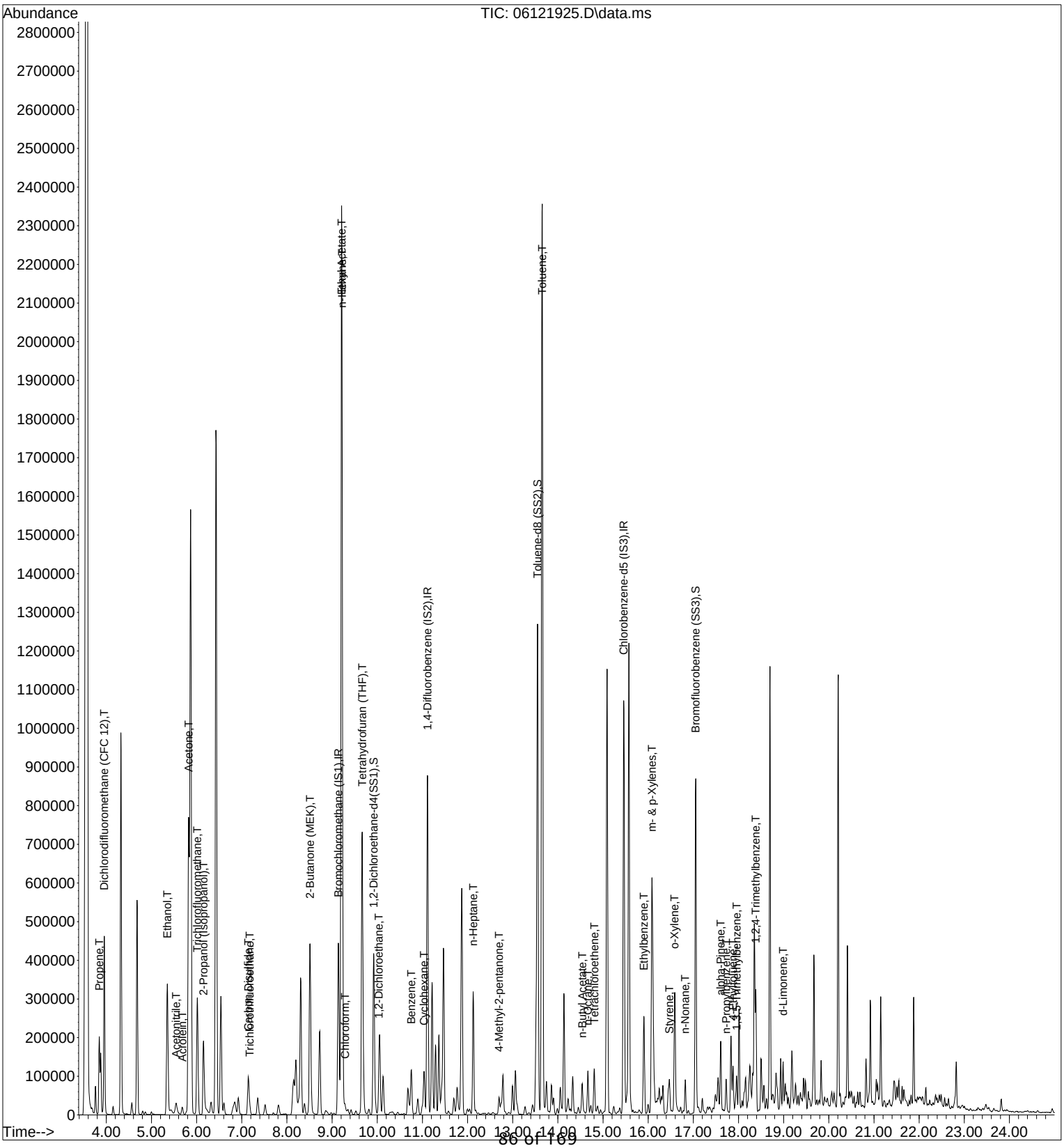
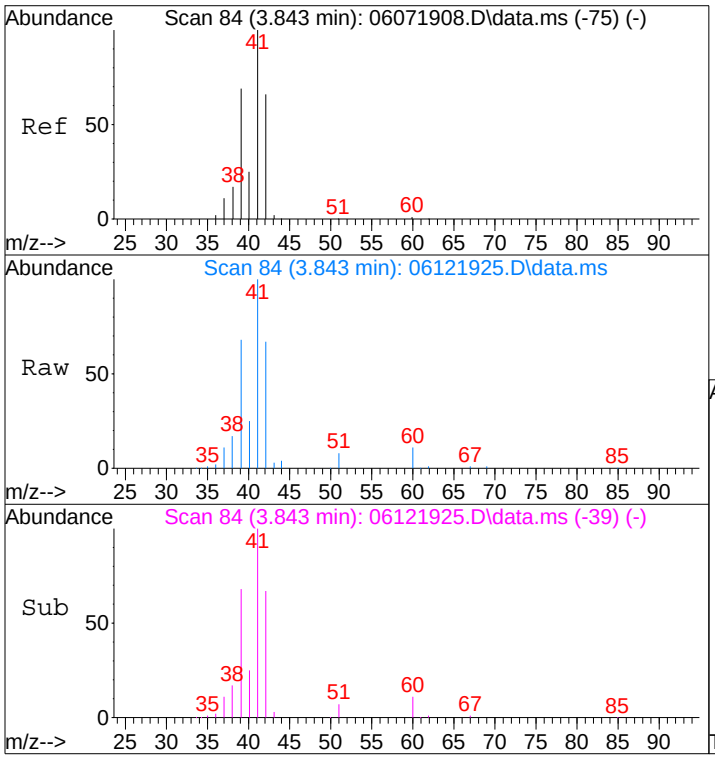
DataAcq Meth:TO15.M

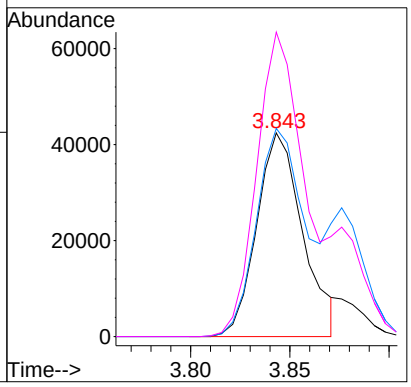


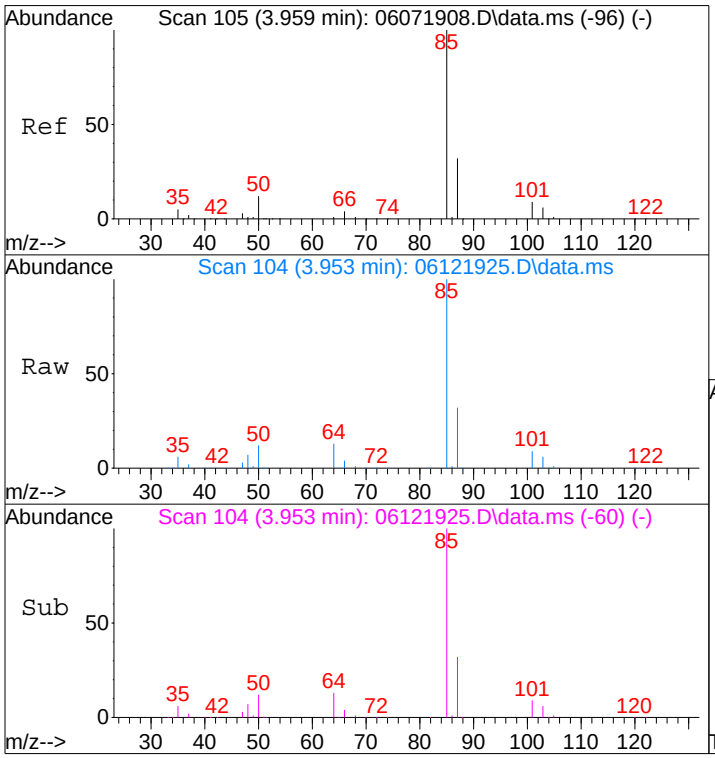


#2
Propene
Concen: 3.16 ng m
RT: 3.84 min Scan# 84
Delta R.T. 0.000 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 42 Resp: 68425

Ion	Ratio	Lower	Upper
42	100		
39	107.6	84.8	124.8
41	190.5	130.3	170.3#

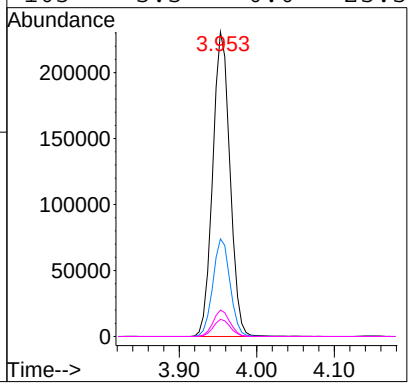


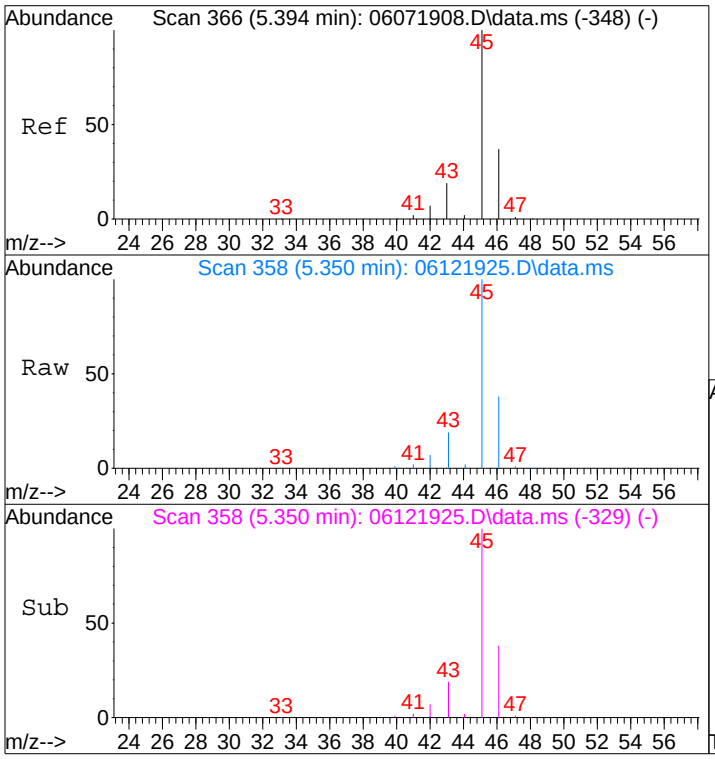


#3
Dichlorodifluoromethane (CFC 12)
Concen: 11.25 ng
RT: 3.95 min Scan# 104
Delta R.T. -0.005 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 85 Resp: 356386

Ion	Ratio	Lower	Upper
85	100		
87	31.9	12.3	52.3
101	8.5	0.0	28.6
103	5.5	0.0	25.5

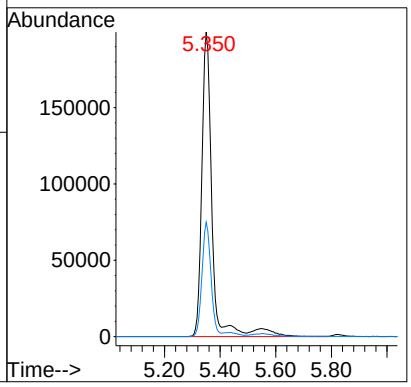


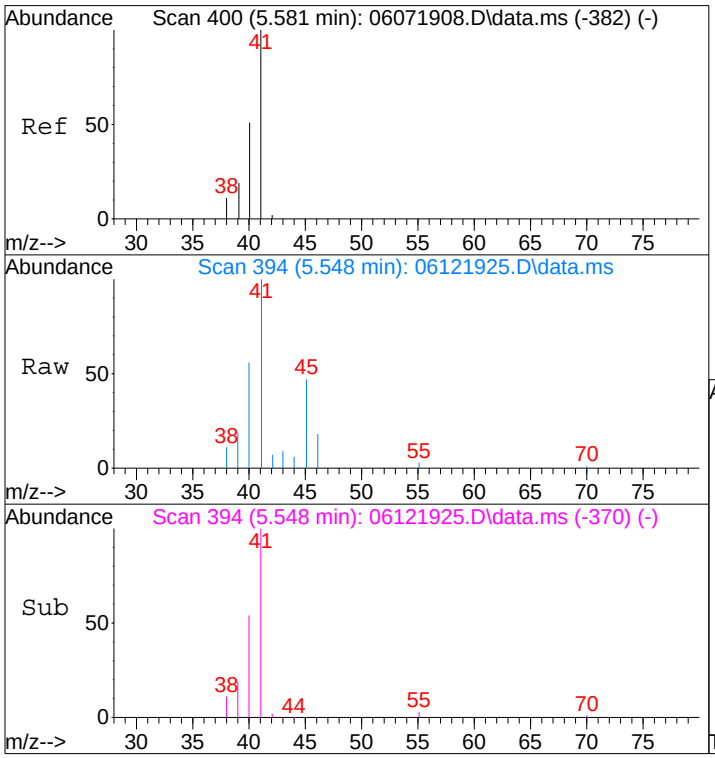


#10
Ethanol
Concen: 30.53 ng
RT: 5.35 min Scan# 358
Delta R.T. -0.088 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 45 Resp: 510767

Ion	Ratio	Lower	Upper
45	100		
46	36.8	17.1	57.1

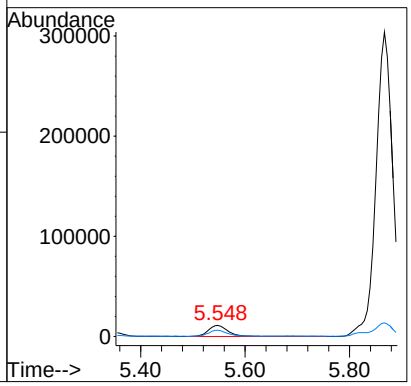


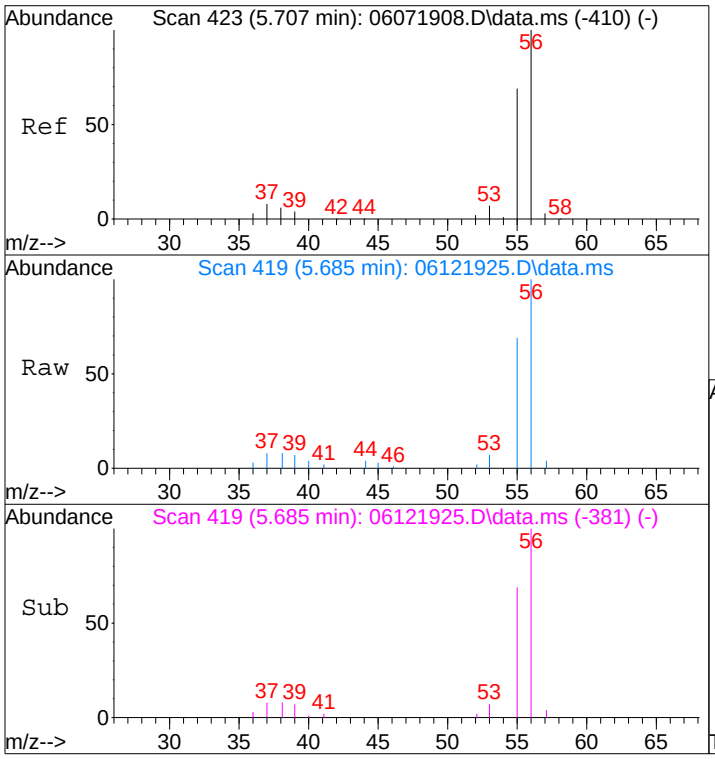


#11
Acetonitrile
Concen: 0.73 ng
RT: 5.55 min Scan# 394
Delta R.T. -0.066 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 41 Resp: 30005

Ion	Ratio	Lower	Upper
41	100		
40	50.0	32.2	72.2

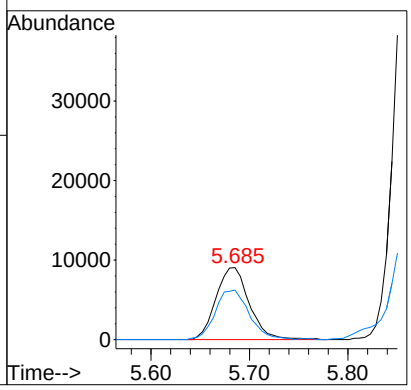


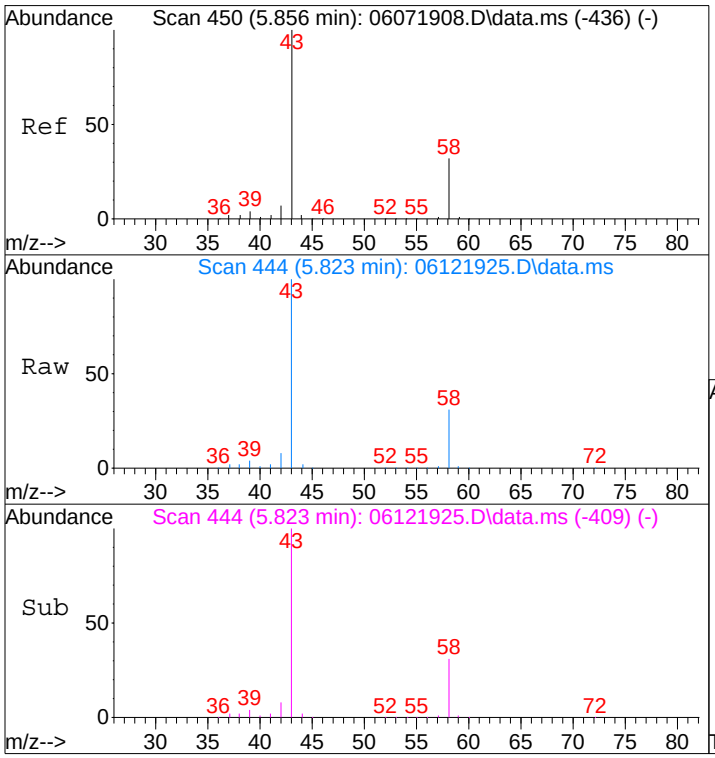


#12
Acrolein
Concen: 1.61 ng
RT: 5.69 min Scan# 419
Delta R.T. -0.044 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 56 Resp: 21250

Ion	Ratio	Lower	Upper
56	100		
55	70.1	49.6	89.6

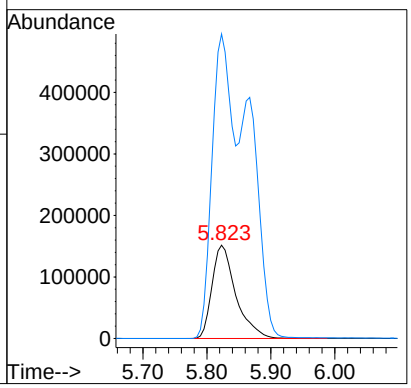


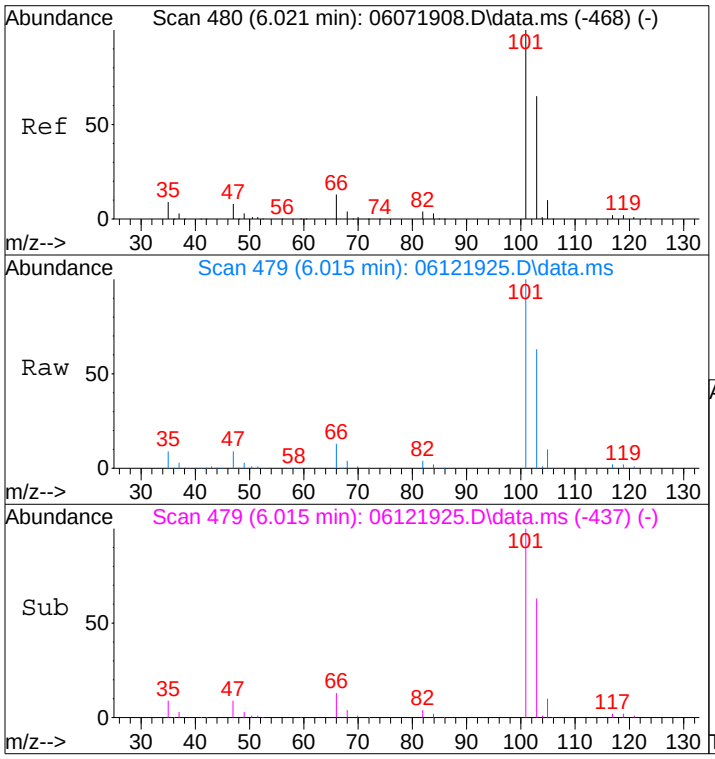


#13
Acetone
Concen: 26.49 ng
RT: 5.82 min Scan# 444
Delta R.T. -0.055 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 58 Resp: 392290

Ion	Ratio	Lower	Upper
58	100		
43	306.7	287.7	347.7

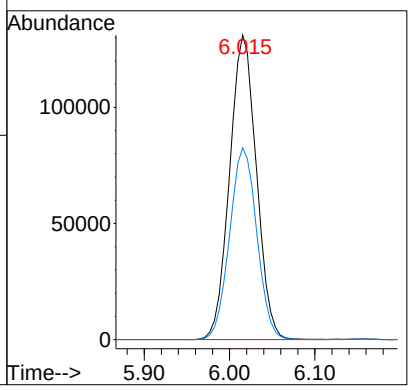


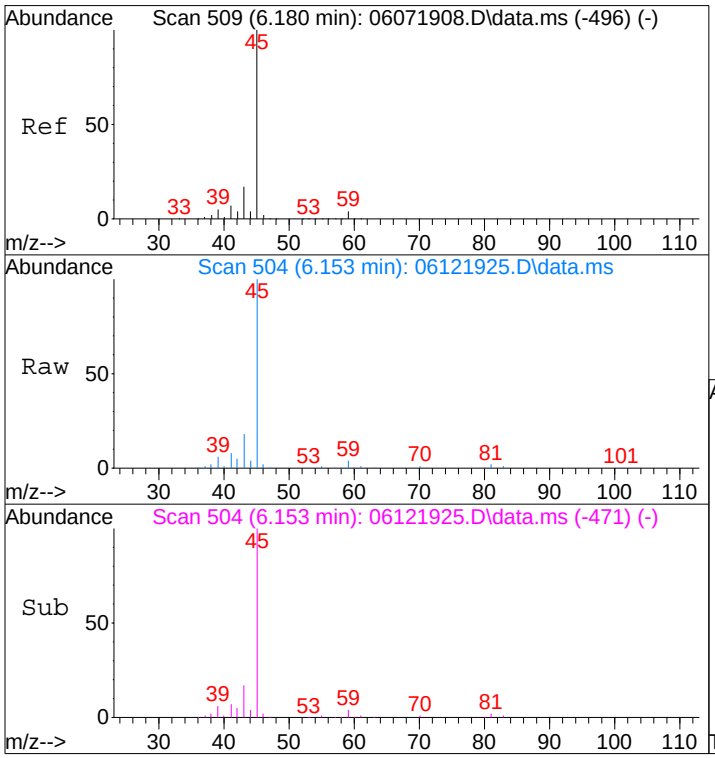


#14
Trichlorofluoromethane
Concen: 10.76 ng
RT: 6.02 min Scan# 479
Delta R.T. -0.016 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion:101 Resp: 286459

Ion	Ratio	Lower	Upper
101	100		
103	63.7	44.7	84.7

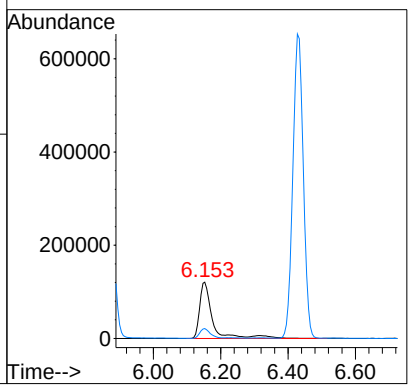


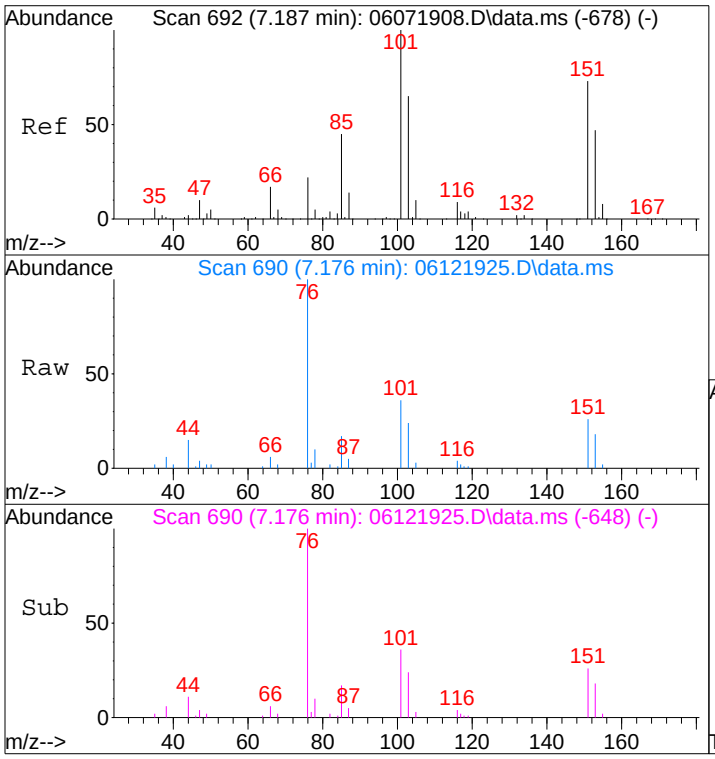


#15
2-Propanol (Isopropanol)
Concen: 5.88 ng
RT: 6.15 min Scan# 504
Delta R.T. -0.066 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 45 Resp: 319842

Ion	Ratio	Lower	Upper
45	100		
43	16.6	0.0	37.3

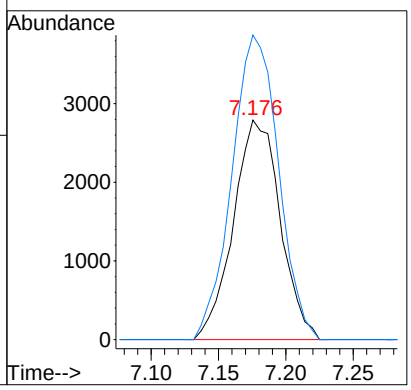


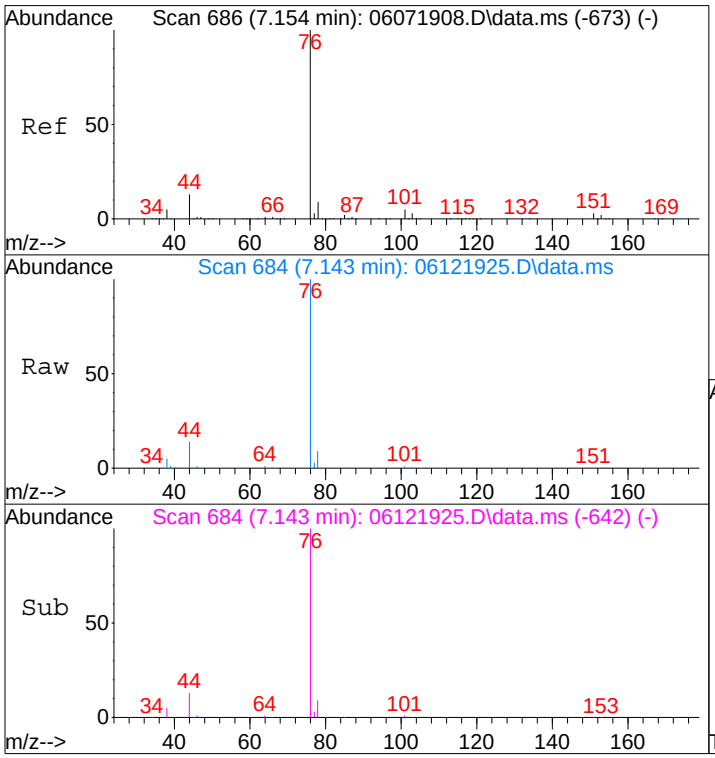


#21
Trichlorotrifluoroethane
Concen: 0.54 ng
RT: 7.18 min Scan# 690
Delta R.T. -0.016 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion:151 Resp: 6746

Ion	Ratio	Lower	Upper
151	100		
101	138.1	119.9	159.9

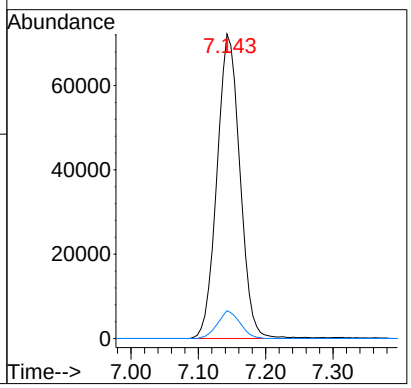


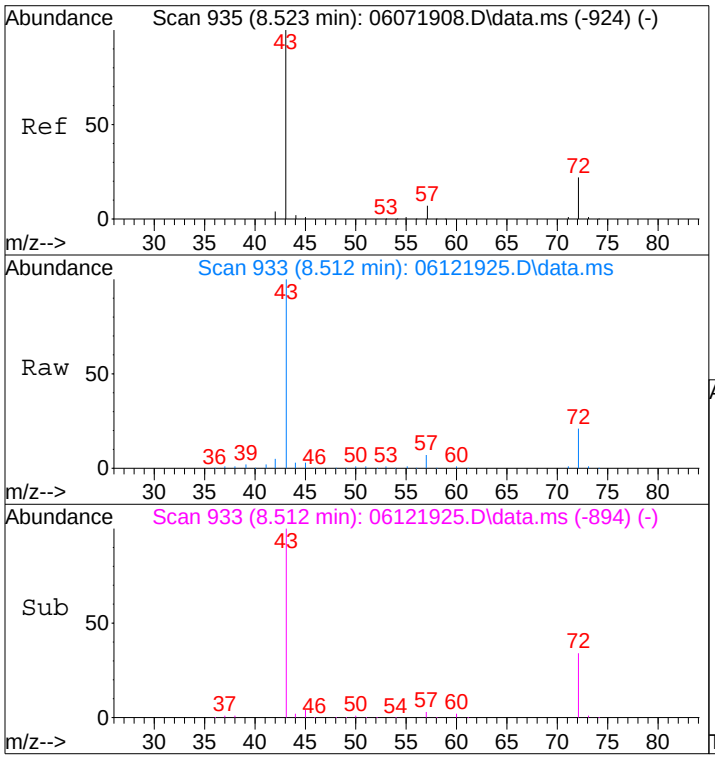


#22
Carbon Disulfide
Concen: 2.56 ng
RT: 7.14 min Scan# 684
Delta R.T. -0.016 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 76 Resp: 171134

Ion	Ratio	Lower	Upper
76	100		
78	8.9	0.0	29.7

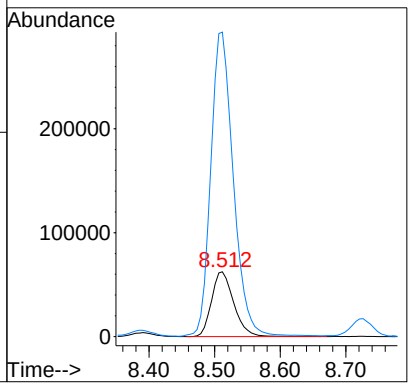


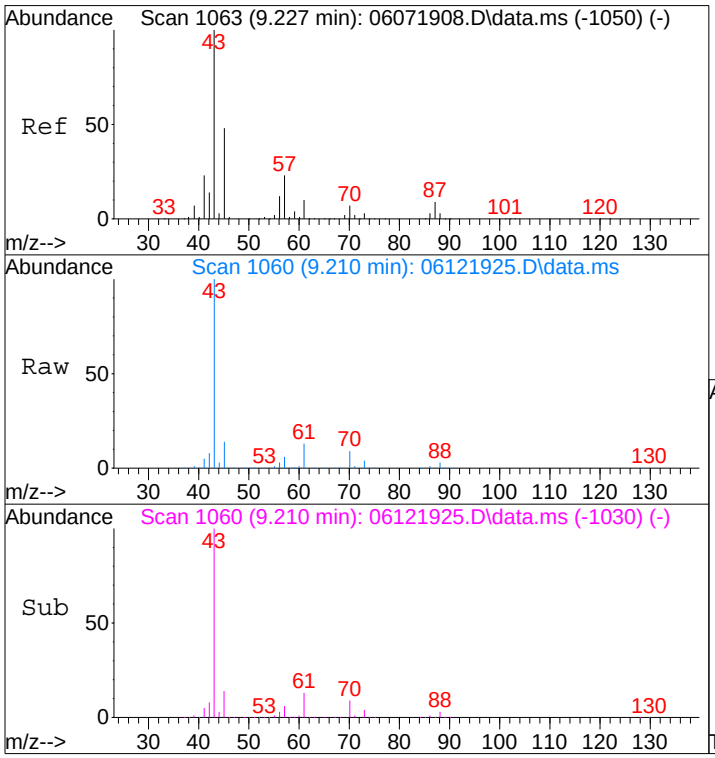


#27
2-Butanone (MEK)
Concen: 10.29 ng
RT: 8.51 min Scan# 933
Delta R.T. -0.033 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 72 Resp: 146629

Ion	Ratio	Lower	Upper
72	100		
43	478.1	436.0	476.0#

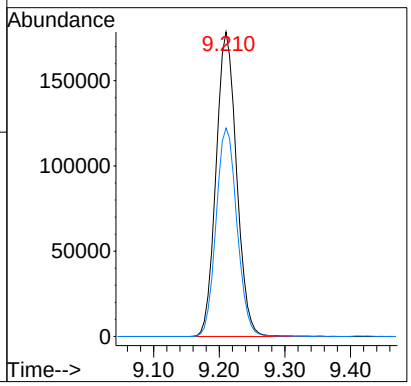


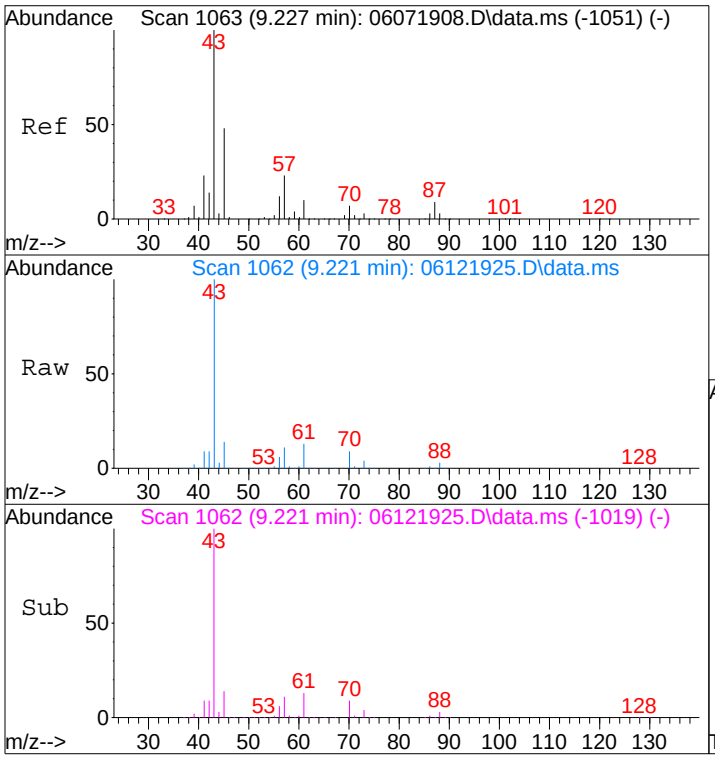


#30
Ethyl Acetate
Concen: 54.68 ng
RT: 9.21 min Scan# 1060
Delta R.T. -0.033 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 61 Resp: 388239

Ion	Ratio	Lower	Upper
61	100		
70	69.7	52.1	92.1

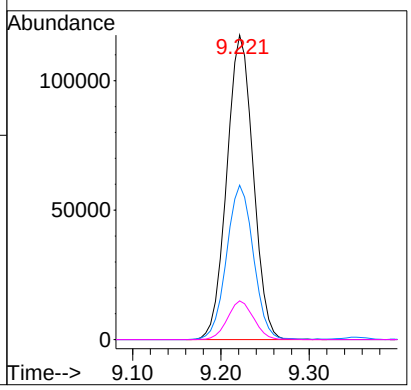


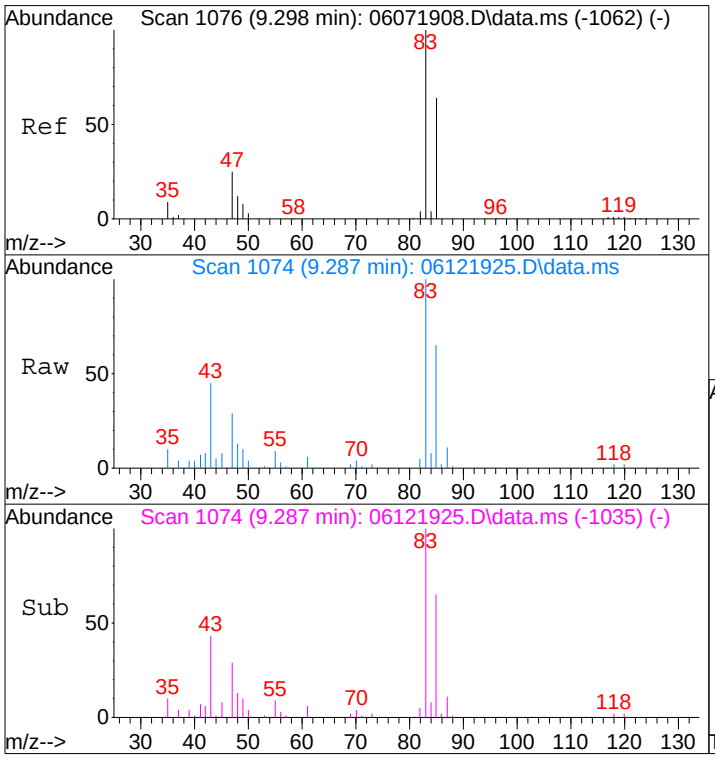


#31
n-Hexane
Concen: 7.22 ng
RT: 9.22 min Scan# 1062
Delta R.T. -0.011 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 57 Resp: 244440

Ion	Ratio	Lower	Upper
57	100		
56	51.6	40.8	61.2
86	12.6	10.3	15.5

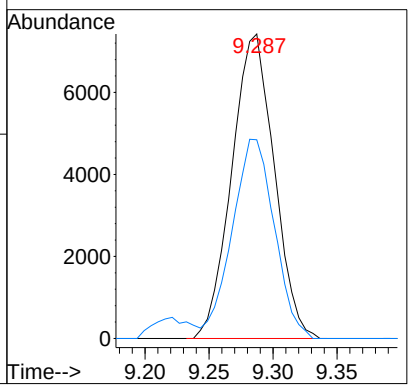


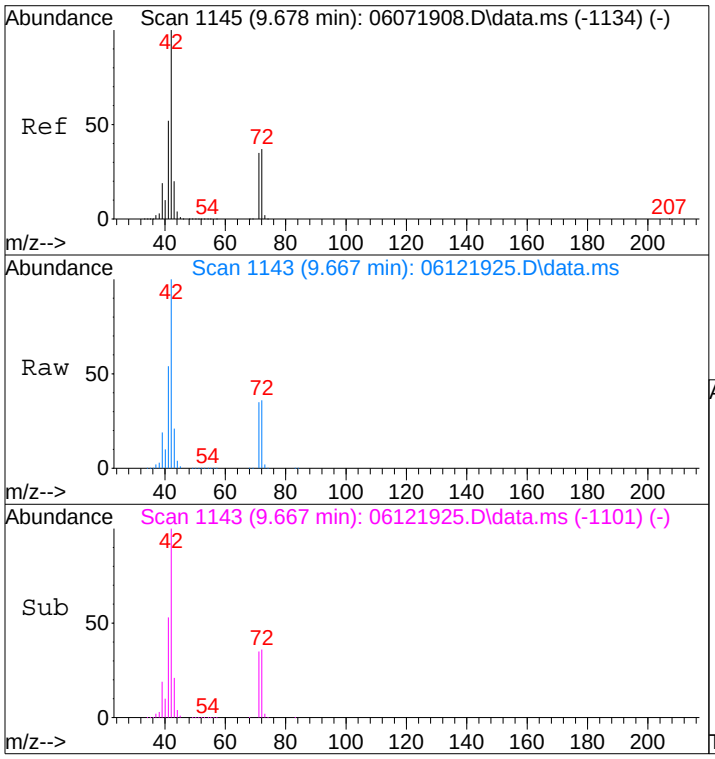


#32
Chloroform
Concen: 0.60 ng
RT: 9.29 min Scan# 1074
Delta R.T. -0.033 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 83 Resp: 17161

Ion	Ratio	Lower	Upper
83	100		
85	65.0	44.8	84.8

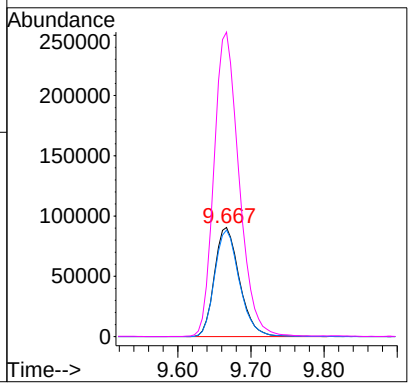


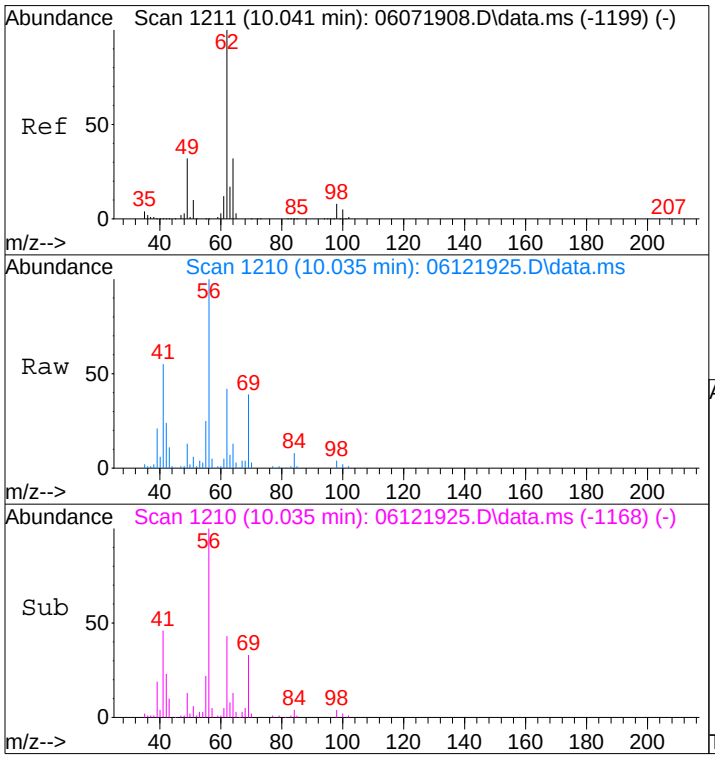


#34
Tetrahydrofuran (THF)
Concen: 16.98 ng
RT: 9.67 min Scan# 1143
Delta R.T. -0.016 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 72 Resp: 215553

Ion	Ratio	Lower	Upper
72	100		
71	96.5	76.8	116.8
42	280.3	253.3	293.3

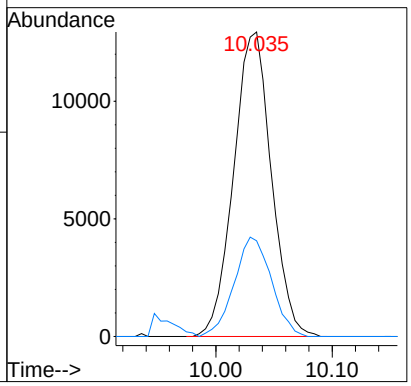


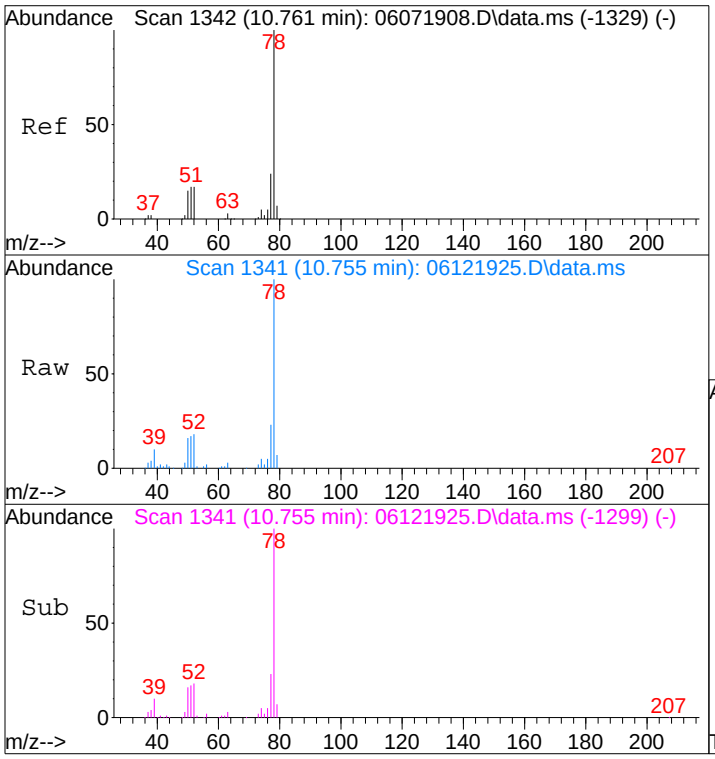


#36
1,2-Dichloroethane
Concen: 1.24 ng
RT: 10.04 min Scan# 1210
Delta R.T. -0.016 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 62 Resp: 29204

Ion	Ratio	Lower	Upper
62	100		
64	32.2	12.3	52.3

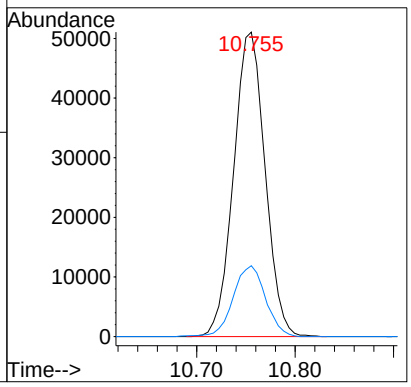


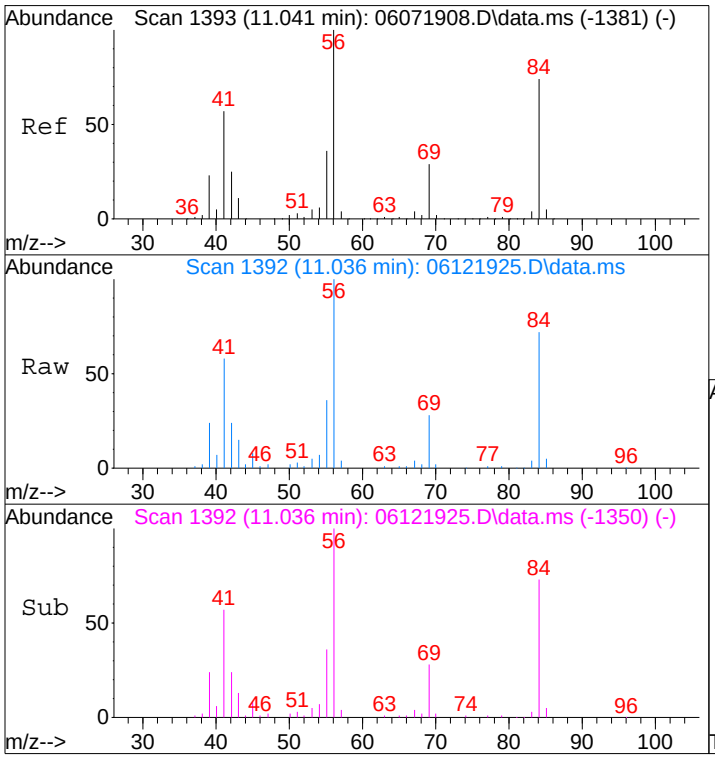


#41
Benzene
Concen: 1.41 ng
RT: 10.76 min Scan# 1341
Delta R.T. -0.016 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 78 Resp: 113337

Ion	Ratio	Lower	Upper
78	100		
77	24.0	3.6	43.6

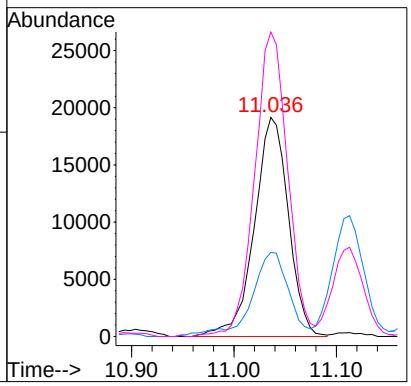


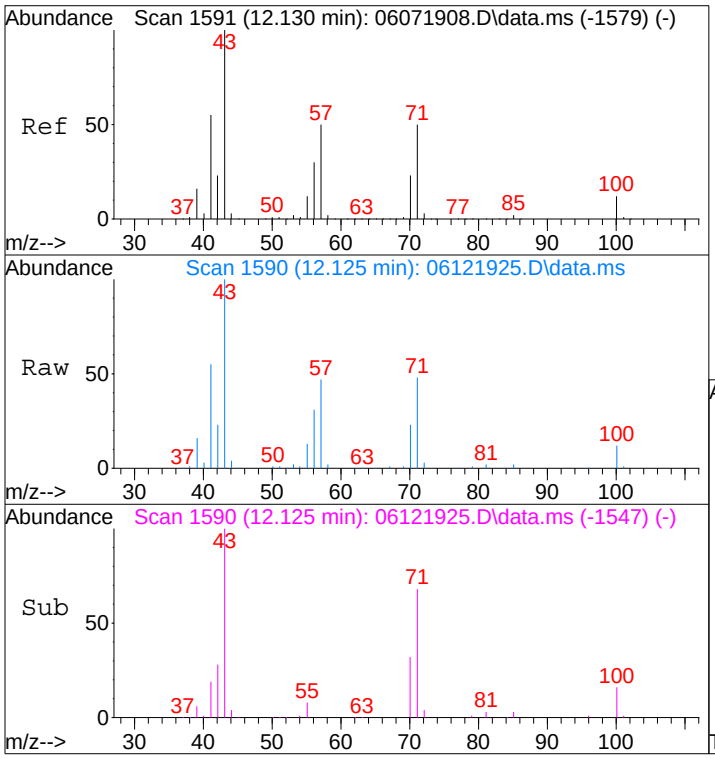


#43
Cyclohexane
Concen: 1.56 ng
RT: 11.04 min Scan# 1392
Delta R.T. -0.016 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 84 Resp: 44280

Ion	Ratio	Lower	Upper
84	100		
69	41.7	18.7	58.7
56	134.8	115.3	155.3

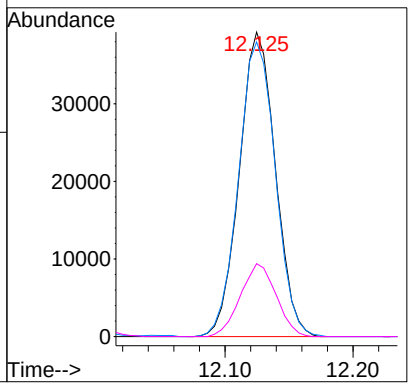


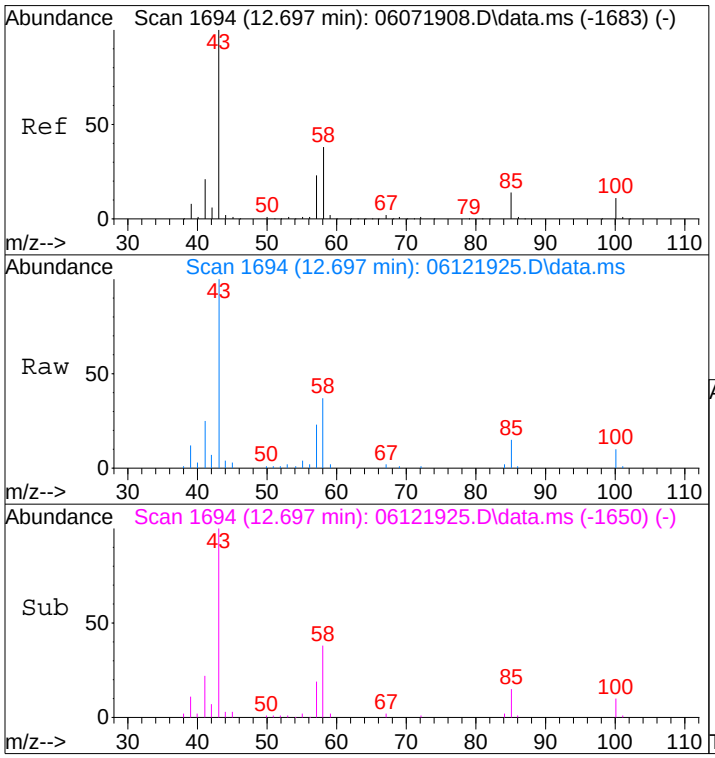


#51
n-Heptane
Concen: 3.96 ng
RT: 12.12 min Scan# 1590
Delta R.T. -0.011 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 71 Resp: 76778

Ion	Ratio	Lower	Upper
71	100		
57	99.0	78.7	118.7
100	23.8	3.7	43.7

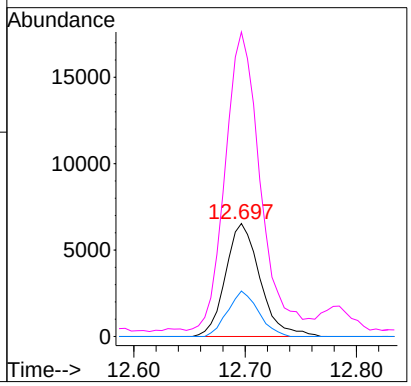


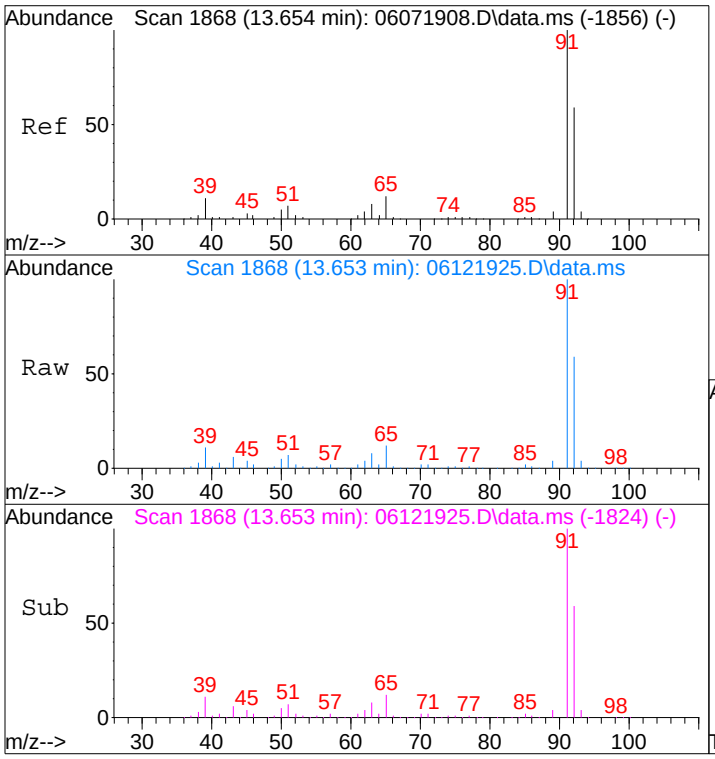


#53
4-Methyl-2-pentanone
Concen: 0.75 ng
RT: 12.70 min Scan# 1694
Delta R.T. -0.005 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 58 Resp: 14110

Ion	Ratio	Lower	Upper
58	100		
85	35.8	31.5	47.3
43	275.5	211.1	316.7

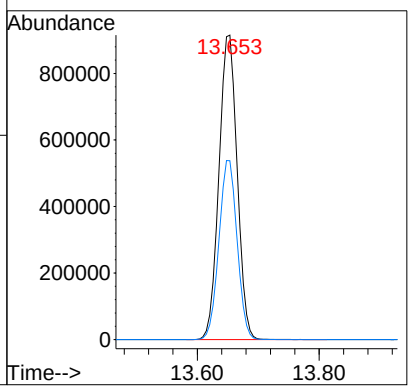


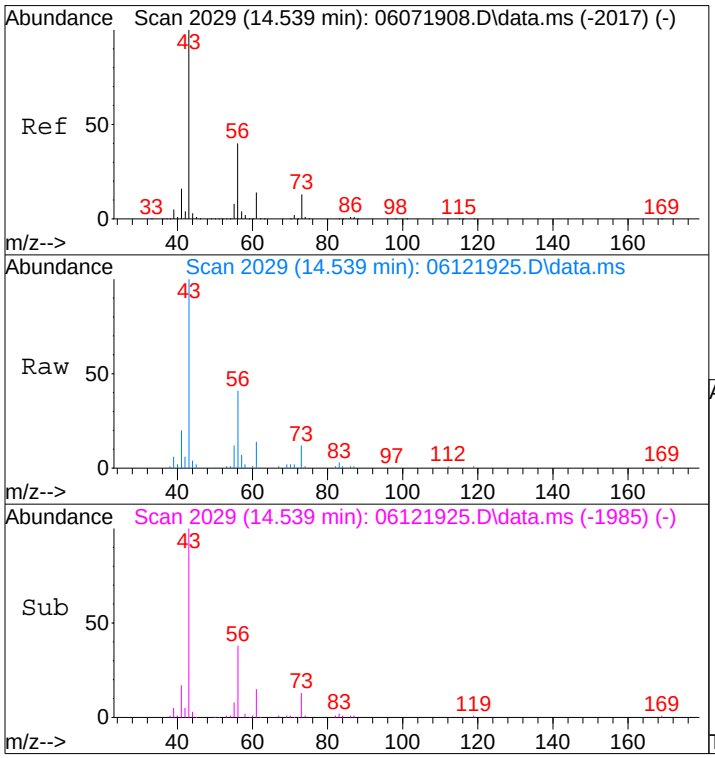


#58
Toluene
Concen: 24.15 ng
RT: 13.65 min Scan# 1868
Delta R.T. -0.005 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 91 Resp: 1893877

Ion	Ratio	Lower	Upper
91	100		
92	58.7	39.0	79.0

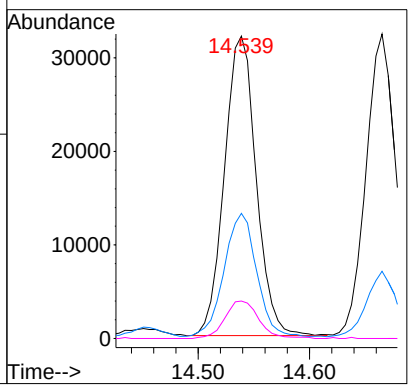


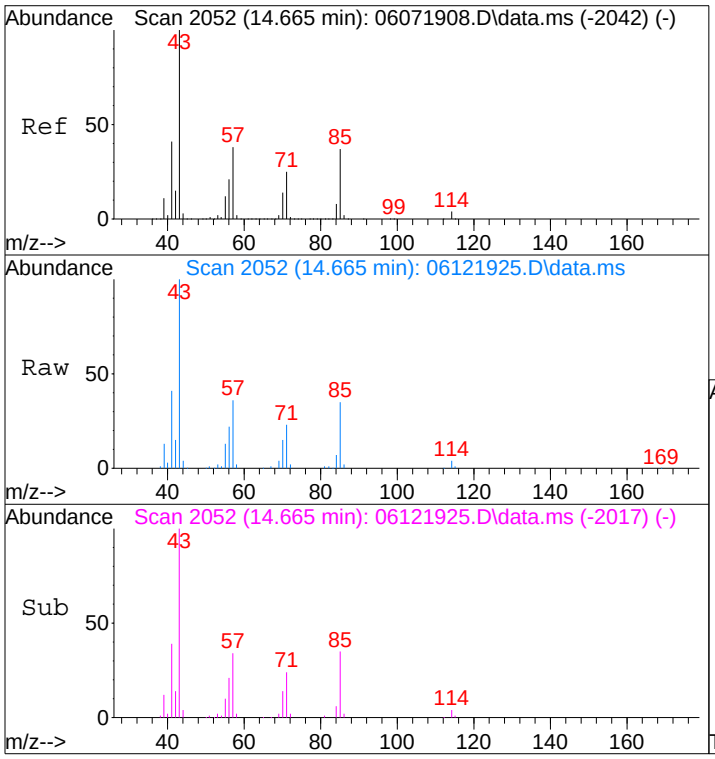


#62
n-Butyl Acetate
Concen: 1.13 ng
RT: 14.54 min Scan# 2029
Delta R.T. -0.005 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 43 Resp: 63463

Ion	Ratio	Lower	Upper
43	100		
56	42.6	20.1	60.1
73	13.4	0.0	32.9

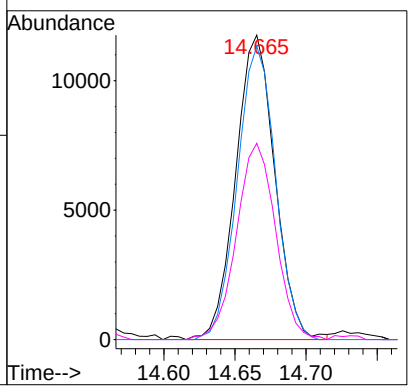


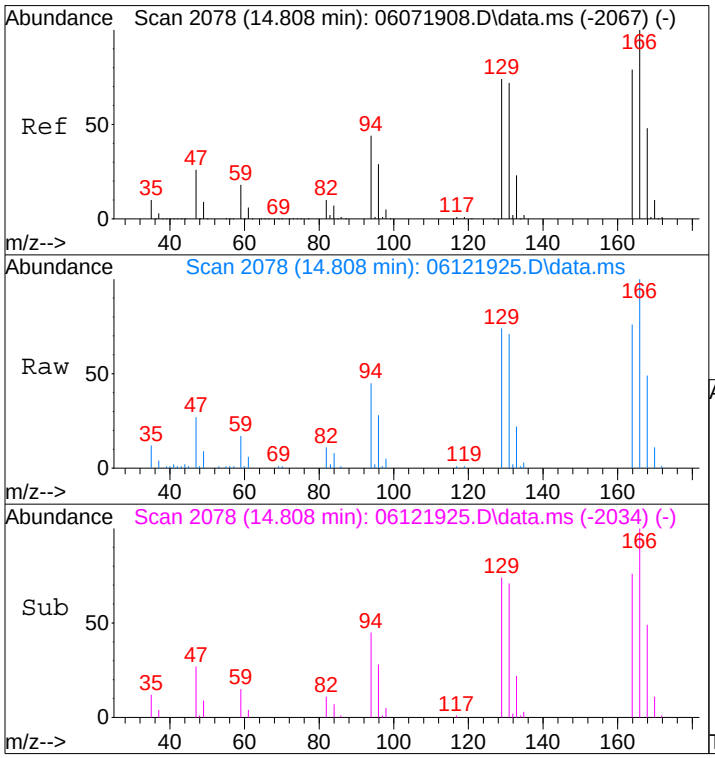


#63
n-Octane
Concen: 1.21 ng
RT: 14.67 min Scan# 2052
Delta R.T. -0.005 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 57 Resp: 22565

Ion	Ratio	Lower	Upper
57	100		
85	94.1	79.0	118.6
71	64.4	52.6	78.8

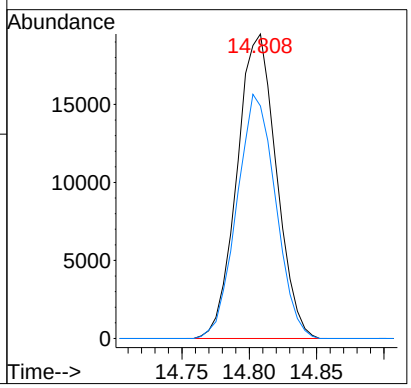


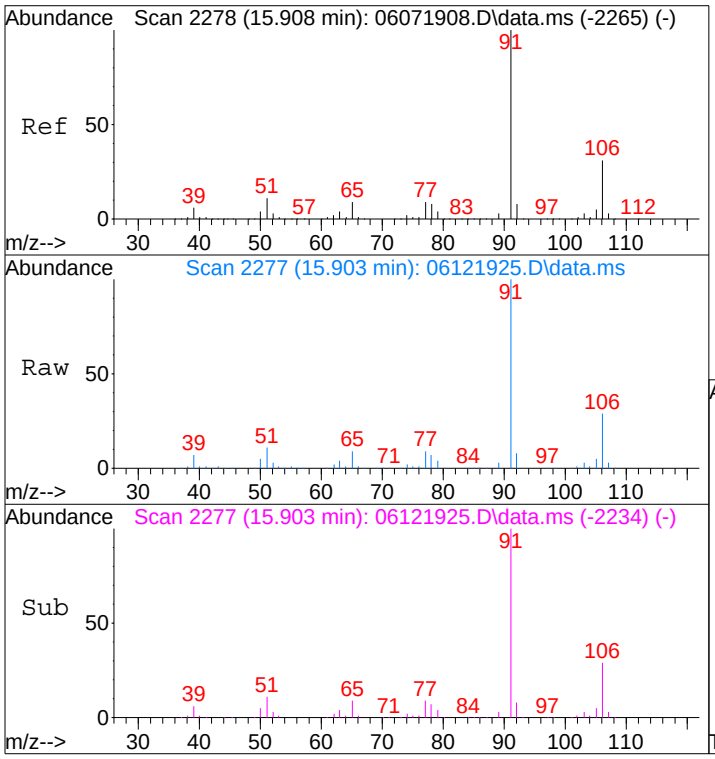


#64
Tetrachloroethene
Concen: 2.21 ng
RT: 14.81 min Scan# 2078
Delta R.T. -0.005 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion:166 Resp: 39614

Ion	Ratio	Lower	Upper
166	100		
164	79.2	58.7	98.7

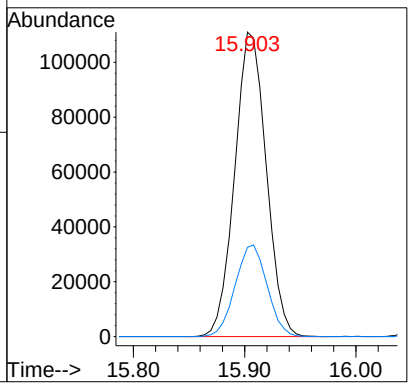


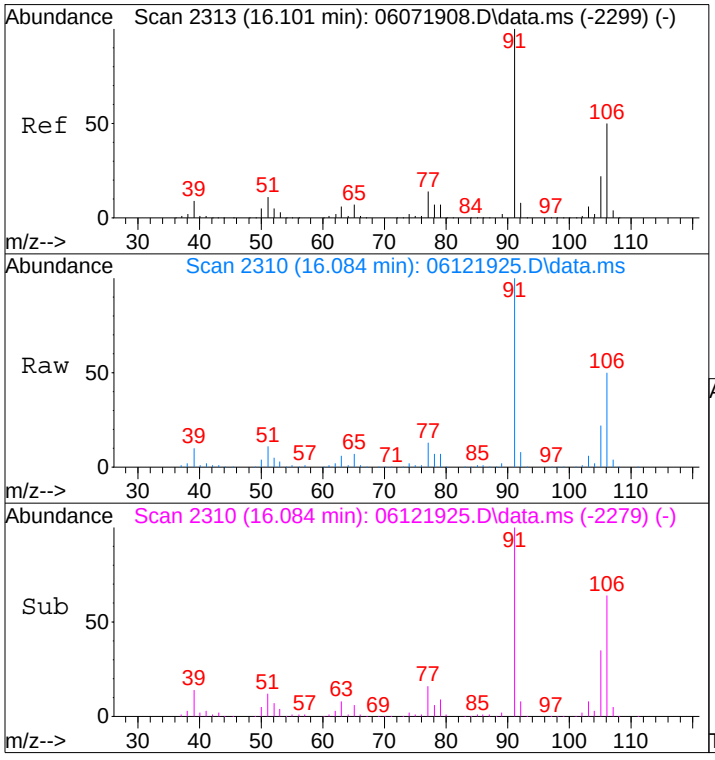


#66
Ethylbenzene
Concen: 2.49 ng
RT: 15.90 min Scan# 2277
Delta R.T. -0.011 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 91 Resp: 218795

Ion	Ratio	Lower	Upper
91	100		
106	30.4	11.0	51.0

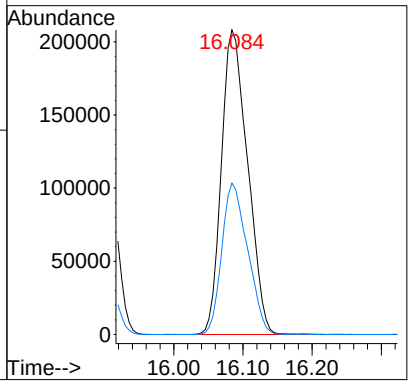


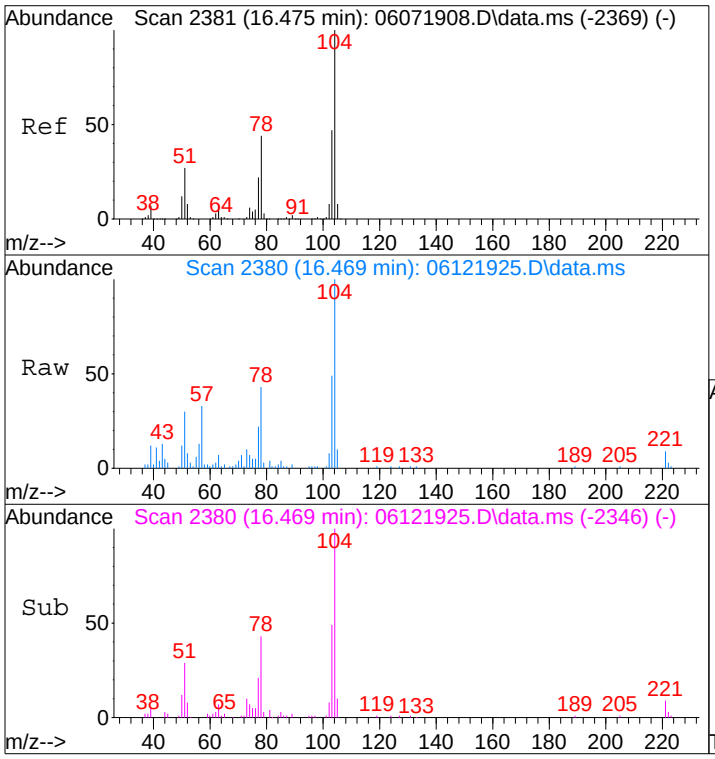


#67
m- & p-Xylenes
Concen: 8.07 ng
RT: 16.08 min Scan# 2310
Delta R.T. -0.027 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 91 Resp: 547393

Ion	Ratio	Lower	Upper
91	100		
106	48.9	28.1	68.1

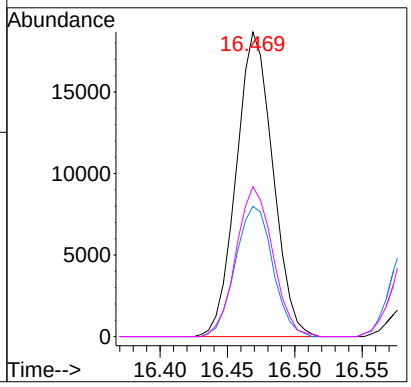


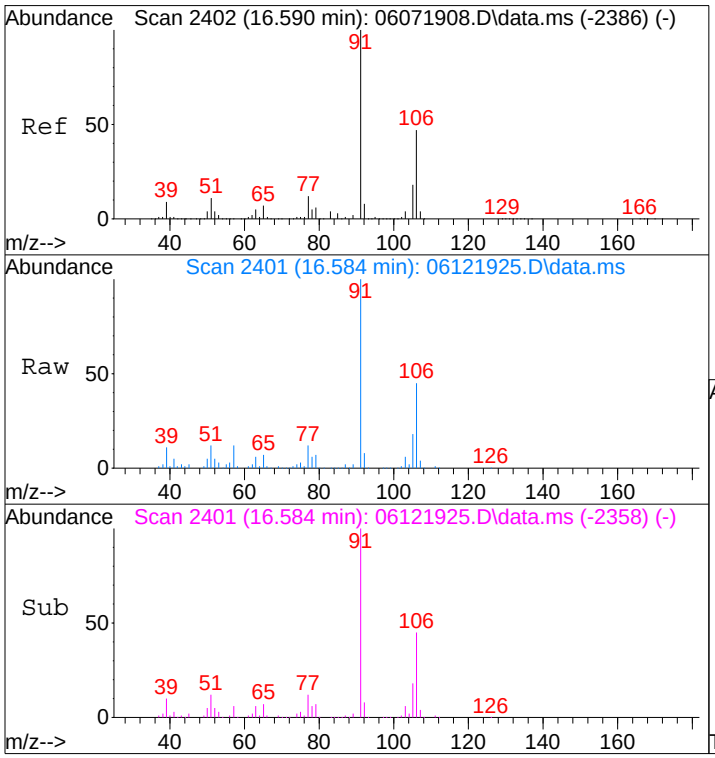


#69
Styrene
Concen: 0.71 ng
RT: 16.47 min Scan# 2380
Delta R.T. -0.011 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion:104 Resp: 35227

Ion	Ratio	Lower	Upper
104	100		
78	43.8	24.0	64.0
103	49.4	27.3	67.3

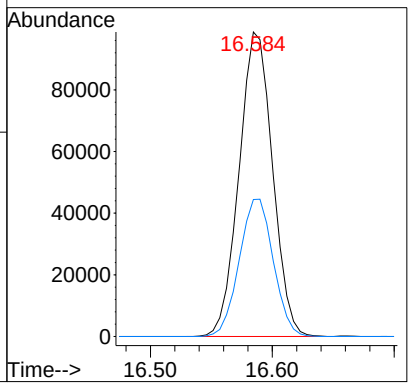


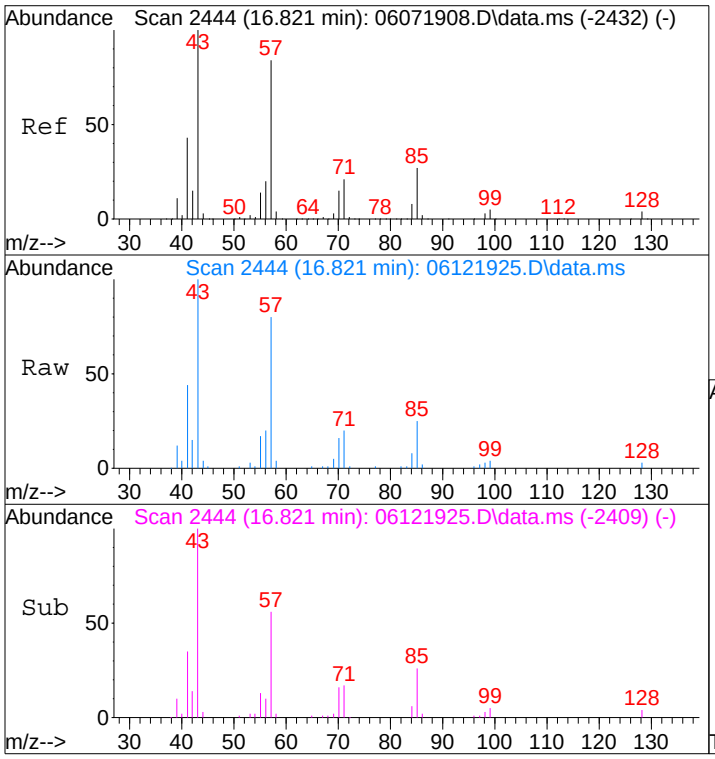


#70
o-Xylene
Concen: 2.83 ng
RT: 16.58 min Scan# 2401
Delta R.T. -0.011 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 91 Resp: 188964

Ion	Ratio	Lower	Upper
91	100		
106	45.8	26.6	66.6

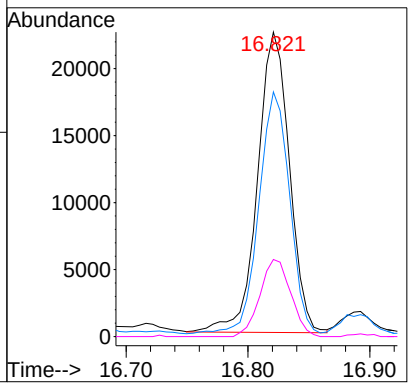


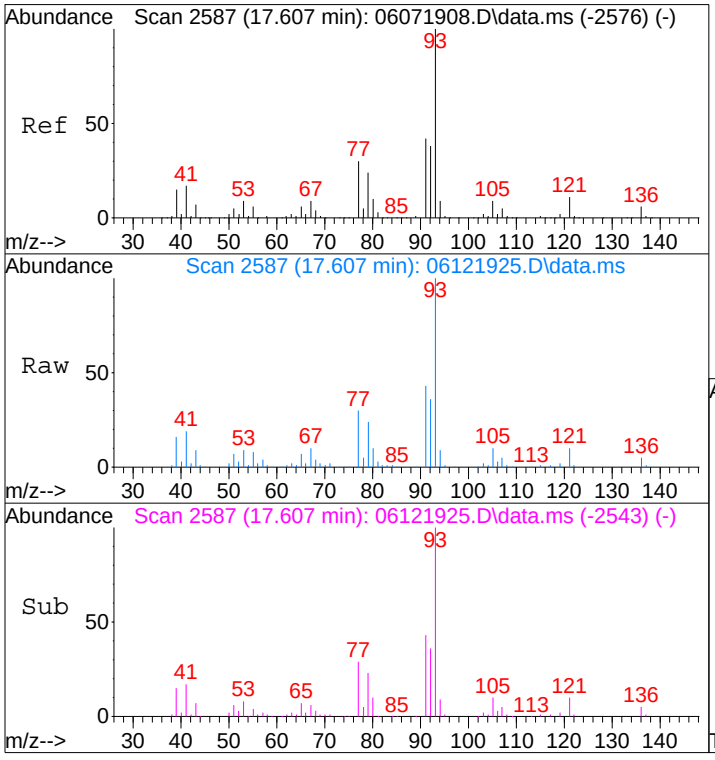


#71
n-Nonane
Concen: 0.88 ng
RT: 16.82 min Scan# 2444
Delta R.T. -0.005 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 43 Resp: 40695

Ion	Ratio	Lower	Upper
43	100		
57	77.9	63.3	103.3
85	24.7	7.7	47.7

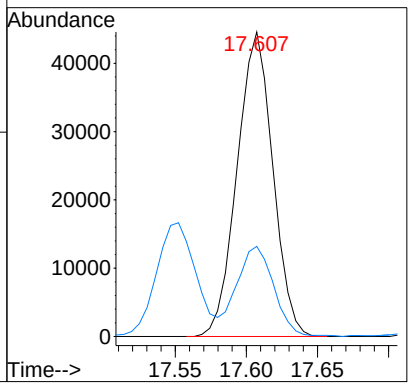


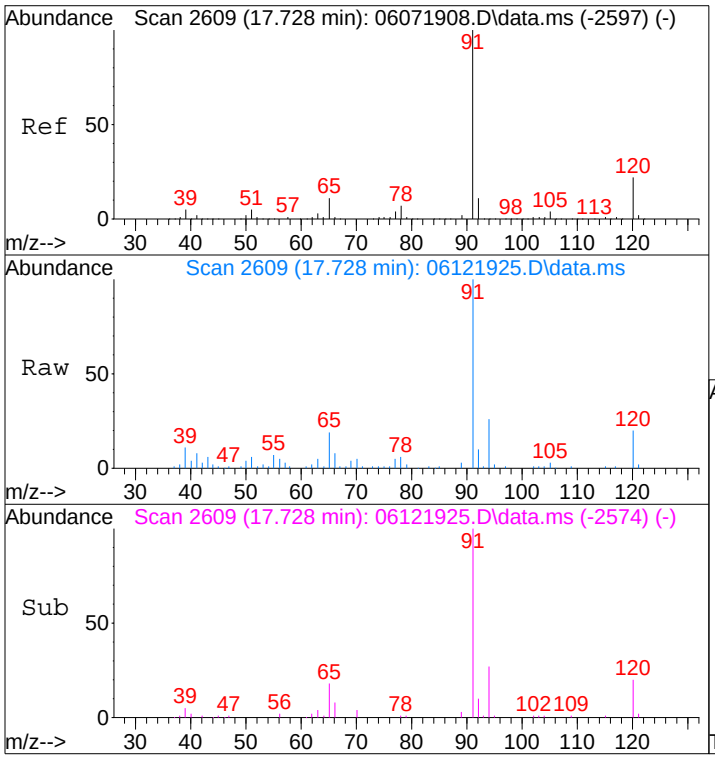


#75
alpha-Pinene
Concen: 1.82 ng
RT: 17.61 min Scan# 2587
Delta R.T. -0.005 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 93 Resp: 77977

Ion	Ratio	Lower	Upper
93	100		
77	30.7	10.4	50.4

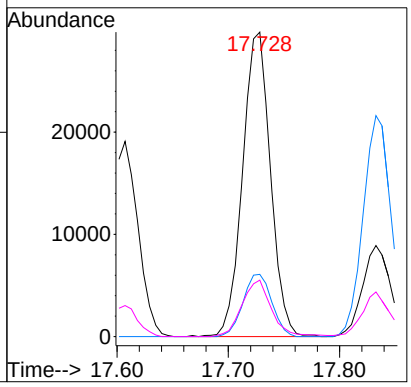


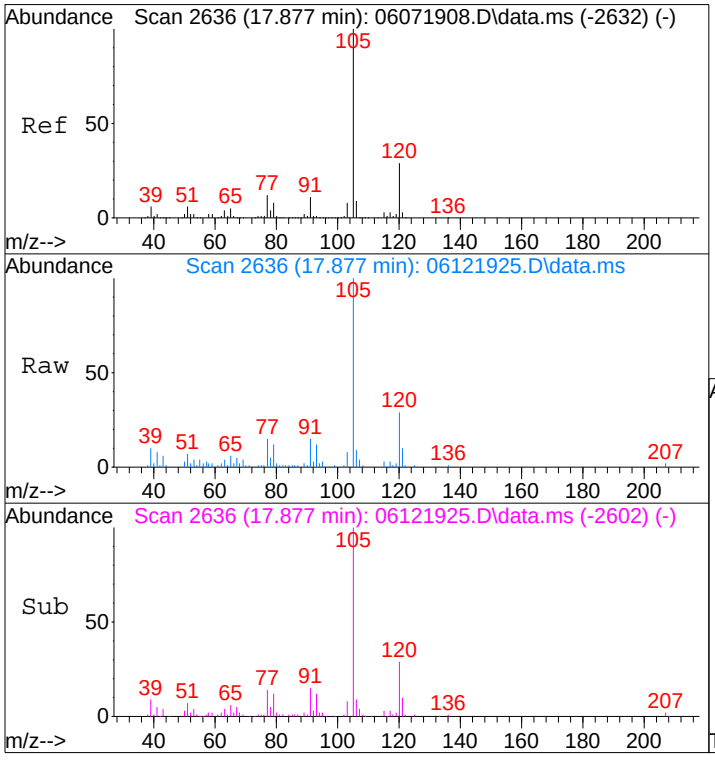


#76
n-Propylbenzene
Concen: 0.51 ng
RT: 17.73 min Scan# 2609
Delta R.T. -0.005 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion: 91 Resp: 51853

Ion	Ratio	Lower	Upper
91	100		
120	21.0	1.9	41.9
65	19.7	0.0	30.6

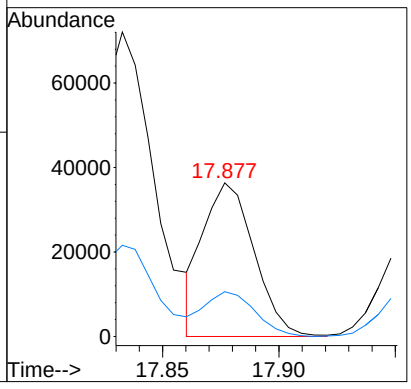


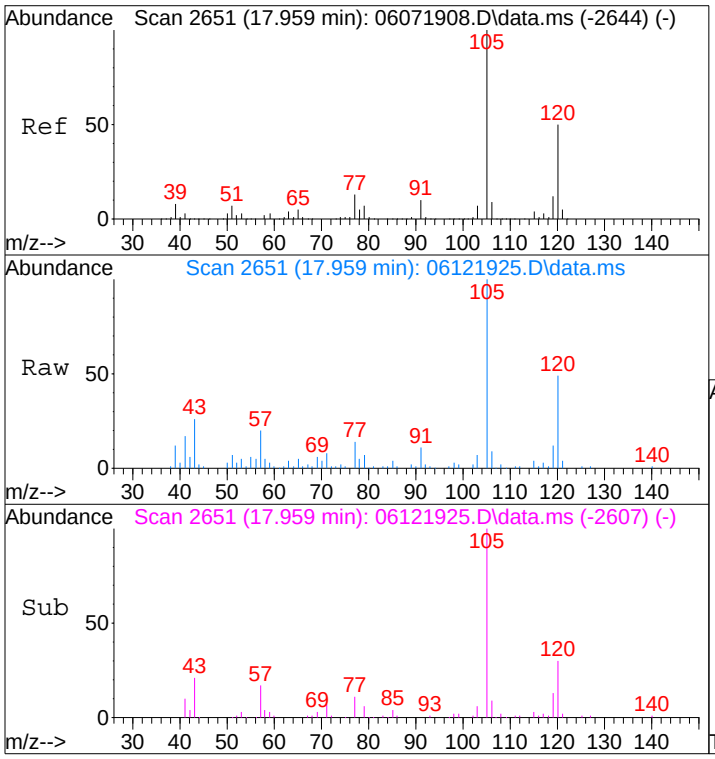


#78
4-Ethyltoluene
Concen: 0.71 ng
RT: 17.88 min Scan# 2636
Delta R.T. -0.011 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion:105 Resp: 55504

Ion	Ratio	Lower	Upper
105	100		
120	29.2	8.0	48.0

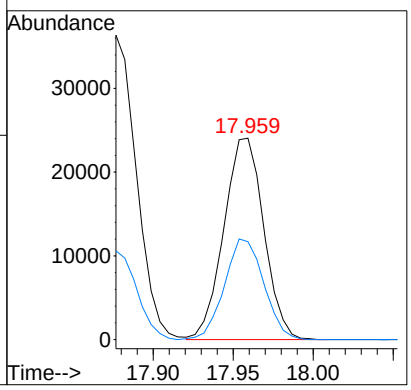


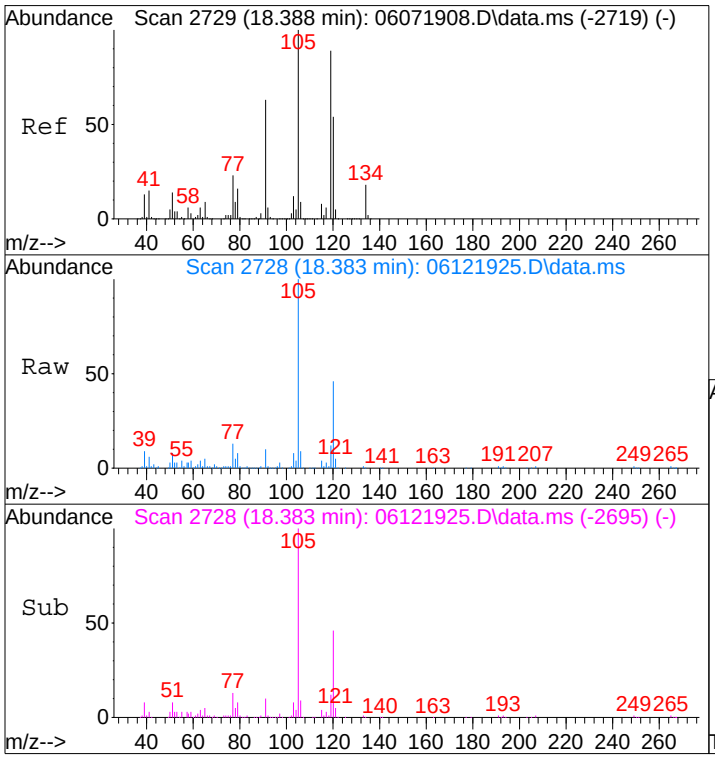


#79
1,3,5-Trimethylbenzene
Concen: 0.61 ng
RT: 17.96 min Scan# 2651
Delta R.T. -0.005 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion:105 Resp: 41839

Ion	Ratio	Lower	Upper
105	100		
120	49.0	29.5	69.5

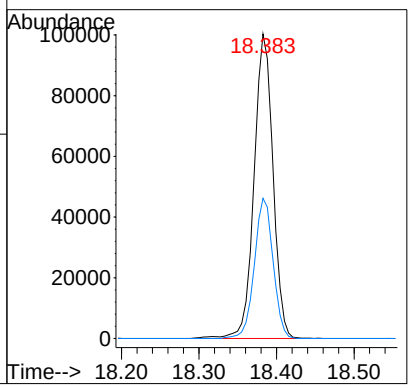


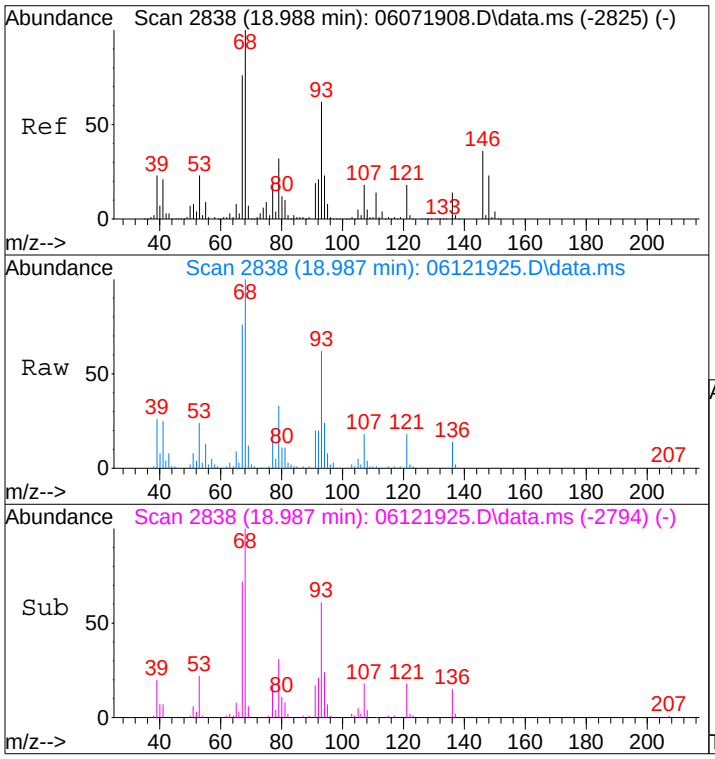


#82
1,2,4-Trimethylbenzene
Concen: 2.45 ng
RT: 18.38 min Scan# 2728
Delta R.T. -0.016 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

Tgt Ion:105 Resp: 170363

Ion	Ratio	Lower	Upper
105	100		
120	45.5	34.0	74.0

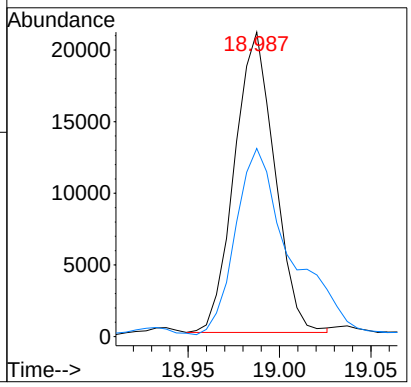




#91
d-Limonene
Concen: 1.08 ng
RT: 18.99 min Scan# 2838
Delta R.T. -0.005 min
Lab File: 06121925.D
Acq: 12 Jun 2019 19:39

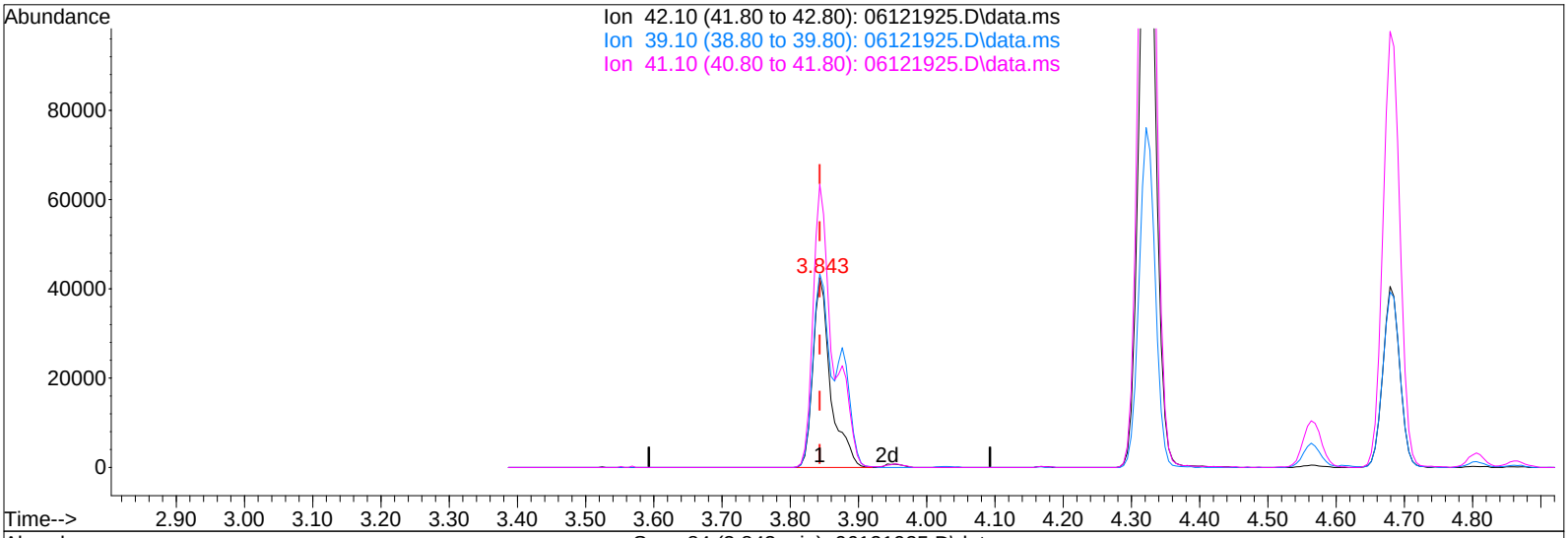
Tgt Ion: 68 Resp: 32011

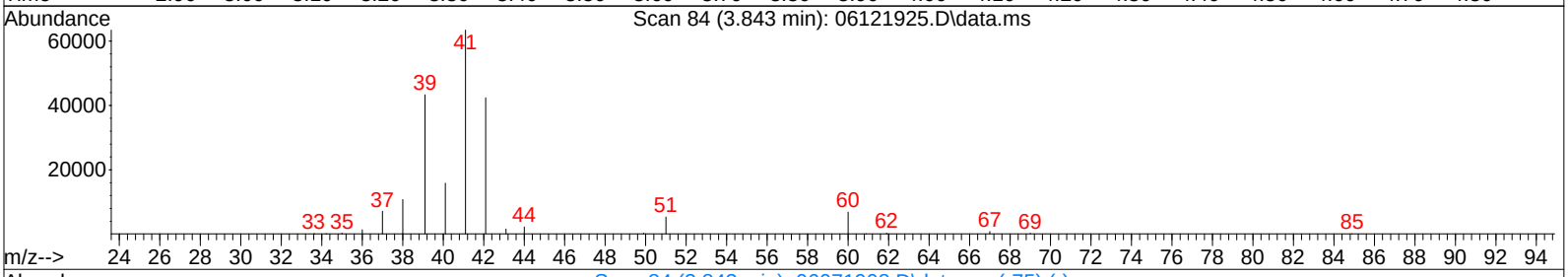
Ion	Ratio	Lower	Upper
68	100		
93	88.7	43.1	83.1#

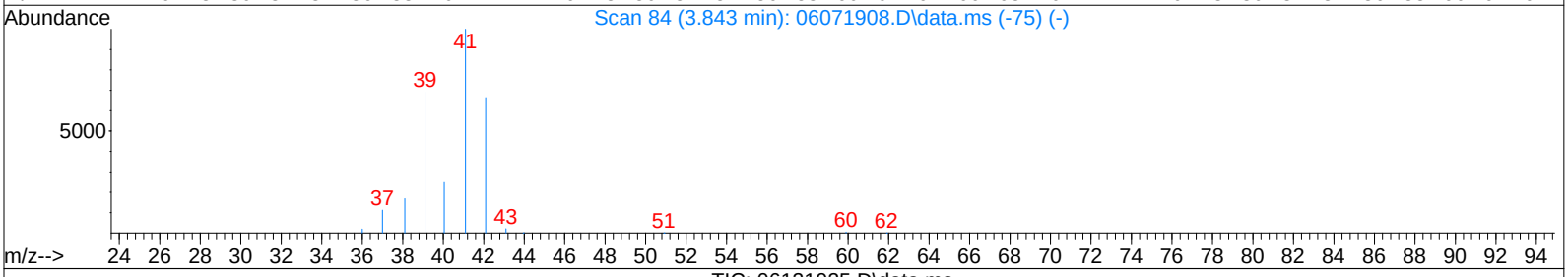


Data File: I:\MS09\Data\2019 06\12\06121925.D
Acq On : 12 Jun 2019 19:39 Operator: SC
Sample : P1903177-004 (1000mL)
Misc : S31-05131901
ALS Vial : 10 Sample Multiplier: 1

Quant Time: Jun 13 08:52:11 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M







TIC: 06121925.D\data.ms

(2) Propene (T)

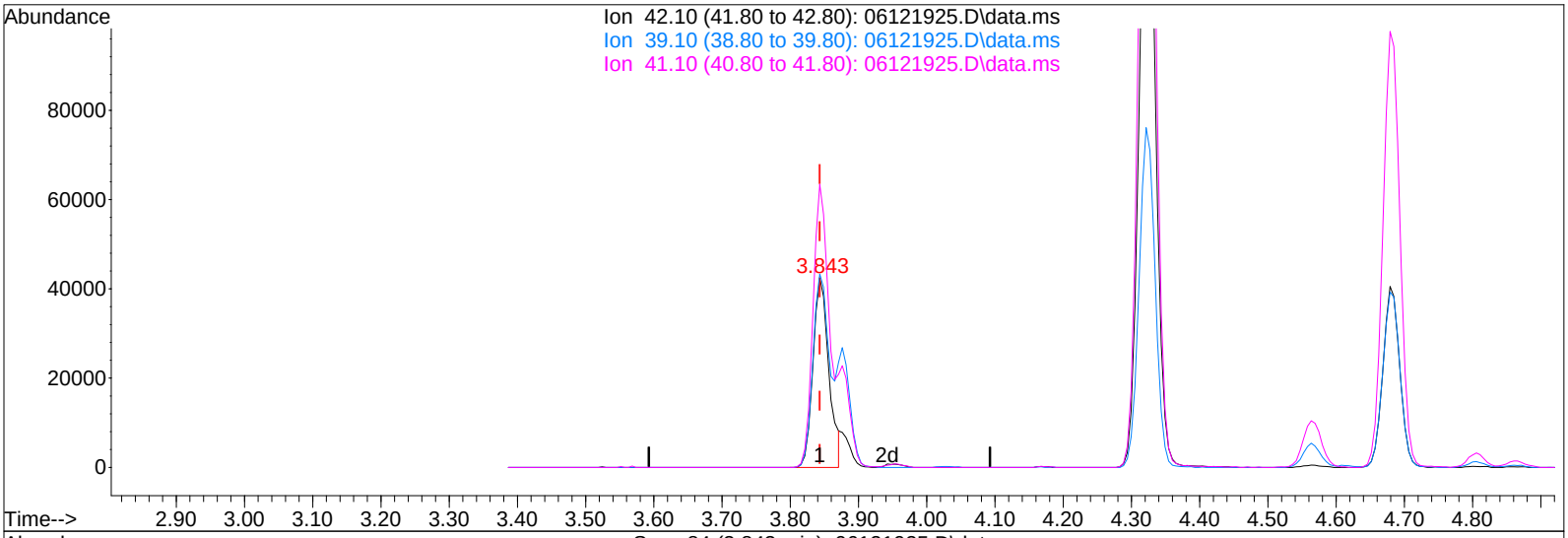
3.843min (+0.000) 3.51ng

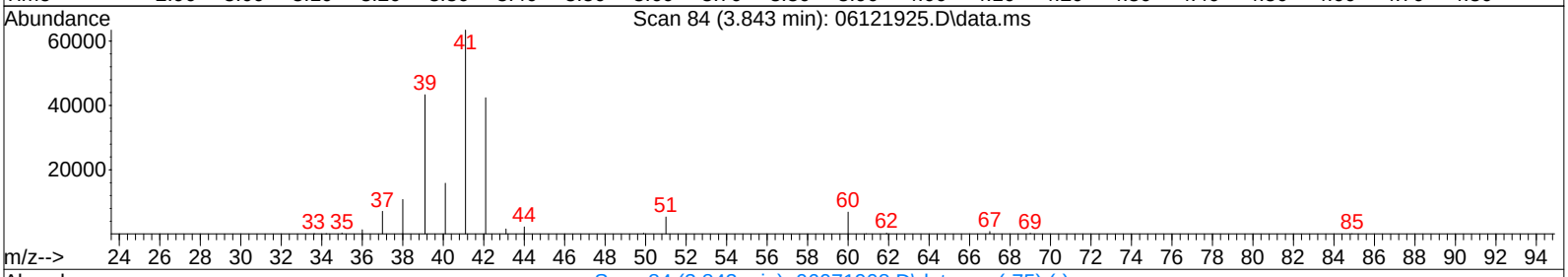
response 75983

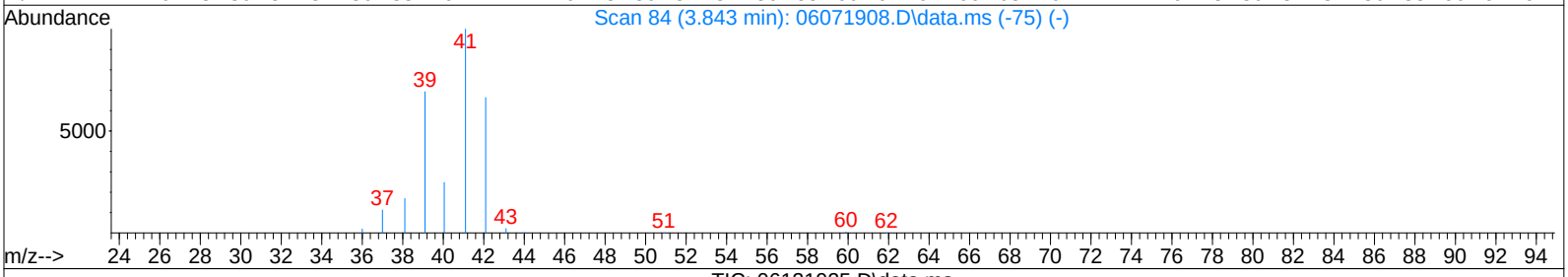
Ion	Exp%	Act%
42.10	100	100
39.10	104.80	96.87
41.10	150.30	171.59#
0.00	0.00	0.00

Data File: I:\MS09\Data\2019 06\12\06121925.D
Acq On : 12 Jun 2019 19:39 Operator: SC
Sample : P1903177-004 (1000mL)
Misc : S31-05131901
ALS Vial : 10 Sample Multiplier: 1

Quant Time: Jun 13 08:52:11 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M







TIC: 06121925.D\data.ms

(2) Propene (T)

3.843min (+0.000) 3.16ng m

response 68425

Ion	Exp%	Act%
42.10	100	100
39.10	104.80	107.56
41.10	150.30	190.54#
0.00	0.00	0.00

IPC

6/13/19

6/14/19

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\12\06121904.D
Acq On : 12 Jun 2019 7:21 Operator: SC
Sample : MB R9061219 1000mL
Misc : S31-05131901/AC00463
ALS Vial : 2 Sample Multiplier: 1

6/12/19

Quant Time: Jun 12 09:10:22 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	181881	12.500	ng		-0.04
37) 1,4-Difluorobenzene (IS2)	11.11	114	846947	12.500	ng		-0.02
56) Chlorobenzene-d5 (IS3)	15.46	82	438055	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.91	65	338101	12.755	ng		-0.03
Spiked Amount 12.500	Range 70 - 130		Recovery = 102.00%				
57) Toluene-d8 (SS2)	13.55	98	1024873	12.543	ng		-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 100.32%				
73) Bromofluorobenzene (SS3)	17.05	174	271075	12.367	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 98.96%				
Target Compounds							Qvalue
2) Propene	0.00	42	0	N.D. d			
3) Dichlorodifluoromethan...	0.00	85	0	N.D.			
4) Chloromethane	0.00	50	0	N.D.			
5) 1,2-Dichloro-1,1,2,2-t...	0.00	135	0	N.D.			
6) Vinyl Chloride	0.00	62	0	N.D.			
7) 1,3-Butadiene	0.00	54	0	N.D.			
8) Bromomethane	0.00	94	0	N.D.			
9) Chloroethane	0.00	64	0	N.D.			
10) Ethanol	5.35	45	2304m	0.128	ng		
11) Acetonitrile	5.56	41	1494	0.034	ng	#	49
12) Acrolein	5.71	56	765	0.054	ng		99
13) Acetone	5.86	58	9474	0.593	ng		89
14) Trichlorofluoromethane	0.00	101	0	N.D.			
15) 2-Propanol (Isopropanol)	6.18	45	560	0.010	ng		75
16) Acrylonitrile	0.00	53	0	N.D. d			
17) 1,1-Dichloroethene	0.00	96	0	N.D.			
18) 2-Methyl-2-Propanol (t...	0.00	59	0	N.D. d			
19) Methylene Chloride	0.00	84	0	N.D.			
20) 3-Chloro-1-propene (Al...	0.00	41	0	N.D.			
21) Trichlorotrifluoroethane	0.00	151	0	N.D.			
22) Carbon Disulfide	0.00	76	0	N.D. d			
23) trans-1,2-Dichloroethene	0.00	61	0	N.D.			
24) 1,1-Dichloroethane	0.00	63	0	N.D.			
25) Methyl tert-Butyl Ether	0.00	73	0	N.D.			
26) Vinyl Acetate	8.25	86	759	0.170	ng	#	42
27) 2-Butanone (MEK)	8.55	72	551	0.036	ng	#	55
28) cis-1,2-Dichloroethene	0.00	61	0	N.D.			
29) Diisopropyl Ether	0.00	87	0	N.D.			
30) Ethyl Acetate	0.00	61	0	N.D.			
31) n-Hexane	0.00	57	0	N.D.			
32) Chloroform	0.00	83	0	N.D.			
34) Tetrahydrofuran (THF)	9.73	72	292	0.021	ng	#	81
35) Ethyl tert-Butyl Ether	0.00	87	0	N.D.			
36) 1,2-Dichloroethane	0.00	62	0	N.D.			
38) 1,1,1-Trichloroethane	0.00	97	0	N.D.			
39) Isopropyl Acetate	0.00	61	0	N.D.			
40) 1-Butanol	0.00	56	0	N.D. d			
41) Benzene	10.75	78	2320	0.027	ng		87
42) Carbon Tetrachloride	0.00	117	0	N.D.			
43) Cyclohexane	0.00	84	0	N.D. d			
44) tert-Amyl Methyl Ether	0.00	73	0	N.D.			
45) 1,2-Dichloropropane	0.00	63	0	N.D.			
46) Bromodichloromethane	0.00	83	0	N.D.			
47) Trichloroethene	0.00	130	0	N.D.			
48) 1,4-Dioxane	0.00	88	0	N.D.			
49) 2,2,4-Trimethylpentane...	0.00	57	0	N.D.			

Data File: I:\MS09\Data\2019 06\12\06121904.D
Acq On : 12 Jun 2019 7:21 Operator: SC
Sample : MB R9061219 1000mL
Misc : S31-05131901/AC00463
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 12 09:10:22 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

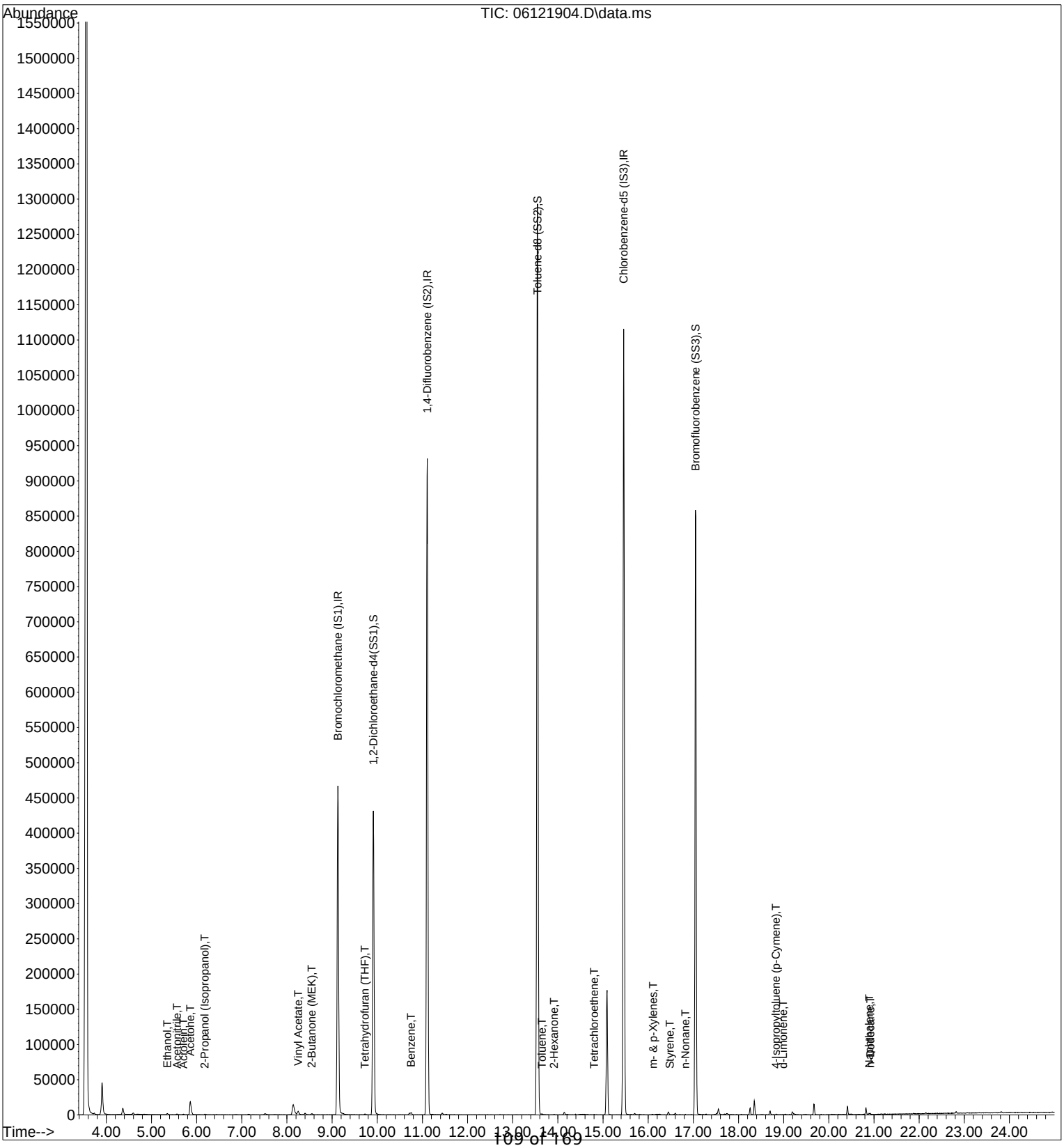
Internal Standards	R.T.	QIon	Response	Conc Units		Dev(Min)
50) Methyl Methacrylate	0.00	100	0	N.D.		
51) n-Heptane	0.00	71	0	N.D.		
52) cis-1,3-Dichloropropene	0.00	75	0	N.D.		
53) 4-Methyl-2-pentanone	0.00	58	0	N.D.		
54) trans-1,3-Dichloropropene	0.00	75	0	N.D.		
55) 1,1,2-Trichloroethane	0.00	97	0	N.D.		
58) Toluene	13.65	91	771	0.009 ng		90
59) 2-Hexanone	13.92	43	523	0.010 ng	#	58
60) Dibromochloromethane	0.00	129	0	N.D.		
61) 1,2-Dibromoethane	0.00	107	0	N.D.		
62) n-Butyl Acetate	0.00	43	0	N.D. d		
63) n-Octane	0.00	57	0	N.D.		
64) Tetrachloroethene	14.80	166	149	0.008 ng		95
65) Chlorobenzene	0.00	112	0	N.D.		
66) Ethylbenzene	0.00	91	0	N.D. d		
67) m- & p-Xylenes	16.11	91	640	0.009 ng	#	57
68) Bromoform	0.00	173	0	N.D.		
69) Styrene	16.48	104	263	0.005 ng	#	31
70) o-Xylene	0.00	91	0	N.D. d		
71) n-Nonane	16.83	43	237	0.005 ng	#	63
72) 1,1,2,2-Tetrachloroethane	0.00	83	0	N.D.		
74) Cumene	0.00	105	0	N.D. d		
75) alpha-Pinene	0.00	93	0	N.D.		
76) n-Propylbenzene	0.00	91	0	N.D. d		
77) 3-Ethyltoluene	0.00	105	0	N.D. d		
78) 4-Ethyltoluene	0.00	105	0	N.D. d		
79) 1,3,5-Trimethylbenzene	0.00	105	0	N.D. d		
80) alpha-Methylstyrene	0.00	118	0	N.D.		
81) 2-Ethyltoluene	0.00	105	0	N.D. d		
82) 1,2,4-Trimethylbenzene	0.00	105	0	N.D. d		
83) n-Decane	0.00	57	0	N.D. d		
84) Benzyl Chloride	0.00	91	0	N.D. d		
85) 1,3-Dichlorobenzene	0.00	146	0	N.D. d		
86) 1,4-Dichlorobenzene	0.00	146	0	N.D. d		
87) sec-Butylbenzene	0.00	105	0	N.D.		
88) 4-Isopropyltoluene (p-...	18.83	119	233	0.003 ng	#	1
89) 1,2,3-Trimethylbenzene	0.00	105	0	N.D.		
90) 1,2-Dichlorobenzene	0.00	146	0	N.D.		
91) d-Limonene	18.99	68	181	0.006 ng		96
92) 1,2-Dibromo-3-Chloropr...	0.00	157	0	N.D.		
93) n-Undecane	0.00	57	0	N.D. d		
94) 1,2,4-Trichlorobenzene	0.00	180	0	N.D. d		
95) Naphthalene	20.90	128	1595	0.019 ng	#	71
96) n-Dodecane	20.92	57	475	0.012 ng	#	63
97) Hexachlorobutadiene	0.00	225	0	N.D.		
98) Cyclohexanone	0.00	55	0	N.D. d		
99) tert-Butylbenzene	0.00	119	0	N.D. d		
100) n-Butylbenzene	0.00	91	0	N.D. d		

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\12\06121904.D
Acq On : 12 Jun 2019 7:21 Operator: SC
Sample : MB R9061219 1000mL
Misc : S31-05131901/AC00463
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 12 09:10:22 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\13\06131904.D
Acq On : 13 Jun 2019 7:21 Operator: SC
Sample : MB R9061319 1000mL
Misc : S31-05131901/AC00463
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 13 09:35:06 2019 6/13/19
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc Units		Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	171243	12.500 ng		-0.04
37) 1,4-Difluorobenzene (IS2)	11.11	114	795421	12.500 ng		-0.02
56) Chlorobenzene-d5 (IS3)	15.46	82	417260	12.500 ng		0.00
System Monitoring Compounds						
33) 1,2-Dichloroethane-d4(...	9.91	65	326721	13.091 ng		-0.03
Spiked Amount 12.500	Range 70 - 130		Recovery = 104.72%			
57) Toluene-d8 (SS2)	13.55	98	964654	12.394 ng		-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 99.12%			
73) Bromofluorobenzene (SS3)	17.05	174	251793	12.060 ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 96.48%			
Target Compounds						Qvalue
2) Propene	0.00	42	0	N.D. d		
3) Dichlorodifluoromethan...	0.00	85	0	N.D.		
4) Chloromethane	0.00	50	0	N.D.		
5) 1,2-Dichloro-1,1,2,2-t...	0.00	135	0	N.D.		
6) Vinyl Chloride	0.00	62	0	N.D.		
7) 1,3-Butadiene	0.00	54	0	N.D.		
8) Bromomethane	0.00	94	0	N.D.		
9) Chloroethane	0.00	64	0	N.D.		
10) Ethanol	5.36	45	2126m	0.125 ng		
11) Acetonitrile	5.56	41	1353	0.033 ng		73
12) Acrolein	5.72	56	605	0.045 ng		87
13) Acetone	5.86	58	7819	0.520 ng		94
14) Trichlorofluoromethane	0.00	101	0	N.D.		
15) 2-Propanol (Isopropanol)	0.00	45	0	N.D. d		
16) Acrylonitrile	0.00	53	0	N.D. d		
17) 1,1-Dichloroethene	0.00	96	0	N.D.		
18) 2-Methyl-2-Propanol (t...	0.00	59	0	N.D. d		
19) Methylene Chloride	0.00	84	0	N.D.		
20) 3-Chloro-1-propene (Al...	0.00	41	0	N.D.		
21) Trichlorotrifluoroethane	0.00	151	0	N.D.		
22) Carbon Disulfide	0.00	76	0	N.D. d		
23) trans-1,2-Dichloroethene	0.00	61	0	N.D.		
24) 1,1-Dichloroethane	0.00	63	0	N.D.		
25) Methyl tert-Butyl Ether	0.00	73	0	N.D.		
26) Vinyl Acetate	8.25	86	563	0.134 ng	#	60
27) 2-Butanone (MEK)	8.55	72	416	0.029 ng	#	26
28) cis-1,2-Dichloroethene	0.00	61	0	N.D.		
29) Diisopropyl Ether	0.00	87	0	N.D.		
30) Ethyl Acetate	0.00	61	0	N.D.		
31) n-Hexane	0.00	57	0	N.D.		
32) Chloroform	0.00	83	0	N.D.		
34) Tetrahydrofuran (THF)	9.73	72	199	0.015 ng	#	58
35) Ethyl tert-Butyl Ether	0.00	87	0	N.D.		
36) 1,2-Dichloroethane	0.00	62	0	N.D.		
38) 1,1,1-Trichloroethane	0.00	97	0	N.D.		
39) Isopropyl Acetate	0.00	61	0	N.D.		
40) 1-Butanol	10.72	56	1552	0.065 ng	#	70
41) Benzene	10.76	78	2026	0.025 ng		91
42) Carbon Tetrachloride	0.00	117	0	N.D.		
43) Cyclohexane	0.00	84	0	N.D. d		
44) tert-Amyl Methyl Ether	0.00	73	0	N.D.		
45) 1,2-Dichloropropane	0.00	63	0	N.D.		
46) Bromodichloromethane	0.00	83	0	N.D.		
47) Trichloroethene	0.00	130	0	N.D.		
48) 1,4-Dioxane	0.00	88	0	N.D.		
49) 2,2,4-Trimethylpentane...	0.00	57	0	N.D.		

Data File: I:\MS09\Data\2019 06\13\06131904.D
Acq On : 13 Jun 2019 7:21 Operator: SC
Sample : MB R9061319 1000mL
Misc : S31-05131901/AC00463
ALS Vial : 2 Sample Multiplier: 1

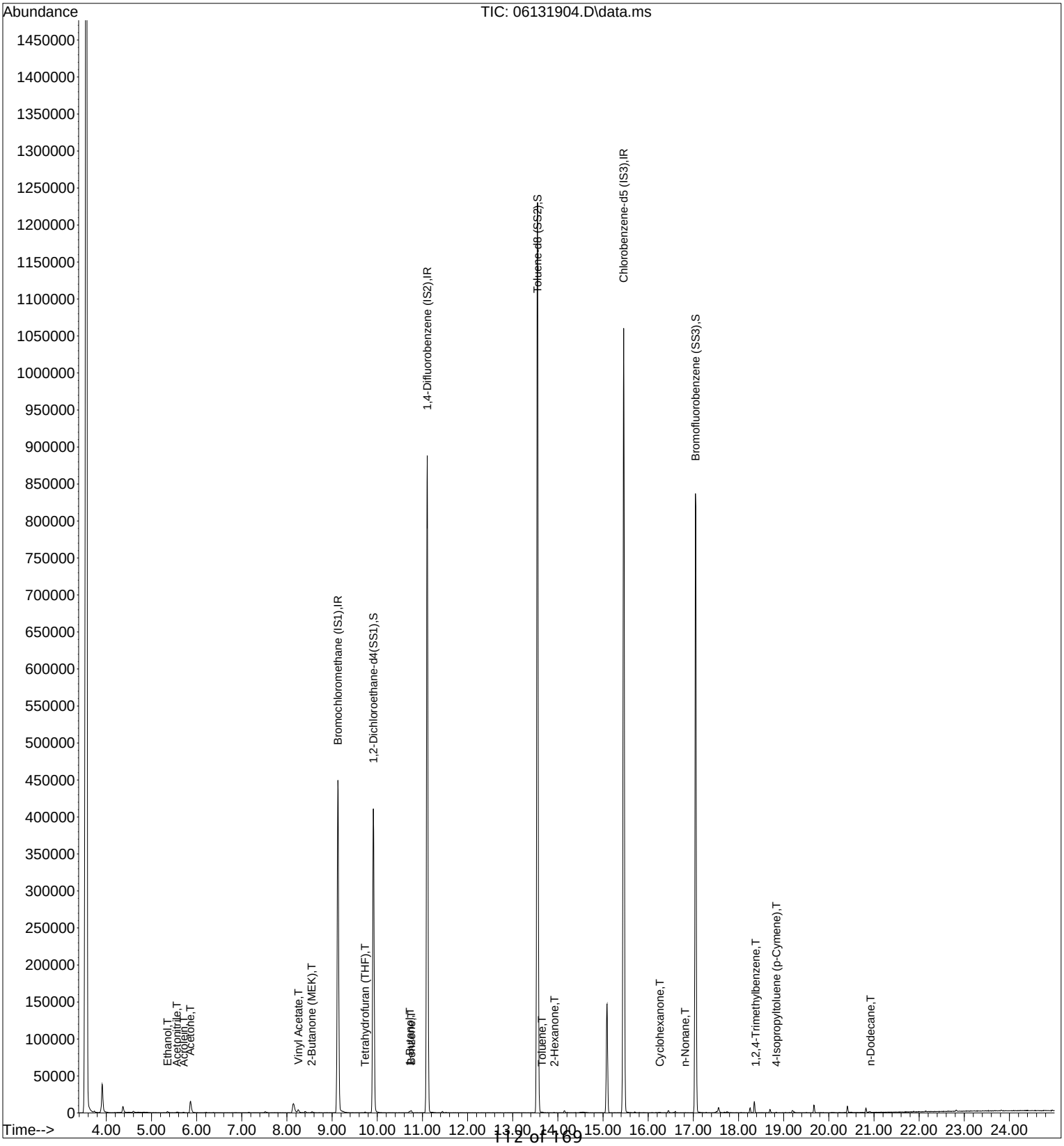
Quant Time: Jun 13 09:35:06 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc Units		Dev(Min)
50) Methyl Methacrylate	0.00	100	0	N.D.		
51) n-Heptane	0.00	71	0	N.D.		
52) cis-1,3-Dichloropropene	0.00	75	0	N.D.		
53) 4-Methyl-2-pentanone	0.00	58	0	N.D.		
54) trans-1,3-Dichloropropene	0.00	75	0	N.D.		
55) 1,1,2-Trichloroethane	0.00	97	0	N.D.		
58) Toluene	13.65	91	564	0.007 ng		91
59) 2-Hexanone	13.92	43	475	0.009 ng	#	58
60) Dibromochloromethane	0.00	129	0	N.D.		
61) 1,2-Dibromoethane	0.00	107	0	N.D.		
62) n-Butyl Acetate	0.00	43	0	N.D. d		
63) n-Octane	0.00	57	0	N.D.		
64) Tetrachloroethene	0.00	166	0	N.D.		
65) Chlorobenzene	0.00	112	0	N.D.		
66) Ethylbenzene	0.00	91	0	N.D. d		
67) m- & p-Xylenes	0.00	91	0	N.D. d		
68) Bromoform	0.00	173	0	N.D.		
69) Styrene	0.00	104	0	N.D. d		
70) o-Xylene	0.00	91	0	N.D. d		
71) n-Nonane	16.82	43	195	0.004 ng	#	18
72) 1,1,2,2-Tetrachloroethane	0.00	83	0	N.D.		
74) Cumene	0.00	105	0	N.D. d		
75) alpha-Pinene	0.00	93	0	N.D.		
76) n-Propylbenzene	0.00	91	0	N.D. d		
77) 3-Ethyltoluene	0.00	105	0	N.D. d		
78) 4-Ethyltoluene	0.00	105	0	N.D. d		
79) 1,3,5-Trimethylbenzene	0.00	105	0	N.D. d		
80) alpha-Methylstyrene	0.00	118	0	N.D.		
81) 2-Ethyltoluene	0.00	105	0	N.D.		
82) 1,2,4-Trimethylbenzene	18.38	105	174	0.003 ng	#	25
83) n-Decane	0.00	57	0	N.D. d		
84) Benzyl Chloride	0.00	91	0	N.D. d		
85) 1,3-Dichlorobenzene	0.00	146	0	N.D.		
86) 1,4-Dichlorobenzene	0.00	146	0	N.D.		
87) sec-Butylbenzene	0.00	105	0	N.D.		
88) 4-Isopropyltoluene (p-...	18.84	119	222	0.003 ng	#	7
89) 1,2,3-Trimethylbenzene	0.00	105	0	N.D.		
90) 1,2-Dichlorobenzene	0.00	146	0	N.D.		
91) d-Limonene	0.00	68	0	N.D. d		
92) 1,2-Dibromo-3-Chloropr...	0.00	157	0	N.D.		
93) n-Undecane	0.00	57	0	N.D. d		
94) 1,2,4-Trichlorobenzene	0.00	180	0	N.D.		
95) Naphthalene	0.00	128	0	N.D. d		
96) n-Dodecane	20.92	57	370	0.009 ng	#	34
97) Hexachlorobutadiene	0.00	225	0	N.D.		
98) Cyclohexanone	16.26	55	386	0.011 ng	#	70
99) tert-Butylbenzene	0.00	119	0	N.D. d		
100) n-Butylbenzene	0.00	91	0	N.D. d		

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Data File: I:\MS09\Data\2019 06\13\06131904.D
Acq On : 13 Jun 2019 7:21 Operator: SC
Sample : MB R9061319 1000mL
Misc : S31-05131901/AC00463
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 13 09:35:06 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\12\06121905.D
Acq On : 12 Jun 2019 7:54 Operator: SC
Sample : LCS R9061219 25ng
Misc : S31-05131901/S31-05241901 (6/22)
ALS Vial : 2 Sample Multiplier: 1

6/12/19

Quant Time: Jun 12 09:13:07 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.16	130	188479	12.500	ng		-0.02
37) 1,4-Difluorobenzene (IS2)	11.12	114	844497	12.500	ng		-0.01
56) Chlorobenzene-d5 (IS3)	15.46	82	445152	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.93	65	344457	12.540	ng		-0.02
Spiked Amount 12.500	Range 70 - 130		Recovery = 100.32%				
57) Toluene-d8 (SS2)	13.55	98	1027311	12.372	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 98.96%				
73) Bromofluorobenzene (SS3)	17.05	174	273139	12.263	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 98.08%				
Target Compounds							Qvalue
2) Propene	3.84	42	649802	26.885	ng		100
3) Dichlorodifluoromethan...	3.96	85	873413	24.664	ng		100
4) Chloromethane	4.16	50	851084	26.658	ng		100
5) 1,2-Dichloro-1,1,2,2-t...	4.33	135	395196	24.654	ng		99
6) Vinyl Chloride	4.44	62	769168	25.678	ng		100
7) 1,3-Butadiene	4.62	54	601047	27.343	ng		100
8) Bromomethane	4.93	94	413020	25.569	ng		100
9) Chloroethane	5.15	64	386511	25.374	ng		100
10) Ethanol	5.39	45	2265427	121.165	ng		100
11) Acetonitrile	5.58	41	1162790	25.450	ng		100
12) Acrolein	5.71	56	349433	23.688	ng		100
13) Acetone	5.85	58	2073681	125.324	ng		98
14) Trichlorofluoromethane	6.02	101	746643	25.099	ng		100
15) 2-Propanol (Isopropanol)	6.18	45	3042480	50.040	ng		100
16) Acrylonitrile	6.38	53	773743	25.091	ng		100
17) 1,1-Dichloroethene	6.72	96	450685	25.374	ng		98
18) 2-Methyl-2-Propanol (t...	6.83	59	2772759	53.095	ng		99
19) Methylene Chloride	6.88	84	485260	25.173	ng		98
20) 3-Chloro-1-propene (Al...	7.01	41	942749	26.530	ng		99
21) Trichlorotrifluoroethane	7.19	151	348597	25.095	ng		100
22) Carbon Disulfide	7.15	76	1866022	25.009	ng		100
23) trans-1,2-Dichloroethene	7.90	61	768144	25.293	ng		99
24) 1,1-Dichloroethane	8.12	63	942190	25.629	ng		100
25) Methyl tert-Butyl Ether	8.18	73	1509367	26.621	ng		100
26) Vinyl Acetate	8.29	86	596818	129.297	ng		97
27) 2-Butanone (MEK)	8.52	72	362578	22.763	ng		97
28) cis-1,2-Dichloroethene	8.99	61	732178	24.928	ng		100
29) Diisopropyl Ether	9.22	87	405923	27.194	ng	#	97
30) Ethyl Acetate	9.22	61	420748	53.026	ng		99
31) n-Hexane	9.23	57	970114	25.646	ng		100
32) Chloroform	9.30	83	816799	25.455	ng		100
34) Tetrahydrofuran (THF)	9.67	72	353225	24.902	ng		98
35) Ethyl tert-Butyl Ether	9.77	87	556199	26.286	ng		99
36) 1,2-Dichloroethane	10.04	62	660285	25.122	ng		100
38) 1,1,1-Trichloroethane	10.30	97	704801	25.526	ng		100
39) Isopropyl Acetate	10.67	61	704388	51.443	ng		99
40) 1-Butanol	10.68	56	1289361	51.235	ng		97
41) Benzene	10.76	78	2005894	23.158	ng		100
42) Carbon Tetrachloride	10.91	117	599417	24.989	ng		100
43) Cyclohexane	11.04	84	1530133	49.966	ng		99
44) tert-Amyl Methyl Ether	11.36	73	1403642	26.773	ng		100
45) 1,2-Dichloropropane	11.58	63	544890	25.736	ng		100
46) Bromodichloromethane	11.76	83	666456	26.352	ng		100
47) Trichloroethene	11.82	130	476339	25.384	ng		99
48) 1,4-Dioxane	11.78	88	411777	25.220	ng		100
49) 2,2,4-Trimethylpentane...	11.88	57	2369602	25.294	ng		99

Data File: I:\MS09\Data\2019 06\12\06121905.D
Acq On : 12 Jun 2019 7:54 Operator: SC
Sample : LCS R9061219 25ng
Misc : S31-05131901/S31-05241901 (6/22)
ALS Vial : 2 Sample Multiplier: 1

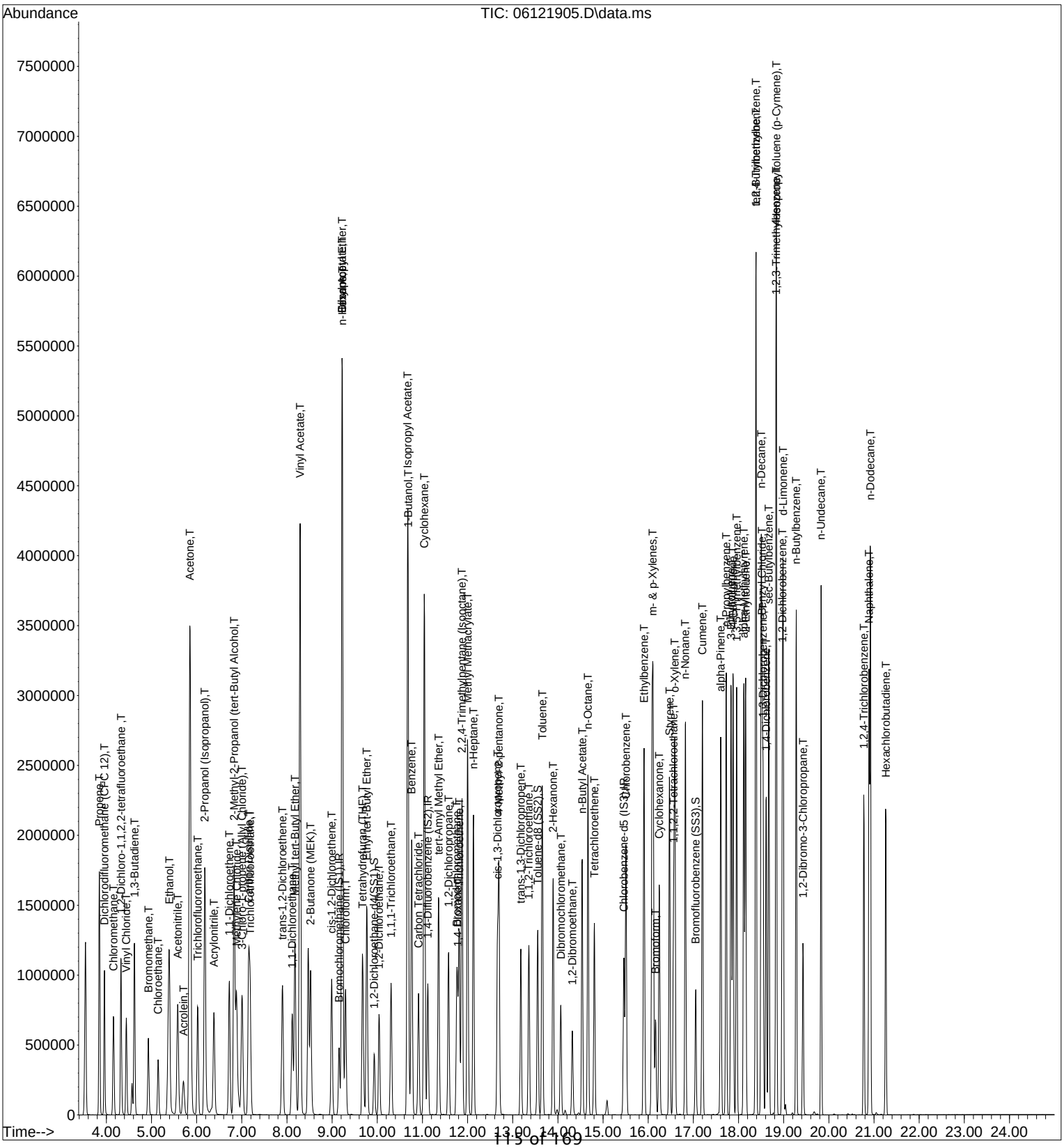
Quant Time: Jun 12 09:13:07 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
50) Methyl Methacrylate	12.00	100	392512	54.371 ng	99
51) n-Heptane	12.13	71	540169	25.811 ng	99
52) cis-1,3-Dichloropropene	12.66	75	860535	26.663 ng	100
53) 4-Methyl-2-pentanone	12.69	58	544472	26.654 ng	99
54) trans-1,3-Dichloropropene	13.18	75	785008	27.206 ng	100
55) 1,1,2-Trichloroethane	13.36	97	462478	25.896 ng	99
58) Toluene	13.65	91	1989332	24.045 ng	100
59) 2-Hexanone	13.90	43	1379050	25.817 ng	99
60) Dibromochloromethane	14.07	129	511650	26.183 ng	100
61) 1,2-Dibromoethane	14.32	107	505652	25.588 ng	100
62) n-Butyl Acetate	14.54	43	1580686	26.747 ng	100
63) n-Octane	14.67	57	499620	25.331 ng	100
64) Tetrachloroethene	14.81	166	468812	24.849 ng	100
65) Chlorobenzene	15.51	112	1243861	24.755 ng	100
66) Ethylbenzene	15.91	91	2278897	24.548 ng	99
67) m- & p-Xylenes	16.10	91	3513353	49.128 ng	99
68) Bromoform	16.16	173	391928	26.707 ng	99
69) Styrene	16.47	104	1380814	26.259 ng	100
70) o-Xylene	16.59	91	1762167	25.015 ng	100
71) n-Nonane	16.82	43	1239144	25.315 ng	100
72) 1,1,2,2-Tetrachloroethane	16.56	83	839578	24.228 ng	100
74) Cumene	17.20	105	2197152	25.017 ng	100
75) alpha-Pinene	17.61	93	1189755	26.275 ng	99
76) n-Propylbenzene	17.73	91	2763582	25.560 ng	100
77) 3-Ethyltoluene	17.83	105	2100063	24.149 ng	100
78) 4-Ethyltoluene	17.88	105	2204748	26.887 ng	100
79) 1,3,5-Trimethylbenzene	17.96	105	1791129	24.801 ng	100
80) alpha-Methylstyrene	18.12	118	999470	29.200 ng	99
81) 2-Ethyltoluene	18.16	105	2133647	25.128 ng	100
82) 1,2,4-Trimethylbenzene	18.39	105	1869084	25.532 ng	100
83) n-Decane	18.50	57	1223569	25.841 ng	100
84) Benzyl Chloride	18.52	91	1772755	28.661 ng	100
85) 1,3-Dichlorobenzene	18.54	146	971840	25.241 ng	100
86) 1,4-Dichlorobenzene	18.61	146	978860	25.212 ng	100
87) sec-Butylbenzene	18.67	105	2425990	25.046 ng	100
88) 4-Isopropyltoluene (p-...	18.84	119	2269488	25.279 ng	100
89) 1,2,3-Trimethylbenzene	18.83	105	1913494	26.085 ng	100
90) 1,2-Dichlorobenzene	18.97	146	940124	25.288 ng	100
91) d-Limonene	18.99	68	880080	28.162 ng	100
92) 1,2-Dibromo-3-Chloropr...	19.43	157	341242	26.559 ng	99
93) n-Undecane	19.83	57	1293991	26.453 ng	100
94) 1,2,4-Trichlorobenzene	20.77	180	700602	26.854 ng	100
95) Naphthalene	20.89	128	2399743	27.748 ng	100
96) n-Dodecane	20.92	57	1324017	31.705 ng	100
97) Hexachlorobutadiene	21.26	225	416590	25.144 ng	99
98) Cyclohexanone	16.24	55	845985	23.120 ng	99
99) tert-Butylbenzene	18.39	119	1763017	25.239 ng	100
100) n-Butylbenzene	19.28	91	2082021	25.461 ng	100

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Data File: I:\MS09\Data\2019 06\12\06121905.D
Acq On : 12 Jun 2019 7:54 Operator: SC
Sample : LCS R9061219 25ng
Misc : S31-05131901/S31-05241901 (6/22)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 12 09:13:07 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\13\06131905.D
Acq On : 13 Jun 2019 7:55 Operator: SC
Sample : LCS R9061319 25ng
Misc : S31-05131901/S31-05241901 (6/22)
ALS Vial : 2 Sample Multiplier: 1

6/13/19

Quant Time: Jun 13 09:37:02 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.16	130	180652	12.500	ng		-0.02
37) 1,4-Difluorobenzene (IS2)	11.12	114	817398	12.500	ng		-0.01
56) Chlorobenzene-d5 (IS3)	15.46	82	434407	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.93	65	342751	13.018	ng		-0.02
Spiked Amount 12.500	Range 70 - 130		Recovery = 104.16%				
57) Toluene-d8 (SS2)	13.55	98	998477	12.322	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 98.56%				
73) Bromofluorobenzene (SS3)	17.05	174	265291	12.205	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 97.60%				
Target Compounds							Qvalue
2) Propene	3.84	42	627232	27.075	ng		100
3) Dichlorodifluoromethan...	3.95	85	834935	24.599	ng		100
4) Chloromethane	4.16	50	836044	27.322	ng		100
5) 1,2-Dichloro-1,1,2,2-t...	4.32	135	367182	23.899	ng		100
6) Vinyl Chloride	4.44	62	730504	25.444	ng		100
7) 1,3-Butadiene	4.62	54	569168	27.015	ng		99
8) Bromomethane	4.93	94	389618	25.165	ng		99
9) Chloroethane	5.15	64	366339	25.092	ng		100
10) Ethanol	5.39	45	2193214	122.385	ng		100
11) Acetonitrile	5.58	41	1127876	25.756	ng		100
12) Acrolein	5.71	56	332209	23.497	ng		99
13) Acetone	5.85	58	1980991	124.909	ng		100
14) Trichlorofluoromethane	6.02	101	705729	24.752	ng		100
15) 2-Propanol (Isopropanol)	6.18	45	2950376	50.627	ng		100
16) Acrylonitrile	6.38	53	742400	25.118	ng		100
17) 1,1-Dichloroethene	6.72	96	419309	24.630	ng		98
18) 2-Methyl-2-Propanol (t...	6.83	59	2652926	53.002	ng		100
19) Methylene Chloride	6.88	84	457890	24.782	ng		99
20) 3-Chloro-1-propene (Al...	7.01	41	910897	26.745	ng		100
21) Trichlorotrifluoroethane	7.19	151	323132	24.270	ng		99
22) Carbon Disulfide	7.15	76	1760471	24.617	ng		100
23) trans-1,2-Dichloroethene	7.90	61	734292	25.226	ng		99
24) 1,1-Dichloroethane	8.12	63	897656	25.475	ng		100
25) Methyl tert-Butyl Ether	8.18	73	1434623	26.399	ng		100
26) Vinyl Acetate	8.29	86	559258	126.409	ng	#	95
27) 2-Butanone (MEK)	8.52	72	344004	22.533	ng		100
28) cis-1,2-Dichloroethene	8.99	61	695406	24.702	ng		98
29) Diisopropyl Ether	9.22	87	381844	26.689	ng		98
30) Ethyl Acetate	9.22	61	395674	52.026	ng		99
31) n-Hexane	9.23	57	922202	25.435	ng		100
32) Chloroform	9.30	83	772637	25.122	ng		99
34) Tetrahydrofuran (THF)	9.68	72	330664	24.321	ng		99
35) Ethyl tert-Butyl Ether	9.77	87	525668	25.919	ng		99
36) 1,2-Dichloroethane	10.04	62	635970	25.246	ng		100
38) 1,1,1-Trichloroethane	10.30	97	668668	25.021	ng		100
39) Isopropyl Acetate	10.67	61	669645	50.527	ng		98
40) 1-Butanol	10.68	56	1227635	50.400	ng		99
41) Benzene	10.76	78	1887161	22.509	ng		100
42) Carbon Tetrachloride	10.91	117	568657	24.493	ng		100
43) Cyclohexane	11.04	84	1441501	48.632	ng		99
44) tert-Amyl Methyl Ether	11.36	73	1325055	26.112	ng		99
45) 1,2-Dichloropropane	11.58	63	518435	25.298	ng		99
46) Bromodichloromethane	11.76	83	631823	25.811	ng		100
47) Trichloroethene	11.82	130	443916	24.440	ng		99
48) 1,4-Dioxane	11.78	88	388247	24.568	ng		99
49) 2,2,4-Trimethylpentane...	11.88	57	2261752	24.943	ng		100

Data File: I:\MS09\Data\2019 06\13\06131905.D
Acq On : 13 Jun 2019 7:55 Operator: SC
Sample : LCS R9061319 25ng
Misc : S31-05131901/S31-05241901 (6/22)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 13 09:37:02 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

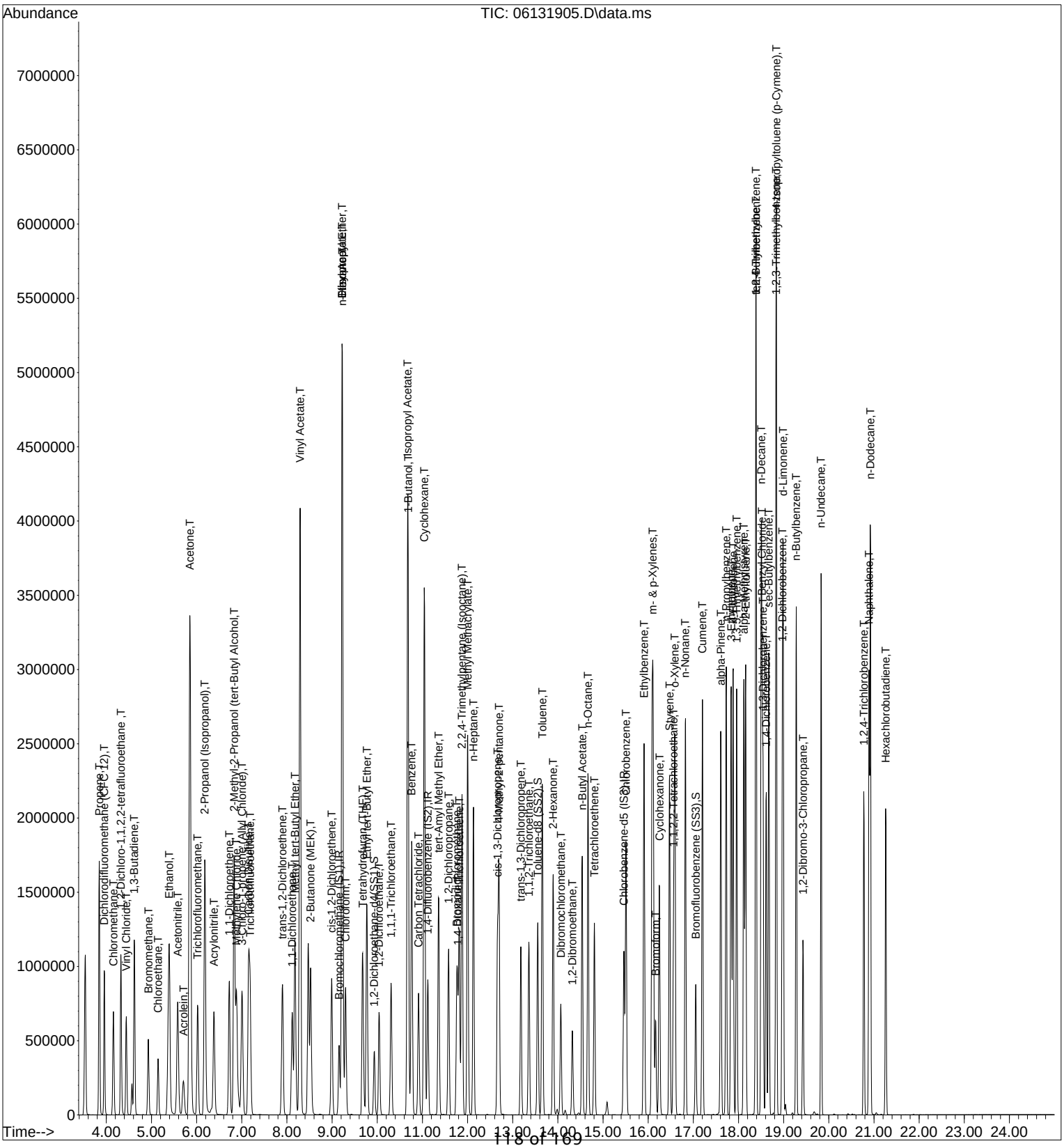
Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
50) Methyl Methacrylate	12.00	100	366363	52.431	ng	98
51) n-Heptane	12.13	71	510137	25.184	ng	100
52) cis-1,3-Dichloropropene	12.66	75	812311	26.003	ng	100
53) 4-Methyl-2-pentanone	12.70	58	517782	26.188	ng	99
54) trans-1,3-Dichloropropene	13.18	75	745876	26.707	ng	99
55) 1,1,2-Trichloroethane	13.36	97	432899	25.044	ng	100
58) Toluene	13.65	91	1869844	23.160	ng	100
59) 2-Hexanone	13.90	43	1331392	25.541	ng	100
60) Dibromochloromethane	14.07	129	477978	25.065	ng	100
61) 1,2-Dibromoethane	14.32	107	475935	24.680	ng	100
62) n-Butyl Acetate	14.54	43	1524925	26.442	ng	99
63) n-Octane	14.67	57	476272	24.745	ng	99
64) Tetrachloroethene	14.81	166	436918	23.731	ng	99
65) Chlorobenzene	15.51	112	1165740	23.774	ng	100
66) Ethylbenzene	15.91	91	2142945	23.655	ng	99
67) m- & p-Xylenes	16.10	91	3380042	48.433	ng	99
68) Bromoform	16.17	173	364870	25.478	ng	100
69) Styrene	16.47	104	1291840	25.175	ng	99
70) o-Xylene	16.59	91	1659108	24.134	ng	100
71) n-Nonane	16.82	43	1200544	25.133	ng	99
72) 1,1,2,2-Tetrachloroethane	16.56	83	795378	23.520	ng	100
74) Cumene	17.20	105	2060470	24.041	ng	100
75) alpha-Pinene	17.61	93	1120369	25.355	ng	99
76) n-Propylbenzene	17.73	91	2611992	24.755	ng	99
77) 3-Ethyltoluene	17.84	105	2082085	24.534	ng	96
78) 4-Ethyltoluene	17.88	105	1967319	24.585	ng	97
79) 1,3,5-Trimethylbenzene	17.96	105	1685983	23.922	ng	99
80) alpha-Methylstyrene	18.12	118	940782	28.165	ng	98
81) 2-Ethyltoluene	18.16	105	2009637	24.253	ng	100
82) 1,2,4-Trimethylbenzene	18.39	105	1762487	24.671	ng	100
83) n-Decane	18.50	57	1173685	25.401	ng	99
84) Benzyl Chloride	18.52	91	1682278	27.871	ng	99
85) 1,3-Dichlorobenzene	18.54	146	913338	24.308	ng	100
86) 1,4-Dichlorobenzene	18.61	146	915215	24.156	ng	100
87) sec-Butylbenzene	18.67	105	2292262	24.251	ng	100
88) 4-Isopropyltoluene (p-...	18.84	119	2134368	24.362	ng	99
89) 1,2,3-Trimethylbenzene	18.83	105	1808739	25.266	ng	100
90) 1,2-Dichlorobenzene	18.97	146	883560	24.354	ng	100
91) d-Limonene	18.99	68	837536	27.463	ng	100
92) 1,2-Dibromo-3-Chloropr...	19.43	157	321445	25.637	ng	97
93) n-Undecane	19.83	57	1244916	26.079	ng	99
94) 1,2,4-Trichlorobenzene	20.77	180	658831	25.878	ng	100
95) Naphthalene	20.89	128	2268899	26.884	ng	100
96) n-Dodecane	20.92	57	1269825	31.160	ng	99
97) Hexachlorobutadiene	21.26	225	393899	24.363	ng	99
98) Cyclohexanone	16.25	55	806798	22.594	ng	99
99) tert-Butylbenzene	18.39	119	1656848	24.305	ng	100
100) n-Butylbenzene	19.28	91	1976624	24.770	ng	100

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\13\06131905.D
Acq On : 13 Jun 2019 7:55 Operator: SC
Sample : LCS R9061319 25ng
Misc : S31-05131901/S31-05241901 (6/22)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 13 09:37:02 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Response Factor Report MS09

Method Path : I:\MS09\Methods\
Method File : R9060719.M
Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
Last Update : Fri Jun 07 14:29:19 2019
Response Via : Initial Calibration

6/7/19

Calibration Files
0.1 =06071903.D 0.2 =06071904.D 0.5 =06071905.D 1.0 =06071906.D 5.0 =06071907.D 25 =06071908.D 50 =06071909.D
100 =06071910.D

		Compound	0.1	0.2	0.5	1.0	5.0	25	50	100	Avg	%RSD
1)	IR	Bromochloromethane...	----------	ISTD	----------							
2)	T	Propene			1.857	1.659	1.387	1.654	1.486	1.575	1.603	10.11
3)	T	Dichlorodifluo...	2.981	2.583	2.570	2.404	1.926	2.273	2.076	1.976	2.349	15.30
4)	T	Chloromethane		2.623	2.552	2.191	1.796	2.222	1.920	1.519	2.117	18.91
5)	T	1,2-Dichloro-1...	1.400	1.143	1.165	1.055	0.831	1.007	0.959	0.944	1.063	16.39
6)	T	Vinyl Chloride	2.585	2.235	2.120	1.965	1.600	1.921	1.777	1.689	1.987	16.19
7)	T	1,3-Butadiene	1.697	1.534	1.547	1.413	1.207	1.519	1.402	1.343	1.458	10.23
8)	T	Bromomethane	1.424	1.248	1.161	0.999	0.858	1.028	0.953	0.900	1.071	17.97
9)	T	Chloroethane	1.242	1.136	1.141	1.008	0.811	0.979	0.901	0.865	1.010	14.99
10)	T	Ethanol	1.602	1.481	1.382	1.253	0.987	1.186	1.056	0.973	1.240	18.84
11)	T	Acetonitrile			3.692	3.407	2.611	3.075	2.775	2.620	3.030	14.70
12)	T	Acrolein	1.265	1.156	1.098	0.986	0.795	0.914	0.822	0.790	0.978	18.36
13)	T	Acetone			1.515	1.370	0.897	1.041	0.922	0.840	1.097	25.41
14)	T	Trichlorofluor...	2.484	2.167	2.186	2.028	1.603	1.900	1.740	1.675	1.973	15.23
15)	T	2-Propanol (Is...	5.107	4.539	4.472	4.191	3.357	4.015	3.590	2.988	4.032	17.22
16)	T	Acrylonitrile	2.462	2.224	2.250	2.097	1.681	2.025	1.851	1.771	2.045	13.01
17)	T	1,1-Dichloroet...	1.564	1.265	1.282	1.162	0.938	1.125	1.055	1.031	1.178	16.51
18)	T	2-Methyl-2-Pro...	4.218	3.769	3.741	3.544	2.829	3.443	3.159	3.004	3.463	13.16
19)	T	Methylene Chlo...	1.634	1.459	1.387	1.285	1.016	1.214	1.131	1.102	1.278	16.10
20)	T	3-Chloro-1-pro...	2.960	2.504	2.572	2.470	1.904	2.350	2.109	1.985	2.357	14.78
21)	T	Trichlorotrifl...	1.132	1.044	0.985	0.932	0.730	0.884	0.836	0.827	0.921	14.09
22)	T	Carbon Disulfide	6.761	5.666	5.270	4.865	3.861	4.673	4.326	4.166	4.948	18.97
23)	T	trans-1,2-Dich...	2.529	2.209	2.212	2.020	1.635	1.970	1.806	1.732	2.014	14.66
24)	T	1,1-Dichloroet...	3.034	2.654	2.644	2.481	2.016	2.399	2.190	2.088	2.438	13.95
25)	T	Methyl tert-Bu...	4.583	4.082	4.082	3.806	3.086	3.706	3.426	3.311	3.760	12.95
26)	T	Vinyl Acetate	0.369	0.312	0.340	0.318	0.247	0.304	0.285	0.274	0.306	12.47
27)	T	2-Butanone (MEK)	1.351	1.241	1.257	1.155	0.778	0.942	0.880	0.846	1.056	20.76
28)	T	cis-1,2-Dichlo...	2.482	2.163	2.125	1.953	1.574	1.891	1.736	1.659	1.948	15.45
29)	T	Diisopropyl Ether			1.192	1.057	0.828	1.010	0.942	0.911	0.990	12.82
30)	T	Ethyl Acetate	0.620	0.580	0.579	0.541	0.459	0.524	0.476	0.430	0.526	12.64
31)	T	n-Hexane	3.263	2.885	2.754	2.563	2.049	2.433	2.178	1.945	2.509	17.95
32)	T	Chloroform	2.667	2.394	2.317	2.128	1.727	2.067	1.902	1.823	2.128	14.92
33)	S	1,2-Dichloroet...	1.784	1.816	1.849	1.869	1.873	1.850	1.792	1.742	1.822	2.56
34)	T	Tetrahydrofura...	1.246	1.083	1.012	0.937	0.736	0.889	0.828	0.795	0.941	17.85
35)	T	Ethyl tert-But...	1.667	1.493	1.531	1.429	1.130	1.395	1.305	1.277	1.403	11.89
36)	T	1,2-Dichloroet...	2.174	1.914	1.949	1.772	1.424	1.704	1.543	1.464	1.743	15.01
37)	IR	1,4-Difluorobenzen...	----------	ISTD	----------							
38)	T	1,1,1-Trichlor...	0.512	0.440	0.441	0.404	0.330	0.403	0.375	0.365	0.409	13.72
39)	T	Isopropyl Acetate	0.241	0.214	0.222	0.205	0.168	0.204	0.189	0.179	0.203	11.67
40)	T	1-Butanol	0.481	0.409	0.399	0.379	0.298	0.363	0.335	0.316	0.372	15.80
41)	T	Benzene	1.840	1.587	1.380	1.234	0.969	1.147	1.068	1.031	1.282	23.60
42)	T	Carbon Tetrach...	0.431	0.387	0.371	0.359	0.287	0.353	0.330	0.323	0.355	12.33

6/7/19

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Method Path : I:\MS09\Methods\
Method File : R9060719.M
Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)

43)	T	Cyclohexane	0.582	0.496	0.486	0.444	0.366	0.441	0.412	0.399	0.453	14.90
44)	T	tert-Amyl Meth...	0.956	0.831	0.844	0.768	0.625	0.767	0.718	0.699	0.776	13.10
45)	T	1,2-Dichloropr...	0.390	0.341	0.343	0.317	0.252	0.307	0.284	0.273	0.313	14.13
46)	T	Bromodichlorom...	0.448	0.409	0.397	0.370	0.306	0.374	0.350	0.341	0.374	11.74
47)	T	Trichloroethene	0.372	0.313	0.295	0.270	0.213	0.262	0.250	0.247	0.278	17.51
48)	T	1,4-Dioxane	0.299	0.265	0.269	0.245	0.186	0.233	0.220	0.216	0.242	14.68
49)	T	2,2,4-Trimethy...	1.793	1.538	1.504	1.408	1.131	1.345	1.226	1.148	1.387	16.17
50)	T	Methyl Methacr...	0.120	0.108	0.115	0.107	0.088	0.109	0.104	0.102	0.107	8.92
51)	T	n-Heptane	0.394	0.340	0.335	0.308	0.249	0.301	0.280	0.271	0.310	14.82
52)	T	cis-1,3-Dichlo...	0.576	0.492	0.500	0.466	0.394	0.491	0.458	0.443	0.478	10.96
53)	T	4-Methyl-2-pen...	0.358	0.315	0.322	0.310	0.253	0.307	0.283	0.271	0.302	10.87
54)	T	trans-1,3-Dich...	0.485	0.417	0.445	0.424	0.358	0.453	0.423	0.411	0.427	8.62
55)	T	1,1,2-Trichlor...	0.321	0.298	0.282	0.260	0.210	0.259	0.244	0.240	0.264	13.26
56)	IR	Chlorobenzene-d5 (...	----------	----------	----------	ISTD	----------	----------	----------	----------	----------	
57)	S	Toluene-d8 (SS2)	2.362	2.360	2.342	2.327	2.308	2.306	2.329	2.319	2.332	0.92
58)	T	Toluene	3.197	2.673	2.499	2.238	1.814	2.150	2.045	1.969	2.323	19.37
59)	T	2-Hexanone	1.889	1.641	1.652	1.562	1.220	1.457	1.337	1.241	1.500	15.37
60)	T	Dibromochlorom...	0.674	0.587	0.575	0.532	0.437	0.544	0.525	0.516	0.549	12.36
61)	T	1,2-Dibromoethane	0.721	0.598	0.589	0.538	0.435	0.538	0.514	0.505	0.555	15.20
62)	T	n-Butyl Acetate	2.034	1.797	1.827	1.725	1.367	1.633	1.502	1.390	1.659	13.96
63)	T	n-Octane	0.739	0.636	0.588	0.547	0.438	0.525	0.492	0.466	0.554	17.76
64)	T	Tetrachloroethene	0.675	0.577	0.579	0.517	0.407	0.505	0.491	0.488	0.530	15.12
65)	T	Chlorobenzene	1.881	1.578	1.490	1.391	1.096	1.329	1.275	1.248	1.411	17.07
66)	T	Ethylbenzene	3.431	2.871	2.753	2.571	2.068	2.496	2.378	2.286	2.607	16.07
67)	T	m- & p-Xylenes	2.664	2.207	2.125	1.950	1.590	1.926	1.838	1.766	2.008	16.36
68)	T	Bromoform	0.473	0.423	0.415	0.391	0.328	0.428	0.419	0.419	0.412	9.93
69)	T	Styrene	1.802	1.584	1.526	1.417	1.204	1.478	1.418	1.383	1.477	11.74
70)	T	o-Xylene	2.607	2.207	2.100	1.940	1.560	1.885	1.794	1.732	1.978	16.46
71)	T	n-Nonane	1.796	1.569	1.507	1.402	1.122	1.321	1.198	1.082	1.375	17.76
72)	T	1,1,2,2-Tetrac...	1.232	1.071	1.031	0.962	0.772	0.944	0.898	0.874	0.973	14.35
73)	S	Bromofluoroben...	0.627	0.620	0.619	0.620	0.622	0.628	0.632	0.635	0.625	0.96
74)	T	Cumene	3.213	2.798	2.633	2.433	1.944	2.345	2.228	2.136	2.466	16.44
75)	T	alpha-Pinene	1.522	1.325	1.330	1.251	1.052	1.279	1.224	1.187	1.271	10.60
76)	T	n-Propylbenzene	3.999	3.340	3.251	3.063	2.415	2.909	2.739	2.574	3.036	16.57
77)	T	3-Ethyltoluene	3.159	2.687	2.597	2.406	1.941	2.299	2.255	2.191	2.442	15.23
78)	T	4-Ethyltoluene	3.007	2.509	2.455	2.301	1.825	2.284	2.086	1.953	2.303	16.09
79)	T	1,3,5-Trimethy...	2.688	2.216	2.182	2.009	1.593	1.934	1.836	1.767	2.028	16.65
80)	T	alpha-Methylst...	1.063	0.941	0.975	0.900	0.862	1.019	0.975	0.954	0.961	6.58
81)	T	2-Ethyltoluene	3.132	2.653	2.561	2.377	1.889	2.273	2.144	2.045	2.384	16.57
82)	T	1,2,4-Trimethy...	2.684	2.255	2.149	2.021	1.607	2.008	1.915	1.806	2.056	15.71
83)	T	n-Decane	1.695	1.514	1.466	1.348	1.077	1.290	1.181	1.065	1.330	16.68
84)	T	Benzyl Chloride	1.871	1.637	1.688	1.642	1.476	1.935	1.862	1.784	1.737	8.82
85)	T	1,3-Dichlorobe...	1.413	1.178	1.154	1.049	0.842	1.040	0.995	0.978	1.081	15.74
86)	T	1,4-Dichlorobe...	1.457	1.228	1.133	1.035	0.841	1.053	0.999	0.975	1.090	17.10
87)	T	sec-Butylbenzene	3.531	3.014	2.957	2.759	2.181	2.602	2.434	2.281	2.720	16.33
88)	T	4-Isopropyltol...	3.315	2.802	2.724	2.503	1.989	2.436	2.295	2.104	2.521	16.87
89)	T	1,2,3-Trimethy...	2.589	2.267	2.198	2.050	1.628	2.026	1.921	1.801	2.060	14.40
90)	T	1,2-Dichlorobe...	1.398	1.122	1.109	1.018	0.811	0.999	0.958	0.936	1.044	16.67
91)	T	d-Limonene	0.982	0.888	0.908	0.851	0.778	0.938	0.872	0.804	0.878	7.66
92)	T	1,2-Dibromo-3-...	0.411	0.363	0.381	0.354	0.295	0.374	0.357	0.351	0.361	9.14
93)	T	n-Undecane	1.705	1.516	1.457	1.392	1.137	1.375	1.259	1.148	1.374	13.96
94)	T	1,2,4-Trichlor...	0.943	0.758	0.724	0.656	0.551	0.761	0.737	0.731	0.733	15.02

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Method Path : I:\MS09\Methods\
Method File : R9060719.M
Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)

95)	T	Naphthalene	2.856	2.341	2.279	2.105	1.987	2.772	2.622	2.466	2.428	12.73
96)	T	n-Dodecane	1.259	1.143	1.153	1.088	1.104	1.322	1.210	1.102	1.173	7.15
97)	T	Hexachlorobuta...	0.576	0.476	0.499	0.454	0.352	0.462	0.450	0.454	0.465	13.32
98)	T	Cyclohexanone	1.352	1.169	1.148	1.075	0.798	0.946	0.890	0.844	1.028	18.55
99)	T	tert-Butylbenzene	2.578	2.207	2.096	1.924	1.537	1.878	1.785	1.687	1.962	16.73
100)	T	n-Butylbenzene	2.932	2.475	2.503	2.322	1.853	2.240	2.087	1.957	2.296	15.07

(#) = Out of Range

Primary Source Standards Concentrations (Working & Initial Calibration)

6/11/19

1ng/L Std. ID:
4ng/L Std. ID: S31-05201906
20ng/L Std. ID: S31-06061905
200ng/L Std. ID: S31-05311906

Dilution Factors:		5	50	250	1000	Working STD Conc.(ng/L):	4	4	4	20	200	200	200	200
	Source Std.	Primary Working Standards				Injection (L):	0.025	0.050	0.125	0.050	0.025	0.125	0.25	0.50
Compounds	mg/m^3	200ng/L	20ng/L	4ng/L	1ng/L	ICAL Points:	0.1ng	0.2ng	0.5ng	1ng	5ng	25ng	50ng	100ng
Propene	1.031	206.2	20.62	4.124	1.031		0.1031	0.2062	0.5155	1.031	5.155	25.775	51.55	103.1
Dichlorodifluoromethane	1.045	209.0	20.90	4.180	1.045		0.1045	0.2090	0.5225	1.045	5.225	26.125	52.25	104.5
Chloromethane	1.008	201.6	20.16	4.032	1.008		0.1008	0.2016	0.5040	1.008	5.040	25.200	50.40	100.8
Freon-114	1.028	205.6	20.56	4.112	1.028		0.1028	0.2056	0.5140	1.028	5.140	25.700	51.40	102.8
Vinyl Chloride	1.051	210.2	21.02	4.204	1.051		0.1051	0.2102	0.5255	1.051	5.255	26.275	52.55	105.1
1,3-Butadiene	1.049	209.8	20.98	4.196	1.049		0.1049	0.2098	0.5245	1.049	5.245	26.225	52.45	104.9
Bromomethane	1.009	201.8	20.18	4.036	1.009		0.1009	0.2018	0.5045	1.009	5.045	25.225	50.45	100.9
Chloroethane	1.022	204.4	20.44	4.088	1.022		0.1022	0.2044	0.5110	1.022	5.110	25.550	51.10	102.2
Ethanol	5.140	1028.0	102.80	20.560	5.140		0.5140	1.0280	2.5700	5.140	25.700	128.500	257.00	514.0
Acetonitrile	1.033	206.6	20.66	4.132	1.033		0.1033	0.2066	0.5165	1.033	5.165	25.825	51.65	103.3
Acrolein	1.028	205.6	20.56	4.112	1.028		0.1028	0.2056	0.5140	1.028	5.140	25.700	51.40	102.8
Acetone	5.370	1074.0	107.40	21.480	5.370		0.5370	1.0740	2.6850	5.370	26.850	134.250	268.50	537.0
Trichlorofluoromethane	1.060	212.0	21.20	4.240	1.060		0.1060	0.2120	0.5300	1.060	5.300	26.500	53.00	106.0
Isopropanol	2.063	412.6	41.26	8.252	2.063		0.2063	0.4126	1.0315	2.063	10.315	51.575	103.15	206.3
Acrylonitrile	1.034	206.8	20.68	4.136	1.034		0.1034	0.2068	0.5170	1.034	5.170	25.850	51.70	103.4
1,1-Dichloroethene	1.074	214.8	21.48	4.296	1.074		0.1074	0.2148	0.5370	1.074	5.370	26.850	53.70	107.4
tert-Butanol	2.144	428.8	42.88	8.576	2.144		0.2144	0.4288	1.0720	2.144	10.720	53.600	107.20	214.4
Methylene Chloride	1.070	214.0	21.40	4.280	1.070		0.1070	0.2140	0.5350	1.070	5.350	26.750	53.50	107.0
Allyl Chloride	1.067	213.4	21.34	4.268	1.067		0.1067	0.2134	0.5335	1.067	5.335	26.675	53.35	106.7
Trichlorotrifluoroethane	1.065	213.0	21.30	4.260	1.065		0.1065	0.2130	0.5325	1.065	5.325	26.625	53.25	106.5
Carbon Disulfide	1.075	215.0	21.50	4.300	1.075		0.1075	0.2150	0.5375	1.075	5.375	26.875	53.75	107.5
trans-1,2-Dichloroethene	1.062	212.4	21.24	4.248	1.062		0.1062	0.2124	0.5310	1.062	5.310	26.550	53.10	106.2
1,1-Dichloroethane	1.030	206.0	20.60	4.120	1.030		0.1030	0.2060	0.5150	1.030	5.150	25.750	51.50	103.0
Methyl tert-Butyl Ether	1.089	217.8	21.78	4.356	1.089		0.1089	0.2178	0.5445	1.089	5.445	27.225	54.45	108.9
Vinyl Acetate	5.252	1050.4	105.04	21.008	5.252		0.5252	1.0504	2.6260	5.252	26.260	131.300	262.60	525.2
2-Butanone	1.027	205.4	20.54	4.108	1.027		0.1027	0.2054	0.5135	1.027	5.135	25.675	51.35	102.7
cis-1,2-Dichloroethene	1.054	210.8	21.08	4.216	1.054		0.1054	0.2108	0.5270	1.054	5.270	26.350	52.70	105.4
Diisopropyl Ether	1.081	216.2	21.62	4.324	1.081		0.1081	0.2162	0.5405	1.081	5.405	27.025	54.05	108.1
Ethyl Acetate	2.166	433.2	43.32	8.664	2.166		0.2166	0.4332	1.0830	2.166	10.830	54.150	108.30	216.6
n-Hexane	1.082	216.4	21.64	4.328	1.082		0.1082	0.2164	0.5410	1.082	5.410	27.050	54.10	108.2
Chloroform	1.077	215.4	21.54	4.308	1.077		0.1077	0.2154	0.5385	1.077	5.385	26.925	53.85	107.7
Tetrahydrofuran	1.068	213.6	21.36	4.272	1.068		0.1068	0.2136	0.5340	1.068	5.340	26.700	53.40	106.8
Ethyl tert-Butyl Ether	1.060	212.0	21.20	4.240	1.060		0.1060	0.2120	0.5300	1.060	5.300	26.500	53.00	106.0
1,2-Dichloroethane	1.061	212.2	21.22	4.244	1.061		0.1061	0.2122	0.5305	1.061	5.305	26.525	53.05	106.1
1,1,1-Trichloroethane	1.081	216.2	21.62	4.324	1.081		0.1081	0.2162	0.5405	1.081	5.405	27.025	54.05	108.1
Isopropyl Acetate	2.066	413.2	41.32	8.264	2.066		0.2066	0.4132	1.0330	2.066	10.330	51.650	103.30	206.6
1-Butanol	2.067	413.4	41.34	8.268	2.067		0.2067	0.4134	1.0335	2.067	10.335	51.675	103.35	206.7
Benzene	1.033	206.6	20.66	4.132	1.033		0.1033	0.2066	0.5165	1.033	5.165	25.825	51.65	103.3
Carbon Tetrachloride	1.036	207.2	20.72	4.144	1.036		0.1036	0.2072	0.5180	1.036	5.180	25.900	51.80	103.6
Cyclohexane	2.087	417.4	41.74	8.348	2.087		0.2087	0.4174	1.0435	2.087	10.435	52.175	104.35	208.7
tert-Amyl Methyl Ether	1.074	214.8	21.48	4.296	1.074		0.1074	0.2148	0.5370	1.074	5.370	26.850	53.70	107.4
1,2-Dichloropropane	1.073	214.6	21.46	4.292	1.073		0.1073	0.2146	0.5365	1.073	5.365	26.825	53.65	107.3
Bromodichloromethane	1.068	213.6	21.36	4.272	1.068		0.1068	0.2136	0.5340	1.068	5.340	26.700	53.40	106.8
Trichloroethene	1.062	212.4	21.24	4.248	1.062		0.1062	0.2124	0.5310	1.062	5.310	26.550	53.10	106.2
1,4-Dioxane	1.064	212.8	21.28	4.256	1.064		0.1064	0.2128	0.5320	1.064	5.320	26.600	53.20	106.4
Isooctane	1.061	212.2	21.22	4.244	1.061		0.1061	0.2122	0.5305	1.061	5.305	26.525	53.05	106.1
Methyl Methacrylate	2.135	427.0	42.70	8.540	2.135		0.2135	0.4270	1.0675	2.135	10.675	53.375	106.75	213.5
n-Heptane	1.076	215.2	21.52	4.304	1.076		0.1076	0.2152	0.5380	1.076	5.380	26.900	53.80	107.6

Q:\TO15 Std. Concentrations\MS09 Std. Conc\2019\R9060719\ICAL Conc. (Primary Source)

Date Updated: 08/22/18
Version: 0

00942925

Primary Source Standards Concentrations (Working & Initial Calibration)

1ng/L Std. ID:
4ng/L Std. ID: S31-05201906
20ng/L Std. ID: S31-06061905
200ng/L Std. ID: S31-05311906

Dilution Factors:		5	50	250	1000	Working STD Conc.(ng/L):	4	4	4	20	200	200	200	200
	Source Std.	Primary Working Standards				Injection (L):	0.025	0.050	0.125	0.050	0.025	0.125	0.25	0.50
Compounds	mg/m^3	200ng/L	20ng/L	4ng/L	1ng/L	ICAL Points:	0.1ng	0.2ng	0.5ng	1ng	5ng	25ng	50ng	100ng
cis-1,3-Dichloropropene	1.120	224.0	22.40	4.480	1.120		0.1120	0.2240	0.5600	1.120	5.600	28.000	56.00	112.0
4-Methyl-2-pentanone	1.060	212.0	21.20	4.240	1.060		0.1060	0.2120	0.5300	1.060	5.300	26.500	53.00	106.0
trans-1,3-Dichloropropene	1.055	211.0	21.10	4.220	1.055		0.1055	0.2110	0.5275	1.055	5.275	26.375	52.75	105.5
1,1,2-Trichloroethane	1.076	215.2	21.52	4.304	1.076		0.1076	0.2152	0.5380	1.076	5.380	26.900	53.80	107.6
Toluene	1.052	210.4	21.04	4.208	1.052		0.1052	0.2104	0.5260	1.052	5.260	26.300	52.60	105.2
2-Hexanone	1.074	214.8	21.48	4.296	1.074		0.1074	0.2148	0.5370	1.074	5.370	26.850	53.70	107.4
Dibromochloromethane	1.075	215.0	21.50	4.300	1.075		0.1075	0.2150	0.5375	1.075	5.375	26.875	53.75	107.5
1,2-Dibromoethane	1.076	215.2	21.52	4.304	1.076		0.1076	0.2152	0.5380	1.076	5.380	26.900	53.80	107.6
n-Butyl Acetate	1.085	217.0	21.70	4.340	1.085		0.1085	0.2170	0.5425	1.085	5.425	27.125	54.25	108.5
n-Octane	1.076	215.2	21.52	4.304	1.076		0.1076	0.2152	0.5380	1.076	5.380	26.900	53.80	107.6
Tetrachloroethene	1.058	211.6	21.16	4.232	1.058		0.1058	0.2116	0.5290	1.058	5.290	26.450	52.90	105.8
Chlorobenzene	1.066	213.2	21.32	4.264	1.066		0.1066	0.2132	0.5330	1.066	5.330	26.650	53.30	106.6
Ethylbenzene	1.033	206.6	20.66	4.132	1.033		0.1033	0.2066	0.5165	1.033	5.165	25.825	51.65	103.3
m-&p-Xylene	2.123	424.6	42.46	8.492	2.123		0.2123	0.4246	1.0615	2.123	10.615	53.075	106.15	212.3
Bromoform	1.063	212.6	21.26	4.252	1.063		0.1063	0.2126	0.5315	1.063	5.315	26.575	53.15	106.3
Styrene	1.060	212.0	21.20	4.240	1.060		0.1060	0.2120	0.5300	1.060	5.300	26.500	53.00	106.0
o-Xylene	1.062	212.4	21.24	4.248	1.062		0.1062	0.2124	0.5310	1.062	5.310	26.550	53.10	106.2
n-Nonane	1.071	214.2	21.42	4.284	1.071		0.1071	0.2142	0.5355	1.071	5.355	26.775	53.55	107.1
1,1,2,2-Tetrachloroethane	1.064	212.8	21.28	4.256	1.064		0.1064	0.2128	0.5320	1.064	5.320	26.600	53.20	106.4
Cumene	1.057	211.4	21.14	4.228	1.057		0.1057	0.2114	0.5285	1.057	5.285	26.425	52.85	105.7
alpha-Pinene	1.035	207.0	20.70	4.140	1.035		0.1035	0.2070	0.5175	1.035	5.175	25.875	51.75	103.5
n-Propylbenzene	1.076	215.2	21.52	4.304	1.076		0.1076	0.2152	0.5380	1.076	5.380	26.900	53.80	107.6
3-Ethyltoluene	1.062	212.4	21.24	4.248	1.062		0.1062	0.2124	0.5310	1.062	5.310	26.550	53.10	106.2
4-Ethyltoluene	1.061	212.2	21.22	4.244	1.061		0.1061	0.2122	0.5305	1.061	5.305	26.525	53.05	106.1
1,3,5-Trimethylbenzene	1.057	211.4	21.14	4.228	1.057		0.1057	0.2114	0.5285	1.057	5.285	26.425	52.85	105.7
alpha-Methylstyrene	1.058	211.6	21.16	4.232	1.058		0.1058	0.2116	0.5290	1.058	5.290	26.450	52.90	105.8
2-Ethyltoluene	1.072	214.4	21.44	4.288	1.072		0.1072	0.2144	0.5360	1.072	5.360	26.800	53.60	107.2
1,2,4-Trimethylbenzene	1.068	213.6	21.36	4.272	1.068		0.1068	0.2136	0.5340	1.068	5.340	26.700	53.40	106.8
n-Decane	1.076	215.2	21.52	4.304	1.076		0.1076	0.2152	0.5380	1.076	5.380	26.900	53.80	107.6
Benzyl Chloride	1.051	210.2	21.02	4.204	1.051		0.1051	0.2102	0.5255	1.051	5.255	26.275	52.55	105.1
1,3-Dichlorobenzene	1.080	216.0	21.60	4.320	1.080		0.1080	0.2160	0.5400	1.080	5.400	27.000	54.00	108.0
1,4-Dichlorobenzene	1.081	216.2	21.62	4.324	1.081		0.1081	0.2162	0.5405	1.081	5.405	27.025	54.05	108.1
sec-Butylbenzene	1.063	212.6	21.26	4.252	1.063		0.1063	0.2126	0.5315	1.063	5.315	26.575	53.15	106.3
p-Isopropyltoluene	1.042	208.4	20.84	4.168	1.042		0.1042	0.2084	0.5210	1.042	5.210	26.050	52.10	104.2
1,2,3-Trimethylbenzene	1.042	208.4	20.84	4.168	1.042		0.1042	0.2084	0.5210	1.042	5.210	26.050	52.10	104.2
1,2-Dichlorobenzene	1.089	217.8	21.78	4.356	1.089		0.1089	0.2178	0.5445	1.089	5.445	27.225	54.45	108.9
d-Limonene	1.010	202.0	20.20	4.040	1.010		0.1010	0.2020	0.5050	1.010	5.050	25.250	50.50	101.0
1,2-Dibromo-3-chloropropane	1.042	208.4	20.84	4.168	1.042		0.1042	0.2084	0.5210	1.042	5.210	26.050	52.10	104.2
n-Undecane	1.057	211.4	21.14	4.228	1.057		0.1057	0.2114	0.5285	1.057	5.285	26.425	52.85	105.7
1,2,4-Trichlorobenzene	1.064	212.8	21.28	4.256	1.064		0.1064	0.2128	0.5320	1.064	5.320	26.600	53.20	106.4
Naphthalene	1.025	205.0	20.50	4.100	1.025		0.1025	0.2050	0.5125	1.025	5.125	25.625	51.25	102.5
n-Dodecane	1.031	206.2	20.62	4.124	1.031		0.1031	0.2062	0.5155	1.031	5.155	25.775	51.55	103.1
Hexachloro-1,3-butadiene	1.053	210.6	21.06	4.212	1.053		0.1053	0.2106	0.5265	1.053	5.265	26.325	52.65	105.3
Methacrylonitrile	1.041	208.2	20.82	4.164	1.041		0.1041	0.2082	0.5205	1.041	5.205	26.025	52.05	104.1
Cyclohexanone	0.982	196.4	19.64	3.928	0.982		0.0982	0.1964	0.4910	0.982	4.910	24.550	49.10	98.2
tert-Butylbenzene	1.067	213.4	21.34	4.268	1.067		0.1067	0.2134	0.5335	1.067	5.335	26.675	53.35	106.7
n-Butylbenzene	1.064	212.8	21.28	4.256	1.064		0.1064	0.2128	0.5320	1.064	5.320	26.600	53.20	106.4

Calibration Status Report MS09

Method : I:\MS09\Methods\R9060719.M (RTE Integrator)
Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
Last Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration

6/7/19

#	ID	Conc	ISTD Conc	Path\File
1	0.1	0	13	I:\MS09\Data\2019_06\07\06071903.D
2	0.2	0	13	I:\MS09\Data\2019_06\07\06071904.D
3	0.5	1	13	I:\MS09\Data\2019_06\07\06071905.D
4	1.0	1	13	I:\MS09\Data\2019_06\07\06071906.D
5	5.0	5	13	I:\MS09\Data\2019_06\07\06071907.D
6	25	26	13	I:\MS09\Data\2019_06\07\06071908.D
7	50	52	13	I:\MS09\Data\2019_06\07\06071909.D
8	100	103	13	I:\MS09\Data\2019_06\07\06071910.D

#	ID	Update Time	Quant Time	Acquisition Time
1	0.1	Jun 07 14:27 2019	Jun 07 13:45 2019	7 Jun 2019 10:04
2	0.2	Jun 07 14:27 2019	Jun 07 13:42 2019	7 Jun 2019 10:38
3	0.5	Jun 07 14:28 2019	Jun 07 13:41 2019	7 Jun 2019 11:11
4	1.0	Jun 07 14:28 2019	Jun 07 13:39 2019	7 Jun 2019 11:45
5	5.0	Jun 07 14:28 2019	Jun 07 13:38 2019	7 Jun 2019 12:18
6	25	Jun 07 14:28 2019	Jun 07 13:36 2019	7 Jun 2019 12:52
7	50	Jun 07 14:29 2019	Jun 07 13:52 2019	7 Jun 2019 13:25
8	100	Jun 07 14:29 2019	Jun 07 14:25 2019	7 Jun 2019 13:59

R9060719.M Fri Jun 07 16:40:59 2019

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071903.D
Acq On : 7 Jun 2019 10:04 Operator: SC
Sample : 0.1ng TO-15 ICAL STD
Misc : S31-05131901/S31-05201906 (6/18)
ALS Vial : 4 Sample Multiplier: 1

6/7/19

Quant Time: Jun 07 13:45:26 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	191585	12.500	ng		-0.03
37) 1,4-Difluorobenzene (IS2)	11.11	114	868994	12.500	ng		-0.01
56) Chlorobenzene-d5 (IS3)	15.46	82	438211	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.91	65	341706	14.134	ng		-0.02
Spiked Amount 12.500	Range 70 - 130		Recovery = 113.04%				
57) Toluene-d8 (SS2)	13.55	98	1035076	11.966	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 95.76%				
73) Bromofluorobenzene (SS3)	17.05	174	274803	12.044	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 96.32%				
Target Compounds							Qvalue
2) Propene	3.88	42	3893	0.196	ng		98
3) Dichlorodifluoromethan...	3.98	85	4774	0.135	ng		98
4) Chloromethane	4.17	50	4452	0.153	ng		100
5) 1,2-Dichloro-1,1,2,2-t...	4.34	135	2206	0.131	ng		91
6) Vinyl Chloride	4.45	62	4164	0.153	ng		98
7) 1,3-Butadiene	4.63	54	2728	0.169	ng		93
8) Bromomethane	4.94	94	2202	0.129	ng		98
9) Chloroethane	5.16	64	1945	0.136	ng		97
10) Ethanol	5.33	45	12622	0.846	ng		95
11) Acetonitrile	5.55	41	7275	0.209	ng		80
12) Acrolein	5.70	56	1993	0.170	ng		94
13) Acetone	5.85	58	17604	1.291	ng		92
14) Trichlorofluoromethane	6.03	101	4035	0.142	ng		96
15) 2-Propanol (Isopropanol)	6.16	45	16148	0.344	ng		97
16) Acrylonitrile	6.35	53	3902	0.148	ng		95
17) 1,1-Dichloroethene	6.72	96	2575	0.141	ng		93
18) 2-Methyl-2-Propanol (t...	6.87	59	13862	0.302	ng		98
19) Methylene Chloride	6.85	84	2679	0.133	ng		96
20) 3-Chloro-1-propene (Al...	6.99	41	4840	0.202	ng		93
21) Trichlorotrifluoroethane	7.19	151	1848	0.142	ng		96
22) Carbon Disulfide	7.15	76	11139	0.163	ng		100
23) trans-1,2-Dichloroethene	7.87	61	4116	0.147	ng		96
24) 1,1-Dichloroethane	8.09	63	4790	0.141	ng		100
25) Methyl tert-Butyl Ether	8.20	73	7650	0.130	ng		98
26) Vinyl Acetate	8.28	86	2972	0.756	ng	#	93
27) 2-Butanone (MEK)	8.54	72	2127	0.151	ng	#	88
28) cis-1,2-Dichloroethene	8.97	61	4009	0.151	ng		98
29) Diisopropyl Ether	9.23	87	2627	0.151	ng	#	60
30) Ethyl Acetate	9.23	61	2058	0.310	ng		96
31) n-Hexane	9.22	57	5412	0.157	ng		99
32) Chloroform	9.27	83	4402	0.131	ng		99
34) Tetrahydrofuran (THF)	9.70	72	2040	0.147	ng		96
35) Ethyl tert-Butyl Ether	9.78	87	2708	0.114	ng		98
36) 1,2-Dichloroethane	10.02	62	3535	0.147	ng		100
38) 1,1,1-Trichloroethane	10.29	97	3846	0.133	ng		96
39) Isopropyl Acetate	10.68	61	3457	0.281	ng	#	91
40) 1-Butanol	10.70	56	6919	0.364	ng		99
41) Benzene	10.75	78	13215	0.156	ng		97
42) Carbon Tetrachloride	10.90	117	3106	0.132	ng		98
43) Cyclohexane	11.04	84	8441	0.269	ng		99
44) tert-Amyl Methyl Ether	11.37	73	7137	0.128	ng		96
45) 1,2-Dichloropropane	11.56	63	2906	0.148	ng		99
46) Bromodichloromethane	11.75	83	3324	0.126	ng		99
47) Trichloroethene	11.80	130	2744	0.134	ng		96
48) 1,4-Dioxane	11.80	88	2211	0.135	ng		91
49) 2,2,4-Trimethylpentane...	11.87	57	13222	0.157	ng		99

Data File: I:\MS09\Data\2019 06\07\06071903.D
Acq On : 7 Jun 2019 10:04 Operator: SC
Sample : 0.1ng TO-15 ICAL STD
Misc : S31-05131901/S31-05201906 (6/18)
ALS Vial : 4 Sample Multiplier: 1

Quant Time: Jun 07 13:45:26 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

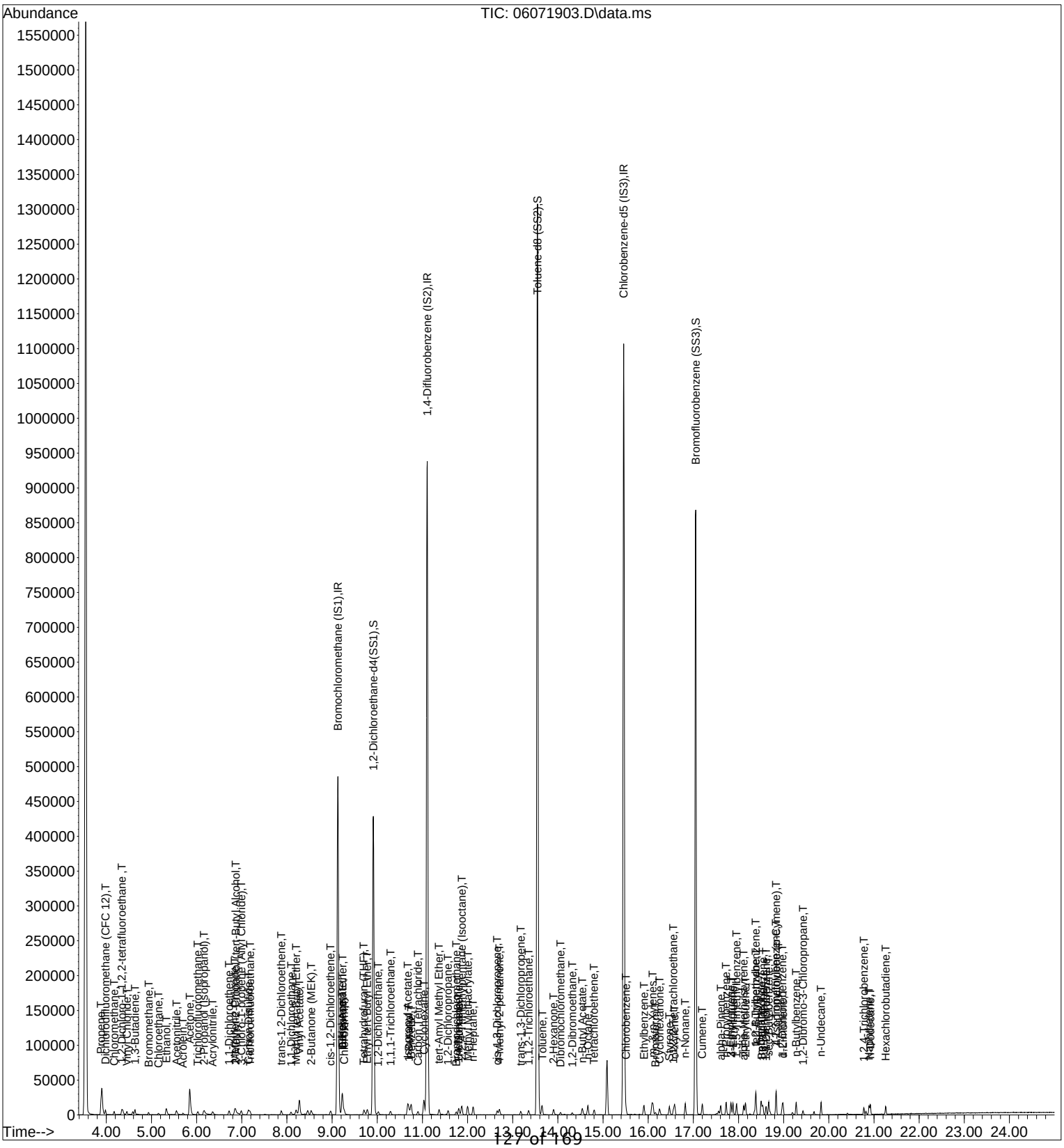
Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
50) Methyl Methacrylate	12.00	100	1782	0.229	ng	#	89
51) n-Heptane	12.12	71	2947	0.139	ng		99
52) cis-1,3-Dichloropropene	12.65	75	4485	0.144	ng		99
53) 4-Methyl-2-pentanone	12.71	58	2639	0.145	ng		90
54) trans-1,3-Dichloropropene	13.18	75	3560	0.134	ng		94
55) 1,1,2-Trichloroethane	13.35	97	2400	0.124	ng		96
58) Toluene	13.65	91	11792	0.130	ng		97
59) 2-Hexanone	13.90	43	7113	0.183	ng		94
60) Dibromochloromethane	14.06	129	2539	0.118	ng		97
61) 1,2-Dibromoethane	14.32	107	2721	0.126	ng		98
62) n-Butyl Acetate	14.54	43	7737	0.181	ng		98
63) n-Octane	14.67	57	2786	0.145	ng		96
64) Tetrachloroethene	14.80	166	2504	0.115	ng		97
65) Chlorobenzene	15.51	112	7028	0.128	ng		99
66) Ethylbenzene	15.91	91	12424	0.123	ng		97
67) m- & p-Xylenes	16.10	91	19825	0.254	ng		97
68) Bromoform	16.16	173	1763	0.106	ng		97
69) Styrene	16.47	104	6697	0.113	ng		99
70) o-Xylene	16.58	91	9707	0.125	ng		98
71) n-Nonane	16.82	43	6744	0.176	ng		100
72) 1,1,2,2-Tetrachloroethane	16.56	83	4594	0.128	ng		99
74) Cumene	17.19	105	11906	0.123	ng		100
75) alpha-Pinene	17.61	93	5524	0.113	ng		96
76) n-Propylbenzene	17.72	91	15086	0.131	ng		98
77) 3-Ethyltoluene	17.83	105	11761	0.125	ng		97
78) 4-Ethyltoluene	17.88	105	11186	0.125	ng		98
79) 1,3,5-Trimethylbenzene	17.95	105	9959	0.123	ng		98
80) alpha-Methylstyrene	18.11	118	3943	0.097	ng		93
81) 2-Ethyltoluene	18.15	105	11770	0.128	ng		98
82) 1,2,4-Trimethylbenzene	18.38	105	10049	0.130	ng		98
83) n-Decane	18.50	57	6394	0.150	ng		97
84) Benzyl Chloride	18.51	91	6892	0.120	ng		95
85) 1,3-Dichlorobenzene	18.54	146	5350	0.132	ng		99
86) 1,4-Dichlorobenzene	18.61	146	5522	0.133	ng		100
87) sec-Butylbenzene	18.67	105	13158	0.125	ng		99
88) 4-Isopropyltoluene (p-...	18.83	119	12109	0.125	ng		97
89) 1,2,3-Trimethylbenzene	18.83	105	9456	0.122	ng		98
90) 1,2-Dichlorobenzene	18.97	146	5338	0.137	ng		99
91) d-Limonene	18.99	68	3476	0.110	ng		99
92) 1,2-Dibromo-3-Chloropr...	19.43	157	1501	0.111	ng		88
93) n-Undecane	19.83	57	6317	0.157	ng		97
94) 1,2,4-Trichlorobenzene	20.77	180	3519	0.135	ng		98
95) Naphthalene	20.89	128	10261	0.121	ng		97
96) n-Dodecane	20.92	57	4550	0.159	ng		99
97) Hexachlorobutadiene	21.26	225	2126	0.115	ng		98
98) Cyclohexanone	16.25	55	4654	0.155	ng		98
99) tert-Butylbenzene	18.38	119	9644	0.129	ng		99
100) n-Butylbenzene	19.28	91	10937	0.130	ng		97

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071903.D
Acq On : 7 Jun 2019 10:04 Operator: SC
Sample : 0.1ng TO-15 ICAL STD
Misc : S31-05131901/S31-05201906 (6/18)
ALS Vial : 4 Sample Multiplier: 1

Quant Time: Jun 07 13:45:26 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



00942931

Data File: I:\MS09\Data\2019 06\07\06071904.D
Acq On : 7 Jun 2019 10:38 Operator: SC
Sample : 0.2ng TO-15 ICAL STD
Misc : S31-05131901/S31-05201906 (6/18)
ALS Vial : 4 Sample Multiplier: 1

6/7/19

Quant Time: Jun 07 13:42:50 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	187134	12.500	ng		-0.03
37) 1,4-Difluorobenzene (IS2)	11.11	114	851299	12.500	ng		-0.01
56) Chlorobenzene-d5 (IS3)	15.46	82	431796	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.91	65	339772	14.389	ng		-0.02
Spiked Amount 12.500	Range 70 - 130		Recovery = 115.12%				
57) Toluene-d8 (SS2)	13.55	98	1018998	11.955	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 95.60%				
73) Bromofluorobenzene (SS3)	17.05	174	267645	11.904	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 95.20%				
Target Compounds							Qvalue
2) Propene	3.88	42	6065	0.313	ng		98
3) Dichlorodifluoromethan...	3.98	85	8083	0.234	ng		98
4) Chloromethane	4.17	50	7916	0.278	ng		98
5) 1,2-Dichloro-1,1,2,2-t...	4.34	135	3518	0.214	ng		99
6) Vinyl Chloride	4.45	62	7034	0.264	ng		99
7) 1,3-Butadiene	4.63	54	4819	0.306	ng		99
8) Bromomethane	4.93	94	3770	0.226	ng		98
9) Chloroethane	5.15	64	3476	0.249	ng		96
10) Ethanol	5.33	45	22790	1.563	ng		91
11) Acetonitrile	5.55	41	12189	0.359	ng		99
12) Acrolein	5.70	56	3559	0.310	ng		99
13) Acetone	5.84	58	27421	2.059	ng		92
14) Trichlorofluoromethane	6.03	101	6879	0.248	ng		97
15) 2-Propanol (Isopropanol)	6.15	45	28039	0.611	ng		96
16) Acrylonitrile	6.36	53	6884	0.267	ng		100
17) 1,1-Dichloroethene	6.72	96	4068	0.229	ng		97
18) 2-Methyl-2-Propanol (t...	6.82	59	24198	0.540	ng		98
19) Methylene Chloride	6.85	84	4674	0.238	ng		99
20) 3-Chloro-1-propene (Al...	6.99	41	7999	0.342	ng		95
21) Trichlorotrifluoroethane	7.19	151	3330	0.262	ng		98
22) Carbon Disulfide	7.14	76	18237	0.273	ng		97
23) trans-1,2-Dichloroethene	7.87	61	7025	0.257	ng		98
24) 1,1-Dichloroethane	8.09	63	8184	0.247	ng		99
25) Methyl tert-Butyl Ether	8.19	73	13310	0.232	ng		98
26) Vinyl Acetate	8.28	86	4901	1.276	ng	#	93
27) 2-Butanone (MEK)	8.53	72	3815	0.278	ng	#	89
28) cis-1,2-Dichloroethene	8.97	61	6827	0.262	ng		99
29) Diisopropyl Ether	9.23	87	4664	0.275	ng	#	57
30) Ethyl Acetate	9.22	61	3764	0.580	ng		99
31) n-Hexane	9.22	57	9348	0.278	ng		98
32) Chloroform	9.27	83	7719	0.236	ng		97
34) Tetrahydrofuran (THF)	9.71	72	3464	0.256	ng		96
35) Ethyl tert-Butyl Ether	9.78	87	4740	0.204	ng		98
36) 1,2-Dichloroethane	10.02	62	6081	0.258	ng		98
38) 1,1,1-Trichloroethane	10.29	97	6485	0.228	ng		100
39) Isopropyl Acetate	10.67	61	6021	0.499	ng	#	91
40) 1-Butanol	10.69	56	11513	0.618	ng		98
41) Benzene	10.75	78	22327	0.269	ng		99
42) Carbon Tetrachloride	10.90	117	5459	0.236	ng		97
43) Cyclohexane	11.04	84	14089	0.458	ng		98
44) tert-Amyl Methyl Ether	11.37	73	12159	0.223	ng		95
45) 1,2-Dichloropropane	11.57	63	4986	0.260	ng		98
46) Bromodichloromethane	11.75	83	5956	0.230	ng		100
47) Trichloroethene	11.81	130	4525	0.226	ng		94
48) 1,4-Dioxane	11.80	88	3840	0.240	ng		94
49) 2,2,4-Trimethylpentane...	11.87	57	22232	0.269	ng		99

Data File: I:\MS09\Data\2019 06\07\06071904.D
Acq On : 7 Jun 2019 10:38 Operator: SC
Sample : 0.2ng TO-15 ICAL STD
Misc : S31-05131901/S31-05201906 (6/18)
ALS Vial : 4 Sample Multiplier: 1

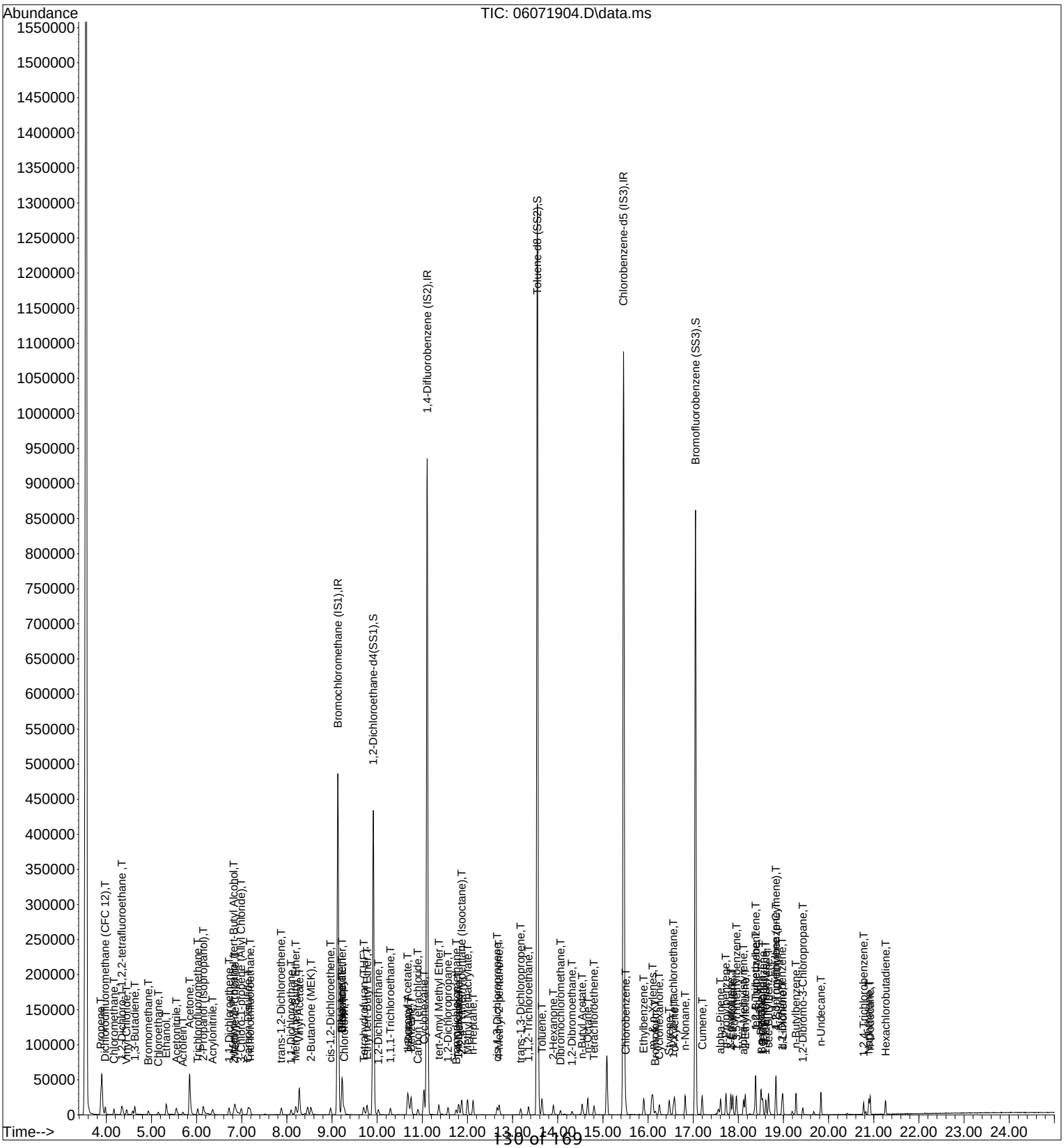
Quant Time: Jun 07 13:42:50 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
50) Methyl Methacrylate	12.00	100	3154	0.414	ng	91
51) n-Heptane	12.12	71	4980	0.240	ng	99
52) cis-1,3-Dichloropropene	12.66	75	7504	0.246	ng	100
53) 4-Methyl-2-pentanone	12.70	58	4546	0.255	ng	92
54) trans-1,3-Dichloropropene	13.18	75	5996	0.231	ng	98
55) 1,1,2-Trichloroethane	13.35	97	4364	0.231	ng	96
58) Toluene	13.65	91	19426	0.218	ng	97
59) 2-Hexanone	13.90	43	12177	0.318	ng	100
60) Dibromochloromethane	14.06	129	4360	0.205	ng	93
61) 1,2-Dibromoethane	14.31	107	4442	0.209	ng	99
62) n-Butyl Acetate	14.54	43	13473	0.320	ng	100
63) n-Octane	14.67	57	4726	0.250	ng	99
64) Tetrachloroethene	14.80	166	4221	0.197	ng	95
65) Chlorobenzene	15.51	112	11622	0.214	ng	97
66) Ethylbenzene	15.90	91	20490	0.205	ng	100
67) m- & p-Xylenes	16.10	91	32365	0.420	ng	100
68) Bromoform	16.16	173	3110	0.189	ng	97
69) Styrene	16.47	104	11601	0.199	ng	99
70) o-Xylene	16.58	91	16191	0.212	ng	99
71) n-Nonane	16.82	43	11608	0.307	ng	98
72) 1,1,2,2-Tetrachloroethane	16.56	83	7875	0.222	ng	97
74) Cumene	17.20	105	20431	0.214	ng	98
75) alpha-Pinene	17.61	93	9476	0.198	ng	92
76) n-Propylbenzene	17.72	91	24826	0.219	ng	98
77) 3-Ethyltoluene	17.83	105	19713	0.213	ng	95
78) 4-Ethyltoluene	17.88	105	18395	0.209	ng	96
79) 1,3,5-Trimethylbenzene	17.96	105	16182	0.203	ng	99
80) alpha-Methylstyrene	18.11	118	6881	0.172	ng	97
81) 2-Ethyltoluene	18.15	105	19646	0.217	ng	100
82) 1,2,4-Trimethylbenzene	18.38	105	16639	0.218	ng	99
83) n-Decane	18.50	57	11256	0.267	ng	97
84) Benzyl Chloride	18.52	91	11887	0.211	ng	100
85) 1,3-Dichlorobenzene	18.54	146	8789	0.220	ng	97
86) 1,4-Dichlorobenzene	18.61	146	9168	0.224	ng	98
87) sec-Butylbenzene	18.67	105	22137	0.214	ng	99
88) 4-Isopropyltoluene (p-...	18.83	119	20173	0.212	ng	98
89) 1,2,3-Trimethylbenzene	18.83	105	16320	0.213	ng	100
90) 1,2-Dichlorobenzene	18.97	146	8442	0.219	ng	97
91) d-Limonene	18.99	68	6199	0.198	ng	98
92) 1,2-Dibromo-3-Chloropr...	19.43	157	2616	0.196	ng	89
93) n-Undecane	19.83	57	11074	0.279	ng	98
94) 1,2,4-Trichlorobenzene	20.77	180	5570	0.217	ng	98
95) Naphthalene	20.89	128	16576	0.198	ng	99
96) n-Dodecane	20.92	57	8145	0.289	ng	99
97) Hexachlorobutadiene	21.26	225	3463	0.190	ng	91
98) Cyclohexanone	16.25	55	7931	0.268	ng	99
99) tert-Butylbenzene	18.38	119	16271	0.222	ng	98
100) n-Butylbenzene	19.27	91	18195	0.219	ng	99

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Data File: I:\MS09\Data\2019 06\07\06071904.D
Acq On : 7 Jun 2019 10:38 Operator: SC
Sample : 0.2ng TO-15 ICAL STD
Misc : S31-05131901/S31-05201906 (6/18)
ALS Vial : 4 Sample Multiplier: 1

Quant Time: Jun 07 13:42:50 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071905.D
Acq On : 7 Jun 2019 11:11 Operator: SC
Sample : 0.5ng TO-15 ICAL STD
Misc : S31-05131901/S31-05201906 (6/18)
ALS Vial : 4 Sample Multiplier: 1

6/7/19

Quant Time: Jun 07 13:41:20 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	175278	12.500	ng		-0.03
37) 1,4-Difluorobenzene (IS2)	11.11	114	801165	12.500	ng		-0.01
56) Chlorobenzene-d5 (IS3)	15.46	82	410704	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.91	65	324088	14.653	ng		-0.02
Spiked Amount 12.500	Range 70 - 130		Recovery = 117.20%				
57) Toluene-d8 (SS2)	13.55	98	961760	11.863	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 94.88%				
73) Bromofluorobenzene (SS3)	17.05	174	254399	11.896	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 95.20%				
Target Compounds							Qvalue
2) Propene	3.87	42	13421	0.739	ng		99
3) Dichlorodifluoromethan...	3.98	85	18828	0.582	ng		99
4) Chloromethane	4.17	50	18035	0.676	ng		98
5) 1,2-Dichloro-1,1,2,2-t...	4.33	135	8400	0.546	ng		99
6) Vinyl Chloride	4.45	62	15625	0.627	ng		98
7) 1,3-Butadiene	4.62	54	11380	0.772	ng		99
8) Bromomethane	4.93	94	8213	0.525	ng		99
9) Chloroethane	5.14	64	8178	0.624	ng		98
10) Ethanol	5.33	45	49807	3.647	ng		100
11) Acetonitrile	5.55	41	26739	0.841	ng		99
12) Acrolein	5.69	56	7916	0.736	ng		100
13) Acetone	5.83	58	57024	4.570	ng		96
14) Trichlorofluoromethane	6.02	101	16245	0.624	ng		99
15) 2-Propanol (Isopropanol)	6.14	45	64689	1.504	ng		94
16) Acrylonitrile	6.36	53	16308	0.676	ng		100
17) 1,1-Dichloroethene	6.71	96	9655	0.579	ng		96
18) 2-Methyl-2-Propanol (t...	6.80	59	56237	1.341	ng		99
19) Methylene Chloride	6.85	84	10408	0.566	ng		99
20) 3-Chloro-1-propene (Al...	6.98	41	19241	0.878	ng		98
21) Trichlorotrifluoroethane	7.18	151	7352	0.617	ng		95
22) Carbon Disulfide	7.14	76	39719	0.634	ng		99
23) trans-1,2-Dichloroethene	7.87	61	16470	0.644	ng		100
24) 1,1-Dichloroethane	8.09	63	19091	0.615	ng		98
25) Methyl tert-Butyl Ether	8.19	73	31170	0.581	ng		99
26) Vinyl Acetate	8.27	86	12515	3.478	ng		99
27) 2-Butanone (MEK)	8.52	72	9052	0.705	ng		100
28) cis-1,2-Dichloroethene	8.97	61	15704	0.645	ng		100
29) Diisopropyl Ether	9.22	87	9032	0.568	ng	#	92
30) Ethyl Acetate	9.22	61	8789	1.445	ng		98
31) n-Hexane	9.22	57	20890	0.662	ng		99
32) Chloroform	9.27	83	17498	0.571	ng		100
34) Tetrahydrofuran (THF)	9.69	72	7574	0.597	ng		98
35) Ethyl tert-Butyl Ether	9.77	87	11376	0.524	ng		99
36) 1,2-Dichloroethane	10.02	62	14498	0.657	ng		98
38) 1,1,1-Trichloroethane	10.29	97	15278	0.572	ng		99
39) Isopropyl Acetate	10.67	61	14676	1.292	ng		97
40) 1-Butanol	10.69	56	26415	1.508	ng		97
41) Benzene	10.75	78	45685	0.586	ng		99
42) Carbon Tetrachloride	10.90	117	12310	0.566	ng		99
43) Cyclohexane	11.04	84	32518	1.123	ng		99
44) tert-Amyl Methyl Ether	11.36	73	29057	0.566	ng		96
45) 1,2-Dichloropropane	11.57	63	11788	0.653	ng		99
46) Bromodichloromethane	11.75	83	13578	0.558	ng		100
47) Trichloroethene	11.80	130	10055	0.534	ng		98
48) 1,4-Dioxane	11.79	88	9168	0.608	ng		99
49) 2,2,4-Trimethylpentane...	11.87	57	51155	0.657	ng		98

Data File: I:\MS09\Data\2019 06\07\06071905.D
Acq On : 7 Jun 2019 11:11 Operator: SC
Sample : 0.5ng TO-15 ICAL STD
Misc : S31-05131901/S31-05201906 (6/18)
ALS Vial : 4 Sample Multiplier: 1

Quant Time: Jun 07 13:41:20 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

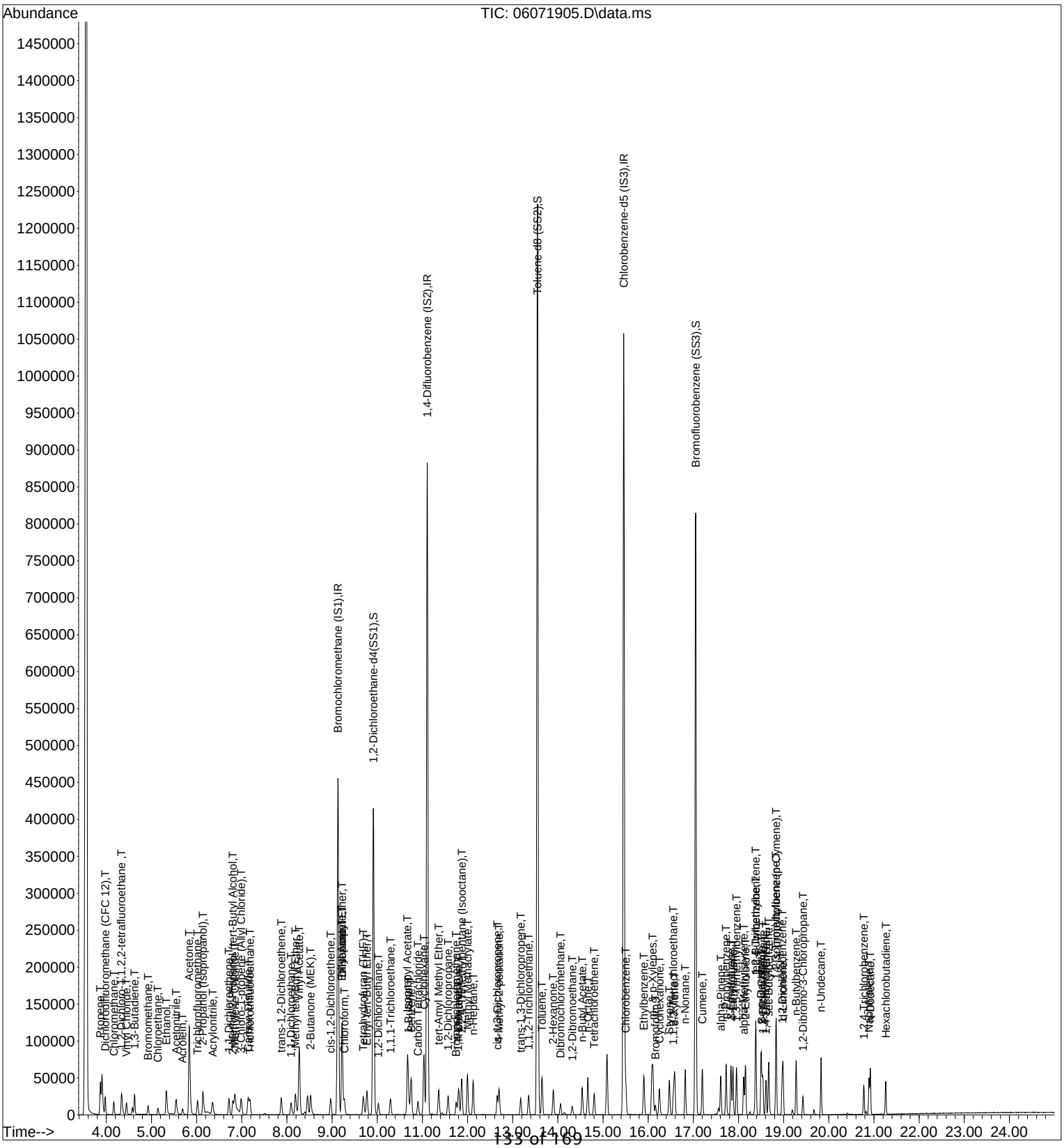
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
50) Methyl Methacrylate	12.00	100	7885	1.100 ng	96
51) n-Heptane	12.12	71	11554	0.591 ng	99
52) cis-1,3-Dichloropropene	12.66	75	17962	0.626 ng	100
53) 4-Methyl-2-pentanone	12.70	58	10928	0.651 ng	93
54) trans-1,3-Dichloropropene	13.18	75	15042	0.615 ng	99
55) 1,1,2-Trichloroethane	13.35	97	9741	0.547 ng	99
58) Toluene	13.65	91	43196	0.510 ng	99
59) 2-Hexanone	13.90	43	29152	0.799 ng	99
60) Dibromochloromethane	14.06	129	10148	0.501 ng	97
61) 1,2-Dibromoethane	14.32	107	10416	0.516 ng	100
62) n-Butyl Acetate	14.54	43	32572	0.813 ng	100
63) n-Octane	14.67	57	10386	0.577 ng	100
64) Tetrachloroethene	14.80	166	10057	0.493 ng	96
65) Chlorobenzene	15.50	112	26092	0.505 ng	99
66) Ethylbenzene	15.90	91	46717	0.492 ng	100
67) m- & p-Xylenes	16.10	91	74115	1.012 ng	99
68) Bromoform	16.16	173	7246	0.464 ng	96
69) Styrene	16.47	104	26577	0.479 ng	100
70) o-Xylene	16.58	91	36636	0.505 ng	99
71) n-Nonane	16.82	43	26508	0.737 ng	99
72) 1,1,2,2-Tetrachloroethane	16.56	83	18026	0.534 ng	99
74) Cumene	17.20	105	45719	0.504 ng	99
75) alpha-Pinene	17.61	93	22620	0.496 ng	97
76) n-Propylbenzene	17.72	91	57460	0.532 ng	99
77) 3-Ethyltoluene	17.83	105	45309	0.514 ng	97
78) 4-Ethyltoluene	17.88	105	42796	0.512 ng	95
79) 1,3,5-Trimethylbenzene	17.95	105	37894	0.500 ng	99
80) alpha-Methylstyrene	18.12	118	16938	0.445 ng	99
81) 2-Ethyltoluene	18.15	105	45109	0.523 ng	100
82) 1,2,4-Trimethylbenzene	18.38	105	37711	0.519 ng	99
83) n-Decane	18.50	57	25920	0.648 ng	97
84) Benzyl Chloride	18.51	91	29151	0.544 ng	99
85) 1,3-Dichlorobenzene	18.54	146	20480	0.539 ng	99
86) 1,4-Dichlorobenzene	18.61	146	20121	0.516 ng	99
87) sec-Butylbenzene	18.67	105	51635	0.525 ng	99
88) 4-Isopropyltoluene (p-...	18.83	119	46632	0.514 ng	98
89) 1,2,3-Trimethylbenzene	18.83	105	37627	0.517 ng	100
90) 1,2-Dichlorobenzene	18.97	146	19849	0.542 ng	99
91) d-Limonene	18.99	68	15059	0.507 ng	99
92) 1,2-Dibromo-3-Chloropr...	19.43	157	6521	0.513 ng	92
93) n-Undecane	19.83	57	25297	0.671 ng	99
94) 1,2,4-Trichlorobenzene	20.77	180	12655	0.519 ng	100
95) Naphthalene	20.89	128	38375	0.482 ng	99
96) n-Dodecane	20.92	57	19531	0.729 ng	98
97) Hexachlorobutadiene	21.26	225	8625	0.498 ng	100
98) Cyclohexanone	16.25	55	18517	0.659 ng	99
99) tert-Butylbenzene	18.38	119	36740	0.526 ng	99
100) n-Butylbenzene	19.28	91	43752	0.555 ng	99

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071905.D
Acq On : 7 Jun 2019 11:11 Operator: SC
Sample : 0.5ng TO-15 ICAL STD
Misc : S31-05131901/S31-05201906 (6/18)
ALS Vial : 4 Sample Multiplier: 1

Quant Time: Jun 07 13:41:20 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071906.D
Acq On : 7 Jun 2019 11:45 Operator: SC
Sample : 1.0ng TO-15 ICAL STD
Misc : S31-05131901/S31-05201906 (6/18)
ALS Vial : 4 Sample Multiplier: 1

6/7/19

Quant Time: Jun 07 13:39:58 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.13	130	174431	12.500	ng		-0.02
37) 1,4-Difluorobenzene (IS2)	11.11	114	796471	12.500	ng		-0.01
56) Chlorobenzene-d5 (IS3)	15.46	82	412311	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.92	65	325951	14.809	ng		-0.02
Spiked Amount 12.500	Range 70 - 130		Recovery = 118.48%				
57) Toluene-d8 (SS2)	13.55	98	959641	11.791	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 94.32%				
73) Bromofluorobenzene (SS3)	17.05	174	255793	11.915	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 95.28%				
Target Compounds							Qvalue
2) Propene	3.87	42	23875	1.320	ng		99
3) Dichlorodifluoromethan...	3.98	85	35060	1.090	ng		99
4) Chloromethane	4.16	50	30819	1.161	ng		99
5) 1,2-Dichloro-1,1,2,2-t...	4.34	135	15131	0.988	ng		99
6) Vinyl Chloride	4.45	62	28818	1.162	ng		98
7) 1,3-Butadiene	4.62	54	20688	1.411	ng		99
8) Bromomethane	4.93	94	14071	0.904	ng		99
9) Chloroethane	5.14	64	14382	1.103	ng		98
10) Ethanol	5.33	45	89905	6.615	ng		99
11) Acetonitrile	5.55	41	49119	1.552	ng		100
12) Acrolein	5.69	56	14143	1.322	ng		98
13) Acetone	5.83	58	102635	8.266	ng		97
14) Trichlorofluoromethane	6.02	101	29998	1.158	ng		99
15) 2-Propanol (Isopropanol)	6.14	45	120637	2.819	ng		96
16) Acrylonitrile	6.35	53	30253	1.259	ng		100
17) 1,1-Dichloroethene	6.71	96	17422	1.050	ng		99
18) 2-Methyl-2-Propanol (t...	6.80	59	106016	2.540	ng		99
19) Methylene Chloride	6.85	84	19182	1.048	ng		100
20) 3-Chloro-1-propene (Al...	6.99	41	36776	1.687	ng		96
21) Trichlorotrifluoroethane	7.18	151	13849	1.168	ng		99
22) Carbon Disulfide	7.14	76	72976	1.170	ng		100
23) trans-1,2-Dichloroethene	7.88	61	29938	1.176	ng		100
24) 1,1-Dichloroethane	8.09	63	35658	1.155	ng		100
25) Methyl tert-Butyl Ether	8.18	73	57845	1.083	ng		99
26) Vinyl Acetate	8.28	86	23276	6.500	ng	#	96
27) 2-Butanone (MEK)	8.52	72	16559	1.295	ng		100
28) cis-1,2-Dichloroethene	8.97	61	28723	1.185	ng		99
29) Diisopropyl Ether	9.22	87	15950	1.007	ng	#	95
30) Ethyl Acetate	9.22	61	16354	2.702	ng		97
31) n-Hexane	9.22	57	38693	1.233	ng		99
32) Chloroform	9.28	83	31987	1.048	ng		98
34) Tetrahydrofuran (THF)	9.68	72	13961	1.106	ng		93
35) Ethyl tert-Butyl Ether	9.77	87	21133	0.977	ng		99
36) 1,2-Dichloroethane	10.02	62	26241	1.195	ng		98
38) 1,1,1-Trichloroethane	10.29	97	27817	1.047	ng		99
39) Isopropyl Acetate	10.67	61	26990	2.390	ng	#	92
40) 1-Butanol	10.68	56	49950	2.868	ng		98
41) Benzene	10.75	78	81221	1.048	ng		100
42) Carbon Tetrachloride	10.90	117	23682	1.095	ng		98
43) Cyclohexane	11.04	84	59089	2.053	ng		98
44) tert-Amyl Methyl Ether	11.36	73	52575	1.030	ng		96
45) 1,2-Dichloropropane	11.57	63	21702	1.210	ng		99
46) Bromodichloromethane	11.75	83	25209	1.042	ng		99
47) Trichloroethene	11.81	130	18271	0.977	ng		99
48) 1,4-Dioxane	11.79	88	16610	1.108	ng		99
49) 2,2,4-Trimethylpentane...	11.87	57	95186	1.230	ng		100

Data File: I:\MS09\Data\2019 06\07\06071906.D
Acq On : 7 Jun 2019 11:45 Operator: SC
Sample : 1.0ng TO-15 ICAL STD
Misc : S31-05131901/S31-05201906 (6/18)
ALS Vial : 4 Sample Multiplier: 1

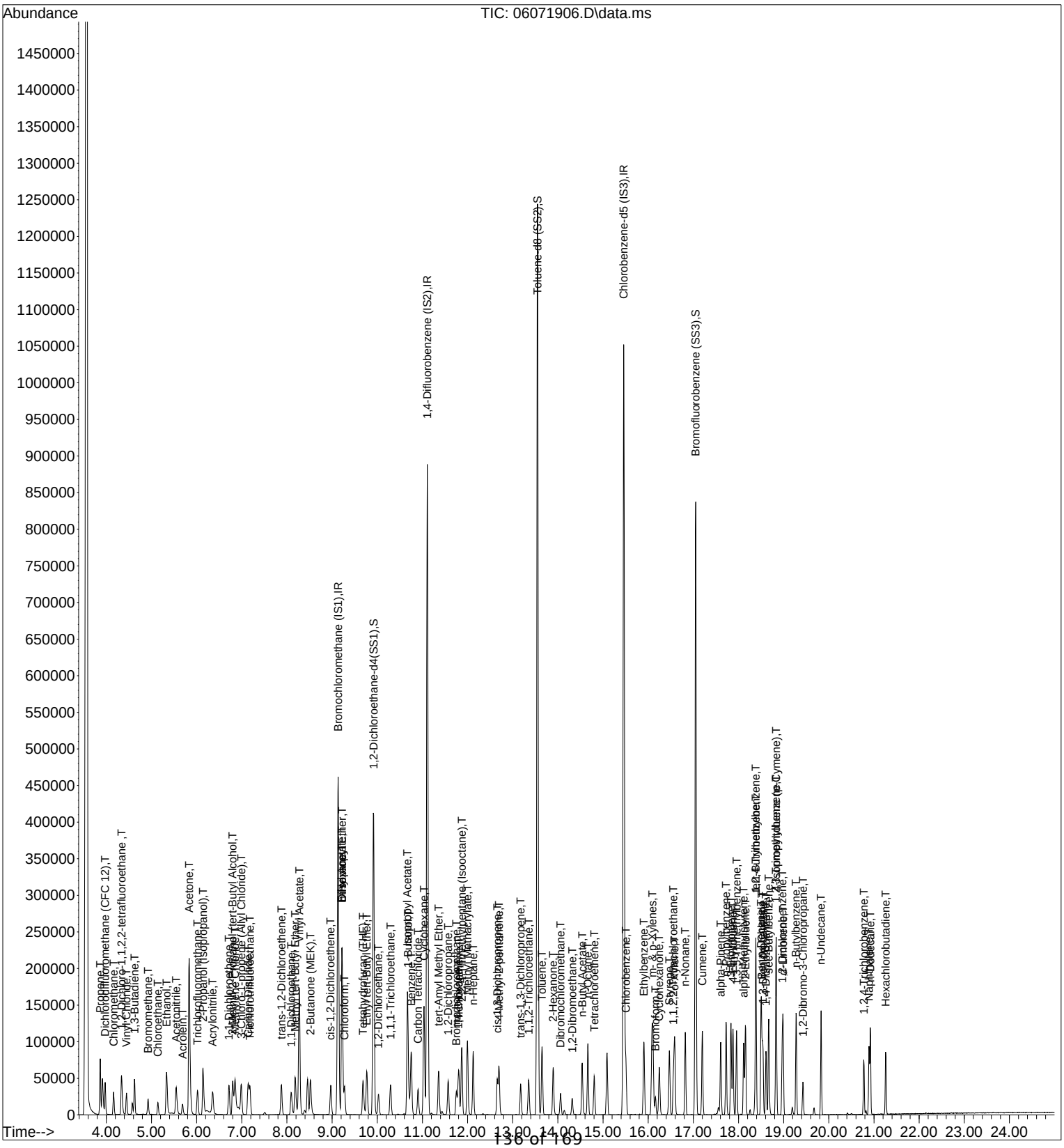
Quant Time: Jun 07 13:39:58 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
50) Methyl Methacrylate	12.00	100	14548	2.042	ng	98
51) n-Heptane	12.12	71	21117	1.086	ng	100
52) cis-1,3-Dichloropropene	12.66	75	33271	1.167	ng	99
53) 4-Methyl-2-pentanone	12.70	58	20950	1.256	ng	97
54) trans-1,3-Dichloropropene	13.18	75	28516	1.173	ng	99
55) 1,1,2-Trichloroethane	13.35	97	17811	1.006	ng	100
58) Toluene	13.65	91	77652	0.913	ng	99
59) 2-Hexanone	13.90	43	55337	1.511	ng	99
60) Dibromochloromethane	14.06	129	18866	0.928	ng	98
61) 1,2-Dibromoethane	14.32	107	19096	0.942	ng	99
62) n-Butyl Acetate	14.54	43	61744	1.535	ng	100
63) n-Octane	14.67	57	19415	1.075	ng	98
64) Tetrachloroethene	14.81	166	18030	0.881	ng	99
65) Chlorobenzene	15.51	112	48907	0.944	ng	99
66) Ethylbenzene	15.90	91	87587	0.918	ng	99
67) m- & p-Xylenes	16.10	91	136565	1.858	ng	100
68) Bromoform	16.16	173	13709	0.875	ng	99
69) Styrene	16.47	104	49555	0.889	ng	99
70) o-Xylene	16.58	91	67950	0.934	ng	99
71) n-Nonane	16.82	43	49528	1.372	ng	99
72) 1,1,2,2-Tetrachloroethane	16.56	83	33759	0.996	ng	99
74) Cumene	17.20	105	84837	0.932	ng	99
75) alpha-Pinene	17.61	93	42724	0.933	ng	99
76) n-Propylbenzene	17.72	91	108701	1.003	ng	98
77) 3-Ethyltoluene	17.83	105	84273	0.952	ng	96
78) 4-Ethyltoluene	17.88	105	80522	0.959	ng	96
79) 1,3,5-Trimethylbenzene	17.96	105	70051	0.921	ng	99
80) alpha-Methylstyrene	18.11	118	31425	0.823	ng	98
81) 2-Ethyltoluene	18.15	105	84039	0.971	ng	99
82) 1,2,4-Trimethylbenzene	18.38	105	71204	0.977	ng	100
83) n-Decane	18.50	57	47854	1.191	ng	100
84) Benzyl Chloride	18.51	91	56931	1.058	ng	98
85) 1,3-Dichlorobenzene	18.54	146	37373	0.980	ng	99
86) 1,4-Dichlorobenzene	18.61	146	36916	0.943	ng	99
87) sec-Butylbenzene	18.67	105	96723	0.979	ng	100
88) 4-Isopropyltoluene (p-...	18.83	119	86022	0.945	ng	99
89) 1,2,3-Trimethylbenzene	18.83	105	70459	0.965	ng	99
90) 1,2-Dichlorobenzene	18.97	146	36569	0.995	ng	99
91) d-Limonene	18.99	68	28339	0.950	ng	100
92) 1,2-Dibromo-3-Chloropr...	19.43	157	12180	0.955	ng	93
93) n-Undecane	19.83	57	48525	1.282	ng	99
94) 1,2,4-Trichlorobenzene	20.77	180	23019	0.941	ng	99
95) Naphthalene	20.89	128	71153	0.890	ng	100
96) n-Dodecane	20.92	57	37000	1.375	ng	100
97) Hexachlorobutadiene	21.26	225	15776	0.908	ng	98
98) Cyclohexanone	16.24	55	34808	1.234	ng	99
99) tert-Butylbenzene	18.38	119	67704	0.966	ng	100
100) n-Butylbenzene	19.27	91	81496	1.029	ng	100

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Data File: I:\MS09\Data\2019 06\07\06071906.D
Acq On : 7 Jun 2019 11:45 Operator: SC
Sample : 1.0ng TO-15 ICAL STD
Misc : S31-05131901/S31-05201906 (6/18)
ALS Vial : 4 Sample Multiplier: 1

Quant Time: Jun 07 13:39:58 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071907.D
Acq On : 7 Jun 2019 12:18 Operator: SC
Sample : 5.0ng TO-15 ICAL STD
Misc : S31-05131901/S31-06061905 (7/4)
ALS Vial : 8 Sample Multiplier: 1

6/7/19

Quant Time: Jun 07 13:38:47 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.14	130	173473	12.500	ng		-0.02
37) 1,4-Difluorobenzene (IS2)	11.11	114	787446	12.500	ng		0.00
56) Chlorobenzene-d5 (IS3)	15.46	82	413665	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.92	65	324959	14.845	ng		-0.02
Spiked Amount 12.500	Range 70 - 130		Recovery = 118.80%				
57) Toluene-d8 (SS2)	13.55	98	954900	11.694	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 93.52%				
73) Bromofluorobenzene (SS3)	17.05	174	257227	11.942	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 95.52%				
Target Compounds							Qvalue
2) Propene	3.85	42	99206	5.516	ng		99
3) Dichlorodifluoromethan...	3.96	85	139656	4.364	ng		100
4) Chloromethane	4.15	50	125587	4.758	ng		99
5) 1,2-Dichloro-1,1,2,2-t...	4.32	135	59303	3.893	ng		99
6) Vinyl Chloride	4.44	62	116716	4.732	ng		100
7) 1,3-Butadiene	4.61	54	87887	6.028	ng		100
8) Bromomethane	4.92	94	60089	3.880	ng		100
9) Chloroethane	5.14	64	57498	4.436	ng		99
10) Ethanol	5.34	45	351944	26.038	ng		99
11) Acetonitrile	5.55	41	187150	5.948	ng		99
12) Acrolein	5.69	56	56725	5.330	ng		100
13) Acetone	5.83	58	334116	27.058	ng		98
14) Trichlorofluoromethane	6.02	101	117899	4.576	ng		100
15) 2-Propanol (Isopropanol)	6.14	45	480534	11.290	ng		98
16) Acrylonitrile	6.36	53	120611	5.048	ng		100
17) 1,1-Dichloroethene	6.71	96	69908	4.238	ng		100
18) 2-Methyl-2-Propanol (t...	6.80	59	420878	10.140	ng		99
19) Methylene Chloride	6.86	84	75407	4.141	ng		98
20) 3-Chloro-1-propene (Al...	6.99	41	140983	6.503	ng		100
21) Trichlorotrifluoroethane	7.18	151	53936	4.575	ng		99
22) Carbon Disulfide	7.14	76	287993	4.644	ng		100
23) trans-1,2-Dichloroethene	7.88	61	120506	4.759	ng		100
24) 1,1-Dichloroethane	8.10	63	144063	4.692	ng		99
25) Methyl tert-Butyl Ether	8.17	73	233201	4.388	ng		99
26) Vinyl Acetate	8.28	86	90154	25.316	ng	#	87
27) 2-Butanone (MEK)	8.51	72	55448	4.361	ng		96
28) cis-1,2-Dichloroethene	8.97	61	115091	4.773	ng		98
29) Diisopropyl Ether	9.21	87	62072	3.941	ng	#	82
30) Ethyl Acetate	9.21	61	69016	11.466	ng		98
31) n-Hexane	9.22	57	153827	4.928	ng		100
32) Chloroform	9.28	83	129030	4.251	ng		100
34) Tetrahydrofuran (THF)	9.67	72	54522	4.342	ng		99
35) Ethyl tert-Butyl Ether	9.76	87	83124	3.866	ng		98
36) 1,2-Dichloroethane	10.03	62	104866	4.801	ng		100
38) 1,1,1-Trichloroethane	10.30	97	112242	4.273	ng		99
39) Isopropyl Acetate	10.66	61	109216	9.781	ng		96
40) 1-Butanol	10.67	56	193880	11.259	ng		98
41) Benzene	10.76	78	315391	4.115	ng		99
42) Carbon Tetrachloride	10.90	117	93547	4.377	ng		100
43) Cyclohexane	11.04	84	240493	8.451	ng		100
44) tert-Amyl Methyl Ether	11.35	73	211387	4.191	ng		99
45) 1,2-Dichloropropane	11.57	63	85311	4.811	ng		99
46) Bromodichloromethane	11.75	83	102919	4.303	ng		99
47) Trichloroethene	11.81	130	71302	3.855	ng		99
48) 1,4-Dioxane	11.78	88	62480	4.214	ng		100
49) 2,2,4-Trimethylpentane...	11.87	57	378035	4.941	ng		100

Data File: I:\MS09\Data\2019 06\07\06071907.D
Acq On : 7 Jun 2019 12:18 Operator: SC
Sample : 5.0ng TO-15 ICAL STD
Misc : S31-05131901/S31-06061905 (7/4)
ALS Vial : 8 Sample Multiplier: 1

Quant Time: Jun 07 13:38:47 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

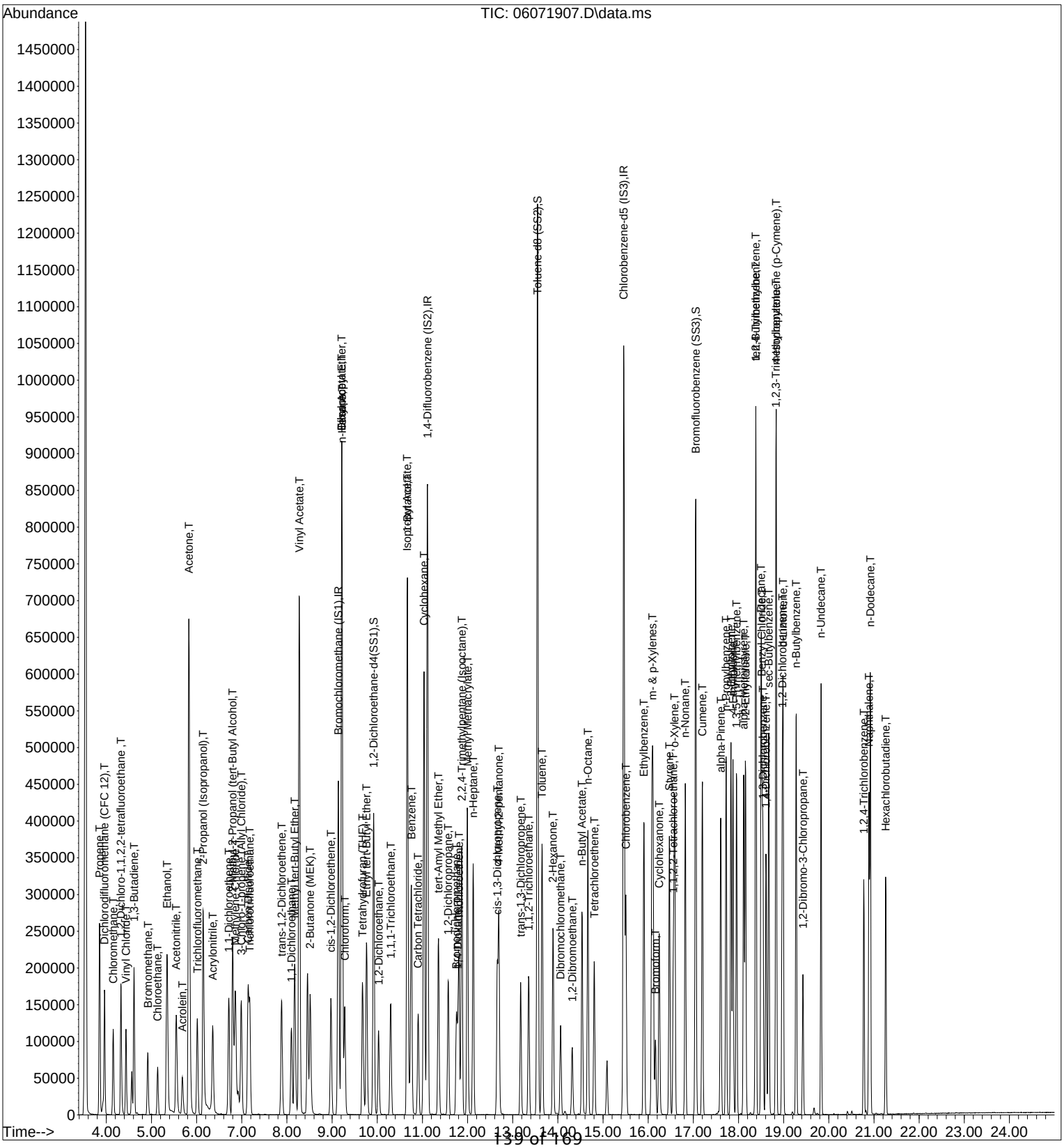
Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
50) Methyl Methacrylate	12.00	100	59173	8.402 ng	96
51) n-Heptane	12.12	71	84431	4.392 ng	100
52) cis-1,3-Dichloropropene	12.66	75	139151	4.936 ng	99
53) 4-Methyl-2-pentanone	12.69	58	84373	5.114 ng	97
54) trans-1,3-Dichloropropene	13.18	75	119070	4.955 ng	99
55) 1,1,2-Trichloroethane	13.35	97	71286	4.073 ng	99
58) Toluene	13.65	91	315685	3.699 ng	99
59) 2-Hexanone	13.89	43	216831	5.902 ng	98
60) Dibromochloromethane	14.06	129	77693	3.809 ng	98
61) 1,2-Dibromoethane	14.32	107	77409	3.806 ng	99
62) n-Butyl Acetate	14.53	43	245396	6.081 ng	99
63) n-Octane	14.67	57	78057	4.306 ng	98
64) Tetrachloroethene	14.81	166	71275	3.470 ng	99
65) Chlorobenzene	15.51	112	193406	3.719 ng	99
66) Ethylbenzene	15.90	91	353534	3.693 ng	99
67) m- & p-Xylenes	16.10	91	558535	7.574 ng	99
68) Bromoform	16.16	173	57696	3.669 ng	99
69) Styrene	16.47	104	211126	3.774 ng	100
70) o-Xylene	16.58	91	274159	3.755 ng	100
71) n-Nonane	16.82	43	198838	5.491 ng	99
72) 1,1,2,2-Tetrachloroethane	16.56	83	135987	4.001 ng	100
74) Cumene	17.20	105	339931	3.724 ng	99
75) alpha-Pinene	17.61	93	180232	3.922 ng	99
76) n-Propylbenzene	17.72	91	429913	3.952 ng	99
77) 3-Ethyltoluene	17.83	105	341144	3.840 ng	96
78) 4-Ethyltoluene	17.88	105	320390	3.804 ng	97
79) 1,3,5-Trimethylbenzene	17.95	105	278552	3.652 ng	100
80) alpha-Methylstyrene	18.11	118	150911	3.938 ng	99
81) 2-Ethyltoluene	18.15	105	335127	3.860 ng	99
82) 1,2,4-Trimethylbenzene	18.38	105	283950	3.882 ng	100
83) n-Decane	18.50	57	191817	4.758 ng	99
84) Benzyl Chloride	18.51	91	256663	4.754 ng	99
85) 1,3-Dichlorobenzene	18.54	146	150509	3.932 ng	100
86) 1,4-Dichlorobenzene	18.61	146	150495	3.830 ng	100
87) sec-Butylbenzene	18.67	105	383691	3.870 ng	99
88) 4-Isopropyltoluene (p-...	18.83	119	342880	3.755 ng	99
89) 1,2,3-Trimethylbenzene	18.83	105	280662	3.831 ng	100
90) 1,2-Dichlorobenzene	18.97	146	146176	3.964 ng	100
91) d-Limonene	18.99	68	130059	4.346 ng	100
92) 1,2-Dibromo-3-Chloropr...	19.43	157	50826	3.972 ng	96
93) n-Undecane	19.83	57	198845	5.236 ng	99
94) 1,2,4-Trichlorobenzene	20.77	180	97067	3.955 ng	100
95) Naphthalene	20.89	128	337057	4.201 ng	99
96) n-Dodecane	20.92	57	188397	6.979 ng	99
97) Hexachlorobutadiene	21.26	225	61255	3.514 ng	100
98) Cyclohexanone	16.24	55	129619	4.580 ng	99
99) tert-Butylbenzene	18.38	119	271426	3.861 ng	99
100) n-Butylbenzene	19.28	91	326319	4.106 ng	100

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071907.D
Acq On : 7 Jun 2019 12:18 Operator: SC
Sample : 5.0ng TO-15 ICAL STD
Misc : S31-05131901/S31-06061905 (7/4)
ALS Vial : 8 Sample Multiplier: 1

Quant Time: Jun 07 13:38:47 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071908.D
Acq On : 7 Jun 2019 12:52 Operator: SC
Sample : 25ng TO-15 ICAL STD
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

6/7/19

Quant Time: Jun 07 13:36:30 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 08:36:10 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.16	130	187330	12.500	ng		0.00
37) 1,4-Difluorobenzene (IS2)	11.12	114	845421	12.500	ng		0.00
56) Chlorobenzene-d5 (IS3)	15.46	82	448978	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.94	65	346572	14.661	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 117.28%				
57) Toluene-d8 (SS2)	13.55	98	1035276	11.681	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 93.44%				
73) Bromofluorobenzene (SS3)	17.05	174	281921	12.059	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 96.48%				
Target Compounds							Qvalue
2) Propene	3.84	42	638777	32.891	ng		100
3) Dichlorodifluoromethan...	3.96	85	889825	25.749	ng		100
4) Chloromethane	4.16	50	838993	29.432	ng		100
5) 1,2-Dichloro-1,1,2,2-t...	4.32	135	387994	23.583	ng		100
6) Vinyl Chloride	4.44	62	756314	28.398	ng		100
7) 1,3-Butadiene	4.62	54	596932	37.914	ng		98
8) Bromomethane	4.93	94	388498	23.230	ng		99
9) Chloroethane	5.15	64	374674	26.767	ng		100
10) Ethanol	5.39	45	2284146	156.487	ng		100
11) Acetonitrile	5.58	41	1190213	35.027	ng		100
12) Acrolein	5.71	56	351887	30.619	ng		99
13) Acetone	5.86	58	2095109	157.120	ng		94
14) Trichlorofluoromethane	6.02	101	754729	27.128	ng		100
15) 2-Propanol (Isopropanol)	6.18	45	3103572	67.521	ng		99
16) Acrylonitrile	6.38	53	784587	30.410	ng		100
17) 1,1-Dichloroethene	6.72	96	452836	25.419	ng		95
18) 2-Methyl-2-Propanol (t...	6.83	59	2765540	61.701	ng		99
19) Methylene Chloride	6.88	84	486852	24.758	ng		95
20) 3-Chloro-1-propene (Al...	7.01	41	939472	40.126	ng		98
21) Trichlorotrifluoroethane	7.19	151	352791	27.709	ng		98
22) Carbon Disulfide	7.15	76	1882267	28.110	ng		100
23) trans-1,2-Dichloroethene	7.90	61	783810	28.667	ng		98
24) 1,1-Dichloroethane	8.12	63	925611	27.916	ng		100
25) Methyl tert-Butyl Ether	8.18	73	1511964	26.347	ng		100
26) Vinyl Acetate	8.29	86	598518	155.636	ng	#	88
27) 2-Butanone (MEK)	8.52	72	362568	26.405	ng		94
28) cis-1,2-Dichloroethene	8.99	61	746864	28.685	ng		97
29) Diisopropyl Ether	9.22	87	408953	24.046	ng	#	89
30) Ethyl Acetate	9.23	61	425545	65.469	ng		98
31) n-Hexane	9.23	57	986137	29.256	ng		100
32) Chloroform	9.30	83	833880	25.441	ng		100
34) Tetrahydrofuran (THF)	9.68	72	355918	26.246	ng		97
35) Ethyl tert-Butyl Ether	9.77	87	553945	23.858	ng		97
36) 1,2-Dichloroethane	10.04	62	677432	28.723	ng		100
38) 1,1,1-Trichloroethane	10.30	97	735819	26.089	ng		99
39) Isopropyl Acetate	10.67	61	713720	59.536	ng		94
40) 1-Butanol	10.68	56	1267990	68.585	ng		98
41) Benzene	10.76	78	2003643	24.349	ng		100
42) Carbon Tetrachloride	10.91	117	618172	26.939	ng		100
43) Cyclohexane	11.04	84	1557641	50.981	ng		98
44) tert-Amyl Methyl Ether	11.36	73	1392620	25.715	ng		99
45) 1,2-Dichloropropane	11.58	63	557062	29.259	ng		100
46) Bromodichloromethane	11.76	83	674929	26.281	ng		100
47) Trichloroethene	11.82	130	470174	23.676	ng		99
48) 1,4-Dioxane	11.78	88	418835	26.310	ng		98
49) 2,2,4-Trimethylpentane...	11.88	57	2413106	29.374	ng		99

Data File: I:\MS09\Data\2019 06\07\06071908.D
Acq On : 7 Jun 2019 12:52 Operator: SC
Sample : 25ng TO-15 ICAL STD
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 07 13:36:30 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 08:36:10 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

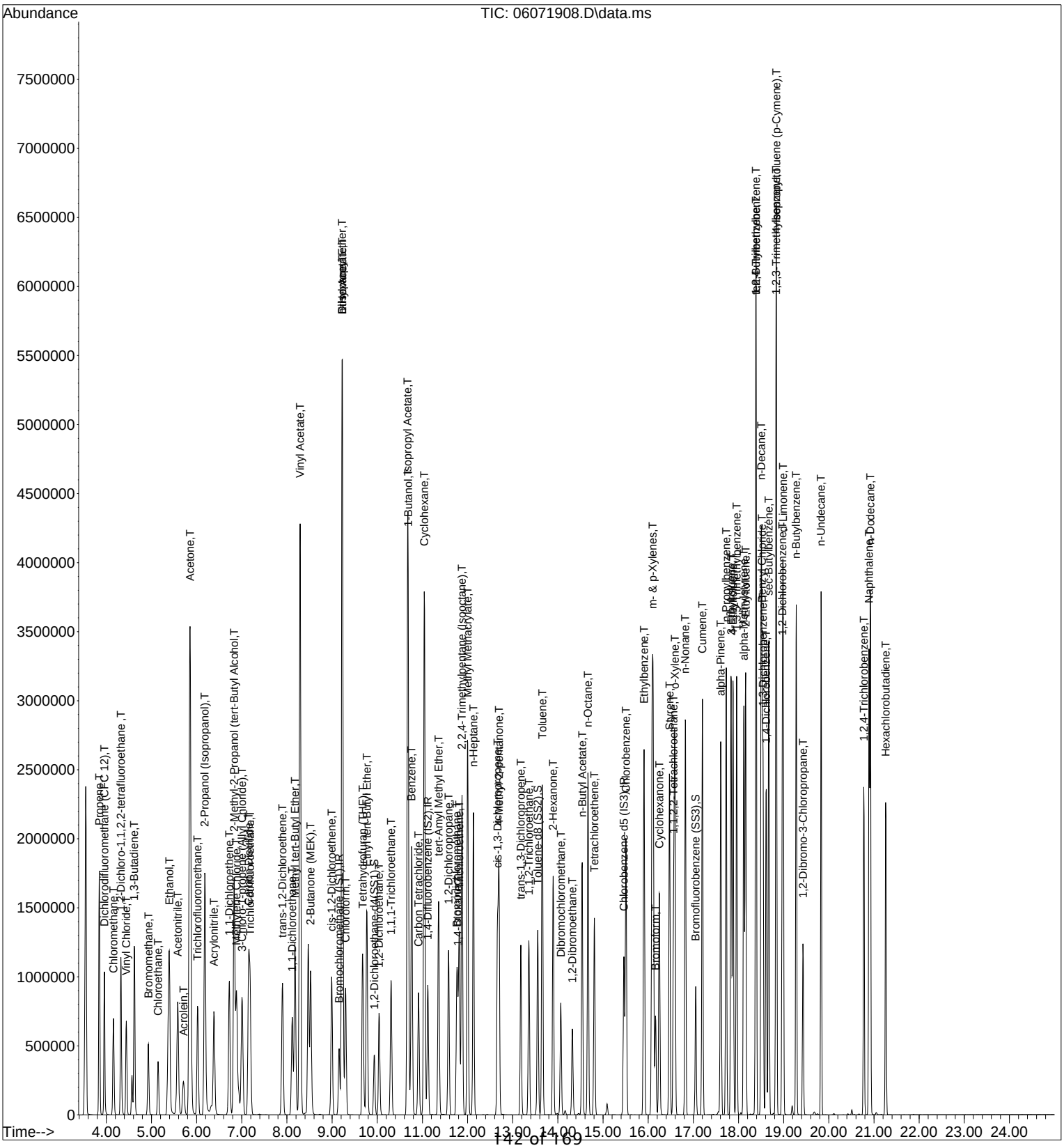
Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
50) Methyl Methacrylate	12.00	100	394989	52.241	ng	96
51) n-Heptane	12.13	71	546878	26.499	ng	99
52) cis-1,3-Dichloropropene	12.66	75	930324	30.736	ng	100
53) 4-Methyl-2-pentanone	12.70	58	550981	31.108	ng	97
54) trans-1,3-Dichloropropene	13.18	75	807381	31.295	ng	100
55) 1,1,2-Trichloroethane	13.36	97	471561	25.098	ng	100
58) Toluene	13.65	91	2030868	21.925	ng	100
59) 2-Hexanone	13.90	43	1404769	35.231	ng	99
60) Dibromochloromethane	14.07	129	525310	23.728	ng	100
61) 1,2-Dibromoethane	14.32	107	520212	23.565	ng	99
62) n-Butyl Acetate	14.54	43	1591224	36.332	ng	99
63) n-Octane	14.67	57	507629	25.802	ng	98
64) Tetrachloroethene	14.81	166	479360	21.505	ng	100
65) Chlorobenzene	15.51	112	1271976	22.536	ng	99
66) Ethylbenzene	15.91	91	2315384	22.287	ng	99
67) m- & p-Xylenes	16.10	91	3671212	45.869	ng	100
68) Bromoform	16.16	173	408375	23.926	ng	99
69) Styrene	16.47	104	1407154	23.178	ng	100
70) o-Xylene	16.59	91	1797673	22.684	ng	100
71) n-Nonane	16.82	43	1270087	32.316	ng	98
72) 1,1,2,2-Tetrachloroethane	16.56	83	901925	24.447	ng	100
74) Cumene	17.20	105	2225864	22.466	ng	100
75) alpha-Pinene	17.61	93	1188383	23.827	ng	100
76) n-Propylbenzene	17.73	91	2810504	23.803	ng	100
77) 3-Ethyltoluene	17.84	105	2192667	22.741	ng	97
78) 4-Ethyltoluene	17.88	105	2176339	23.806	ng	97
79) 1,3,5-Trimethylbenzene	17.96	105	1835721	22.172	ng	100
80) alpha-Methylstyrene	18.12	118	967722	23.265	ng	98
81) 2-Ethyltoluene	18.16	105	2187695	23.218	ng	100
82) 1,2,4-Trimethylbenzene	18.39	105	1925885	24.261	ng	100
83) n-Decane	18.50	57	1246075	28.478	ng	100
84) Benzyl Chloride	18.52	91	1825827	31.156	ng	100
85) 1,3-Dichlorobenzene	18.54	146	1008563	24.275	ng	100
86) 1,4-Dichlorobenzene	18.61	146	1022241	23.971	ng	100
87) sec-Butylbenzene	18.67	105	2483675	23.080	ng	100
88) 4-Isopropyltoluene (p-...	18.84	119	2279403	22.997	ng	100
89) 1,2,3-Trimethylbenzene	18.83	105	1895370	23.840	ng	100
90) 1,2-Dichlorobenzene	18.97	146	976916	24.406	ng	100
91) d-Limonene	18.99	68	851003	26.201	ng	100
92) 1,2-Dibromo-3-Chloropr...	19.43	157	349987	25.202	ng	98
93) n-Undecane	19.83	57	1305375	31.670	ng	99
94) 1,2,4-Trichlorobenzene	20.77	180	727119	27.294	ng	100
95) Naphthalene	20.89	128	2551762	29.303	ng	100
96) n-Dodecane	20.92	57	1223943	41.776	ng	100
97) Hexachlorobutadiene	21.26	225	436487	23.070	ng	99
98) Cyclohexanone	16.25	55	833869	27.145	ng	99
99) tert-Butylbenzene	18.39	119	1799212	23.579	ng	100
100) n-Butylbenzene	19.28	91	2140021	24.810	ng	100

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071908.D
Acq On : 7 Jun 2019 12:52 Operator: SC
Sample : 25ng TO-15 ICAL STD
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 07 13:36:30 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 08:36:10 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071909.D
Acq On : 7 Jun 2019 13:25 Operator: SC
Sample : 50ng TO-15 ICAL STD
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

6/7/19

Quant Time: Jun 07 13:52:32 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.16	130	199764	12.500	ng		0.00
37) 1,4-Difluorobenzene (IS2)	11.12	114	894771	12.500	ng		0.00
56) Chlorobenzene-d5 (IS3)	15.46	82	468531	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.94	65	358029	14.203	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 113.60%				
57) Toluene-d8 (SS2)	13.55	98	1091106	11.797	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 94.40%				
73) Bromofluorobenzene (SS3)	17.05	174	296262	12.144	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 97.12%				
Target Compounds							Qvalue
2) Propene	3.84	42	1224550	59.128	ng		100
3) Dichlorodifluoromethan...	3.96	85	1733545	47.041	ng		100
4) Chloromethane	4.16	50	1546255	50.867	ng		100
5) 1,2-Dichloro-1,1,2,2-t...	4.32	135	787487	44.886	ng		99
6) Vinyl Chloride	4.44	62	1492352	52.546	ng		100
7) 1,3-Butadiene	4.62	54	1174896	69.979	ng		98
8) Bromomethane	4.93	94	768159	43.072	ng		100
9) Chloroethane	5.15	64	735407	49.268	ng		100
10) Ethanol	5.41	45	4335769	278.554	ng		100
11) Acetonitrile	5.59	41	2290663	63.217	ng		100
12) Acrolein	5.72	56	675127	55.088	ng		99
13) Acetone	5.86	58	3958034	278.353	ng		95
14) Trichlorofluoromethane	6.03	101	1473406	49.664	ng		100
15) 2-Propanol (Isopropanol)	6.20	45	5917703	120.731	ng		100
16) Acrylonitrile	6.39	53	1529530	55.593	ng		99
17) 1,1-Dichloroethene	6.72	96	905279	47.653	ng		97
18) 2-Methyl-2-Propanol (t...	6.85	59	5411520	113.220	ng		99
19) Methylene Chloride	6.89	84	966805	46.105	ng		96
20) 3-Chloro-1-propene (Al...	7.01	41	1798262	72.026	ng		98
21) Trichlorotrifluoroethane	7.19	151	711207	52.384	ng		99
22) Carbon Disulfide	7.15	76	3715860	52.039	ng		100
23) trans-1,2-Dichloroethene	7.91	61	1532756	52.570	ng		98
24) 1,1-Dichloroethane	8.12	63	1802734	50.986	ng		100
25) Methyl tert-Butyl Ether	8.18	73	2980782	48.709	ng		99
26) Vinyl Acetate	8.30	86	1196027	291.652	ng	#	80
27) 2-Butanone (MEK)	8.53	72	721898	49.302	ng		93
28) cis-1,2-Dichloroethene	9.00	61	1462366	52.669	ng		99
29) Diisopropyl Ether	9.23	87	814063	44.887	ng	#	84
30) Ethyl Acetate	9.23	61	824438	118.943	ng		98
31) n-Hexane	9.23	57	1882903	52.383	ng		99
32) Chloroform	9.30	83	1637210	46.840	ng		100
34) Tetrahydrofuran (THF)	9.68	72	706431	48.851	ng		96
35) Ethyl tert-Butyl Ether	9.77	87	1105406	44.645	ng		97
36) 1,2-Dichloroethane	10.05	62	1308288	52.018	ng		99
38) 1,1,1-Trichloroethane	10.31	97	1450085	48.579	ng		99
39) Isopropyl Acetate	10.67	61	1400292	110.365	ng	#	92
40) 1-Butanol	10.70	56	2480666	126.778	ng		97
41) Benzene	10.77	78	3948486	45.337	ng		100
42) Carbon Tetrachloride	10.91	117	1223490	50.377	ng		100
43) Cyclohexane	11.05	84	3080929	95.275	ng		97
44) tert-Amyl Methyl Ether	11.36	73	2761173	48.173	ng		99
45) 1,2-Dichloropropane	11.58	63	1089391	54.063	ng		100
46) Bromodichloromethane	11.77	83	1337118	49.194	ng		100
47) Trichloroethene	11.82	130	950412	45.219	ng		99
48) 1,4-Dioxane	11.79	88	837796	49.725	ng		99
49) 2,2,4-Trimethylpentane...	11.88	57	4656145	53.553	ng		99

Data File: I:\MS09\Data\2019 06\07\06071909.D
Acq On : 7 Jun 2019 13:25 Operator: SC
Sample : 50ng TO-15 ICAL STD
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 07 13:52:32 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

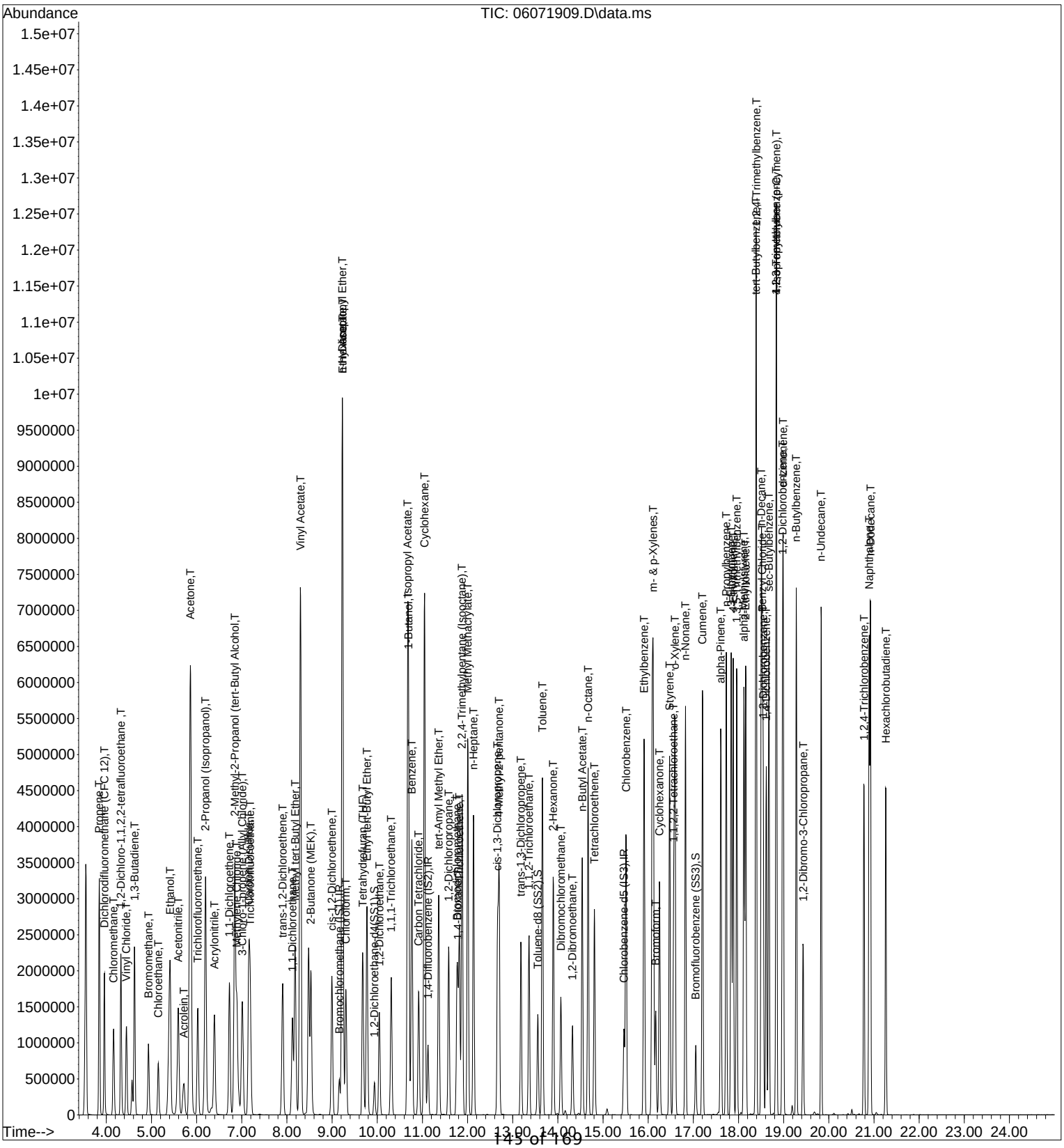
Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
50) Methyl Methacrylate	12.00	100	797291	99.633	ng	96
51) n-Heptane	12.13	71	1080107	49.451	ng	98
52) cis-1,3-Dichloropropene	12.66	75	1836326	57.322	ng	100
53) 4-Methyl-2-pentanone	12.70	58	1073722	57.278	ng	96
54) trans-1,3-Dichloropropene	13.18	75	1597585	58.508	ng	100
55) 1,1,2-Trichloroethane	13.36	97	941190	47.330	ng	99
58) Toluene	13.66	91	4032461	41.718	ng	100
59) 2-Hexanone	13.90	43	2691870	64.693	ng	98
60) Dibromochloromethane	14.07	129	1058006	45.795	ng	100
61) 1,2-Dibromoethane	14.32	107	1037310	45.027	ng	100
62) n-Butyl Acetate	14.54	43	3054037	66.822	ng	99
63) n-Octane	14.67	57	992345	48.334	ng	98
64) Tetrachloroethene	14.81	166	972921	41.825	ng	100
65) Chlorobenzene	15.51	112	2547609	43.253	ng	100
66) Ethylbenzene	15.91	91	4604501	42.471	ng	100
67) m- & p-Xylenes	16.11	91	7313565	87.564	ng	99
68) Bromoform	16.17	173	834674	46.862	ng	99
69) Styrene	16.47	104	2816792	44.461	ng	100
70) o-Xylene	16.59	91	3570160	43.169	ng	99
71) n-Nonane	16.83	43	2404365	58.623	ng	98
72) 1,1,2,2-Tetrachloroethane	16.56	83	1791517	46.533	ng	100
74) Cumene	17.20	105	4412758	42.679	ng	99
75) alpha-Pinene	17.61	93	2374347	45.619	ng	99
76) n-Propylbenzene	17.73	91	5523885	44.832	ng	99
77) 3-Ethyltoluene	17.84	105	4488604	44.610	ng	97
78) 4-Ethyltoluene	17.88	105	4147265	43.472	ng	96
79) 1,3,5-Trimethylbenzene	17.96	105	3636110	42.085	ng	100
80) alpha-Methylstyrene	18.12	118	1932423	44.519	ng	99
81) 2-Ethyltoluene	18.16	105	4308024	43.812	ng	99
82) 1,2,4-Trimethylbenzene	18.39	105	3833183	46.272	ng	100
83) n-Decane	18.50	57	2382266	52.173	ng	98
84) Benzyl Chloride	18.53	91	3667365	59.969	ng	99
85) 1,3-Dichlorobenzene	18.55	146	2013420	46.438	ng	100
86) 1,4-Dichlorobenzene	18.61	146	2023202	45.463	ng	99
87) sec-Butylbenzene	18.67	105	4849354	43.182	ng	100
88) 4-Isopropyltoluene (p-...	18.84	119	4481990	43.331	ng	99
89) 1,2,3-Trimethylbenzene	18.83	105	3750499	45.204	ng	100
90) 1,2-Dichlorobenzene	18.98	146	1954548	46.792	ng	99
91) d-Limonene	18.99	68	1649972	48.680	ng	98
92) 1,2-Dibromo-3-Chloropr...	19.43	157	697432	48.125	ng	97
93) n-Undecane	19.83	57	2493398	57.968	ng	99
94) 1,2,4-Trichlorobenzene	20.78	180	1468912	52.837	ng	100
95) Naphthalene	20.90	128	5037220	55.431	ng	100
96) n-Dodecane	20.92	57	2337291	76.448	ng	98
97) Hexachlorobutadiene	21.26	225	887775	44.965	ng	99
98) Cyclohexanone	16.25	55	1637646	51.085	ng	98
99) tert-Butylbenzene	18.39	119	3569197	44.824	ng	99
100) n-Butylbenzene	19.28	91	4160918	46.226	ng	99

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071909.D
Acq On : 7 Jun 2019 13:25 Operator: SC
Sample : 50ng TO-15 ICAL STD
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 07 13:52:32 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071910.D
Acq On : 7 Jun 2019 13:59 Operator: SC
Sample : 100ng TO-15 ICAL STD
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

6/7/19

Quant Time: Jun 07 14:25:04 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.17	130	207427	12.500	ng		0.02
37) 1,4-Difluorobenzene (IS2)	11.13	114	919348	12.500	ng		0.01
56) Chlorobenzene-d5 (IS3)	15.46	82	483454	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.95	65	361249	13.802	ng		0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 110.40%				
57) Toluene-d8 (SS2)	13.56	98	1120954	11.746	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 94.00%				
73) Bromofluorobenzene (SS3)	17.06	174	306939	12.193	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 97.52%				
Target Compounds							Qvalue
2) Propene	3.84	42	2694270	125.289	ng		100
3) Dichlorodifluoromethan...	3.96	85	3426501	89.546	ng		99
4) Chloromethane	4.16	50	2540207	80.478	ng		99
5) 1,2-Dichloro-1,1,2,2-t...	4.33	135	1610196	88.389	ng		99
6) Vinyl Chloride	4.45	62	2945515	99.882	ng		99
7) 1,3-Butadiene	4.63	54	2337743	134.096	ng		97
8) Bromomethane	4.94	94	1506297	81.340	ng		99
9) Chloroethane	5.16	64	1466279	94.604	ng		99
10) Ethanol	5.44	45	8297697	513.397	ng		100
11) Acetonitrile	5.61	41	4490566	119.350	ng		100
12) Acrolein	5.73	56	1348110	105.938	ng		99
13) Acetone	5.88	58	7481550	506.710	ng		88
14) Trichlorofluoromethane	6.03	101	2946660	95.654	ng		100
15) 2-Propanol (Isopropanol)	6.22	45	10227931	200.958	ng		100
16) Acrylonitrile	6.41	53	3039539	106.396	ng		100
17) 1,1-Dichloroethene	6.74	96	1838119	93.181	ng		93
18) 2-Methyl-2-Propanol (t...	6.87	59	10687446	215.343	ng		99
19) Methylene Chloride	6.90	84	1957264	89.891	ng		92
20) 3-Chloro-1-propene (Al...	7.02	41	3514095	135.551	ng		96
21) Trichlorotrifluoroethane	7.19	151	1462233	103.721	ng		97
22) Carbon Disulfide	7.16	76	7430890	100.221	ng		100
23) trans-1,2-Dichloroethene	7.91	61	3051529	100.794	ng		96
24) 1,1-Dichloroethane	8.13	63	3568575	97.199	ng		99
25) Methyl tert-Butyl Ether	8.19	73	5982618	94.150	ng		99
26) Vinyl Acetate	8.31	86	2389038	561.046	ng	#	46
27) 2-Butanone (MEK)	8.54	72	1442530	94.877	ng	#	88
28) cis-1,2-Dichloroethene	9.00	61	2901866	100.654	ng		97
29) Diisopropyl Ether	9.23	87	1634101	86.774	ng	#	60
30) Ethyl Acetate	9.24	61	1544978	214.662	ng		93
31) n-Hexane	9.23	57	3492555	93.574	ng		99
32) Chloroform	9.32	83	3257746	89.760	ng		100
34) Tetrahydrofuran (THF)	9.68	72	1409125	93.845	ng		92
35) Ethyl tert-Butyl Ether	9.78	87	2245972	87.359	ng		94
36) 1,2-Dichloroethane	10.05	62	2576784	98.669	ng		99
38) 1,1,1-Trichloroethane	10.32	97	2905109	94.722	ng		99
39) Isopropyl Acetate	10.68	61	2712493	208.071	ng	#	83
40) 1-Butanol	10.72	56	4797495	238.628	ng		94
41) Benzene	10.77	78	7835272	87.560	ng		99
42) Carbon Tetrachloride	10.92	117	2462486	98.682	ng		100
43) Cyclohexane	11.05	84	6117604	184.125	ng		94
44) tert-Amyl Methyl Ether	11.37	73	5517597	93.690	ng		98
45) 1,2-Dichloropropane	11.59	63	2154241	104.051	ng		100
46) Bromodichloromethane	11.77	83	2677696	95.881	ng		100
47) Trichloroethene	11.82	130	1930015	89.371	ng		99
48) 1,4-Dioxane	11.79	88	1693135	97.806	ng		97
49) 2,2,4-Trimethylpentane...	11.88	57	8955455	100.248	ng		99

Data File: I:\MS09\Data\2019 06\07\06071910.D
Acq On : 7 Jun 2019 13:59 Operator: SC
Sample : 100ng TO-15 ICAL STD
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 07 14:25:04 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

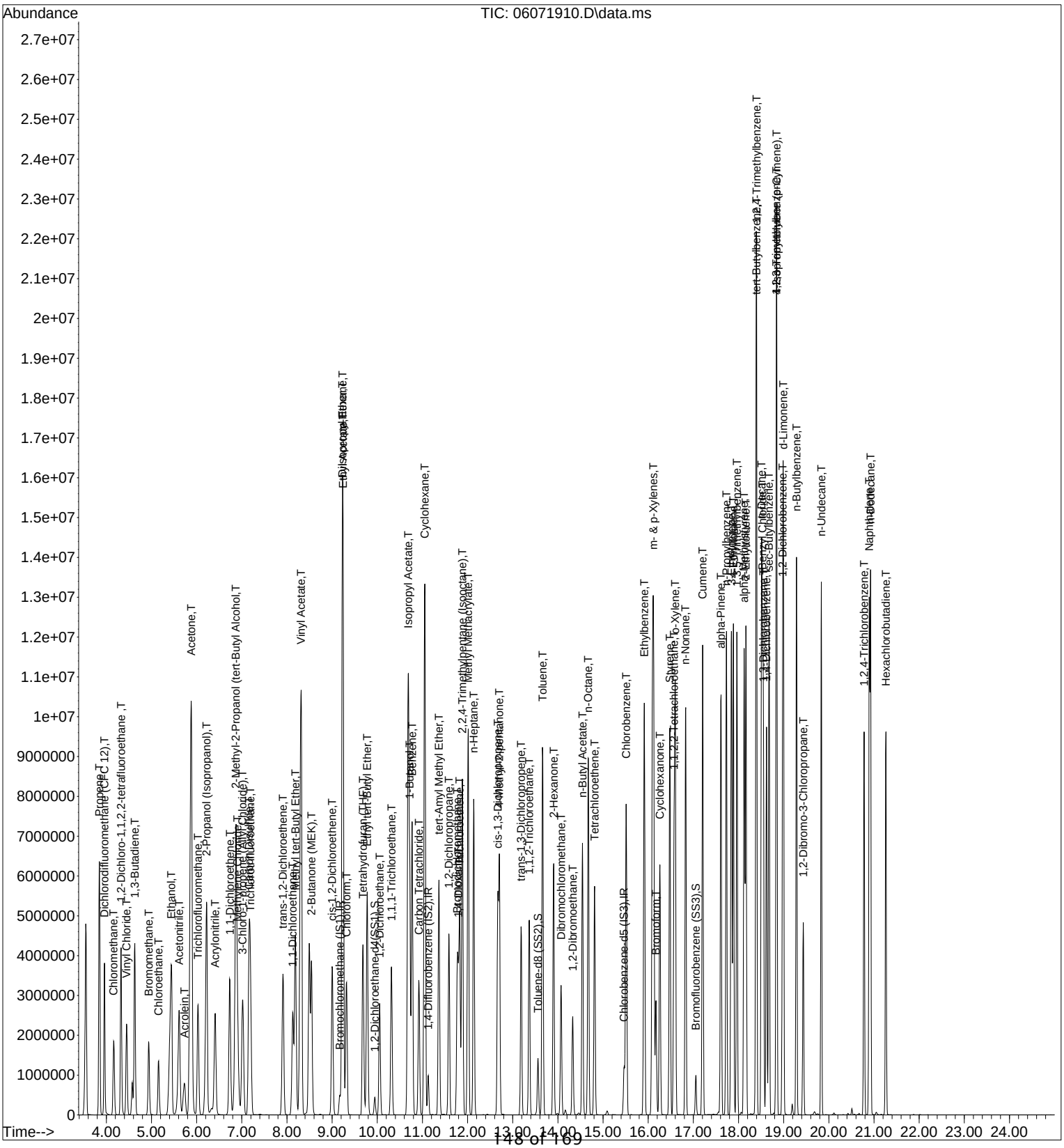
Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
50) Methyl Methacrylate	12.01	100	1607856	195.553	ng	92
51) n-Heptane	12.14	71	2145835	95.617	ng	97
52) cis-1,3-Dichloropropene	12.67	75	3652483	110.966	ng	99
53) 4-Methyl-2-pentanone	12.70	58	2111458	109.625	ng	92
54) trans-1,3-Dichloropropene	13.19	75	3188627	113.655	ng	100
55) 1,1,2-Trichloroethane	13.37	97	1898780	92.933	ng	99
58) Toluene	13.66	91	8013010	80.340	ng	99
59) 2-Hexanone	13.91	43	5155110	120.068	ng	96
60) Dibromochloromethane	14.07	129	2146537	90.044	ng	100
61) 1,2-Dibromoethane	14.33	107	2103524	88.490	ng	100
62) n-Butyl Acetate	14.54	43	5831029	123.644	ng	97
63) n-Octane	14.67	57	1938787	91.518	ng	96
64) Tetrachloroethene	14.81	166	1996618	83.184	ng	100
65) Chlorobenzene	15.51	112	5144325	84.644	ng	99
66) Ethylbenzene	15.91	91	9134554	81.655	ng	98
67) m- & p-Xylenes	16.11	91	14497266	168.216	ng	98
68) Bromoform	16.17	173	1724046	93.807	ng	99
69) Styrene	16.48	104	5669245	86.722	ng	99
70) o-Xylene	16.60	91	7115846	83.387	ng	98
71) n-Nonane	16.83	43	4481835	105.903	ng	94
72) 1,1,2,2-Tetrachloroethane	16.57	83	3595424	90.505	ng	100
74) Cumene	17.21	105	8733066	81.858	ng	98
75) alpha-Pinene	17.61	93	4752567	88.493	ng	100
76) n-Propylbenzene	17.73	91	10711283	84.250	ng	98
77) 3-Ethyltoluene	17.84	105	9000418	86.689	ng	98
78) 4-Ethyltoluene	17.89	105	8014618	81.417	ng	95
79) 1,3,5-Trimethylbenzene	17.96	105	7221640	81.005	ng	99
80) alpha-Methylstyrene	18.12	118	3905547	87.198	ng	98
81) 2-Ethyltoluene	18.16	105	8480594	83.584	ng	98
82) 1,2,4-Trimethylbenzene	18.40	105	7458454	87.256	ng	99
83) n-Decane	18.51	57	4430161	94.029	ng	95
84) Benzyl Chloride	18.53	91	7251585	114.917	ng	97
85) 1,3-Dichlorobenzene	18.55	146	4085387	91.318	ng	100
86) 1,4-Dichlorobenzene	18.62	146	4078305	88.815	ng	99
87) sec-Butylbenzene	18.67	105	9376451	80.917	ng	98
88) 4-Isopropyltoluene (p-...	18.84	119	8478428	79.438	ng	98
89) 1,2,3-Trimethylbenzene	18.84	105	7259917	84.802	ng	100
90) 1,2-Dichlorobenzene	18.98	146	3940874	91.432	ng	100
91) d-Limonene	18.99	68	3139327	89.762	ng	94
92) 1,2-Dibromo-3-Chloropr...	19.43	157	1413430	94.521	ng	95
93) n-Undecane	19.83	57	4693480	105.748	ng	96
94) 1,2,4-Trichlorobenzene	20.78	180	3006863	104.819	ng	99
95) Naphthalene	20.90	128	9775966	104.256	ng	98
96) n-Dodecane	20.92	57	4392602	139.238	ng	95
97) Hexachlorobutadiene	21.26	225	1849494	90.784	ng	99
98) Cyclohexanone	16.26	55	3203768	96.855	ng	97
99) tert-Butylbenzene	18.39	119	6961686	84.730	ng	98
100) n-Butylbenzene	19.28	91	8052719	86.701	ng	98

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071910.D
Acq On : 7 Jun 2019 13:59 Operator: SC
Sample : 100ng TO-15 ICAL STD
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 07 14:25:04 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 13:38:27 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071912.D
Acq On : 7 Jun 2019 15:06 Operator: SC
Sample : 25ng TO-15 ICV STD
Misc : S31-05131901/S31-05241901 (6/22)
ALS Vial : 2 Sample Multiplier: 1

6/7/19

Quant Time: Jun 07 15:32:01 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.16	130	208446	12.500	ng		-0.02
37) 1,4-Difluorobenzene (IS2)	11.12	114	932547	12.500	ng		0.00
56) Chlorobenzene-d5 (IS3)	15.46	82	480512	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.94	65	355450	11.701	ng		-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 93.60%				
57) Toluene-d8 (SS2)	13.55	98	1125126	12.553	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 100.40%				
73) Bromofluorobenzene (SS3)	17.05	174	312903	13.014	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 104.08%				
Target Compounds							Qvalue
2) Propene	3.85	42	651204	24.362	ng		99
3) Dichlorodifluoromethan...	3.96	85	929200	23.725	ng		100
4) Chloromethane	4.16	50	877276	24.847	ng		100
5) 1,2-Dichloro-1,1,2,2-t...	4.33	135	449121	25.335	ng		100
6) Vinyl Chloride	4.45	62	831980	25.114	ng		100
7) 1,3-Butadiene	4.62	54	632034	25.999	ng		97
8) Bromomethane	4.93	94	458788	25.681	ng		100
9) Chloroethane	5.15	64	418129	24.820	ng		100
10) Ethanol	5.39	45	2368268	114.532	ng		100
11) Acetonitrile	5.59	41	1200032	23.750	ng		99
12) Acrolein	5.71	56	369807	22.668	ng		99
13) Acetone	5.86	58	2206187	120.560	ng		93
14) Trichlorofluoromethane	6.03	101	808809	24.584	ng		100
15) 2-Propanol (Isopropanol)	6.19	45	3175338	47.222	ng		100
16) Acrylonitrile	6.39	53	818986	24.015	ng		99
17) 1,1-Dichloroethene	6.72	96	500049	25.456	ng		93
18) 2-Methyl-2-Propanol (t...	6.83	59	2892320	50.079	ng		99
19) Methylene Chloride	6.88	84	536422	25.161	ng		92
20) 3-Chloro-1-propene (Al...	7.01	41	976650	24.852	ng		95
21) Trichlorotrifluoroethane	7.19	151	400639	26.079	ng		96
22) Carbon Disulfide	7.15	76	2024502	24.534	ng		100
23) trans-1,2-Dichloroethene	7.90	61	822111	24.477	ng		96
24) 1,1-Dichloroethane	8.12	63	1003175	24.674	ng		99
25) Methyl tert-Butyl Ether	8.18	73	1604869	25.594	ng		99
26) Vinyl Acetate	8.29	86	657615	128.821	ng	#	80
27) 2-Butanone (MEK)	8.53	72	394659	22.404	ng	#	89
28) cis-1,2-Dichloroethene	8.99	61	775064	23.861	ng		96
29) Diisopropyl Ether	9.22	87	448014	27.139	ng	#	82
30) Ethyl Acetate	9.23	61	447738	51.022	ng		97
31) n-Hexane	9.23	57	1033979	24.716	ng		100
32) Chloroform	9.30	83	881679	24.845	ng		100
34) Tetrahydrofuran (THF)	9.68	72	382840	24.404	ng		92
35) Ethyl tert-Butyl Ether	9.77	87	599125	25.602	ng		95
36) 1,2-Dichloroethane	10.04	62	696393	23.958	ng		100
38) 1,1,1-Trichloroethane	10.31	97	763105	25.028	ng		99
39) Isopropyl Acetate	10.67	61	756711	50.047	ng	#	91
40) 1-Butanol	10.68	56	1375902	49.512	ng		94
41) Benzene	10.77	78	2188623	22.882	ng		100
42) Carbon Tetrachloride	10.91	117	656436	24.783	ng		99
43) Cyclohexane	11.05	84	1695524	50.139	ng		96
44) tert-Amyl Methyl Ether	11.36	73	1483290	25.621	ng		98
45) 1,2-Dichloropropane	11.58	63	584449	24.998	ng		100
46) Bromodichloromethane	11.76	83	717106	25.678	ng		100
47) Trichloroethene	11.82	130	533649	25.753	ng		99
48) 1,4-Dioxane	11.78	88	452929	25.122	ng		97
49) 2,2,4-Trimethylpentane...	11.88	57	2517845	24.338	ng		98

Data File: I:\MS09\Data\2019 06\07\06071912.D
Acq On : 7 Jun 2019 15:06 Operator: SC
Sample : 25ng TO-15 ICV STD
Misc : S31-05131901/S31-05241901 (6/22)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 07 15:32:01 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

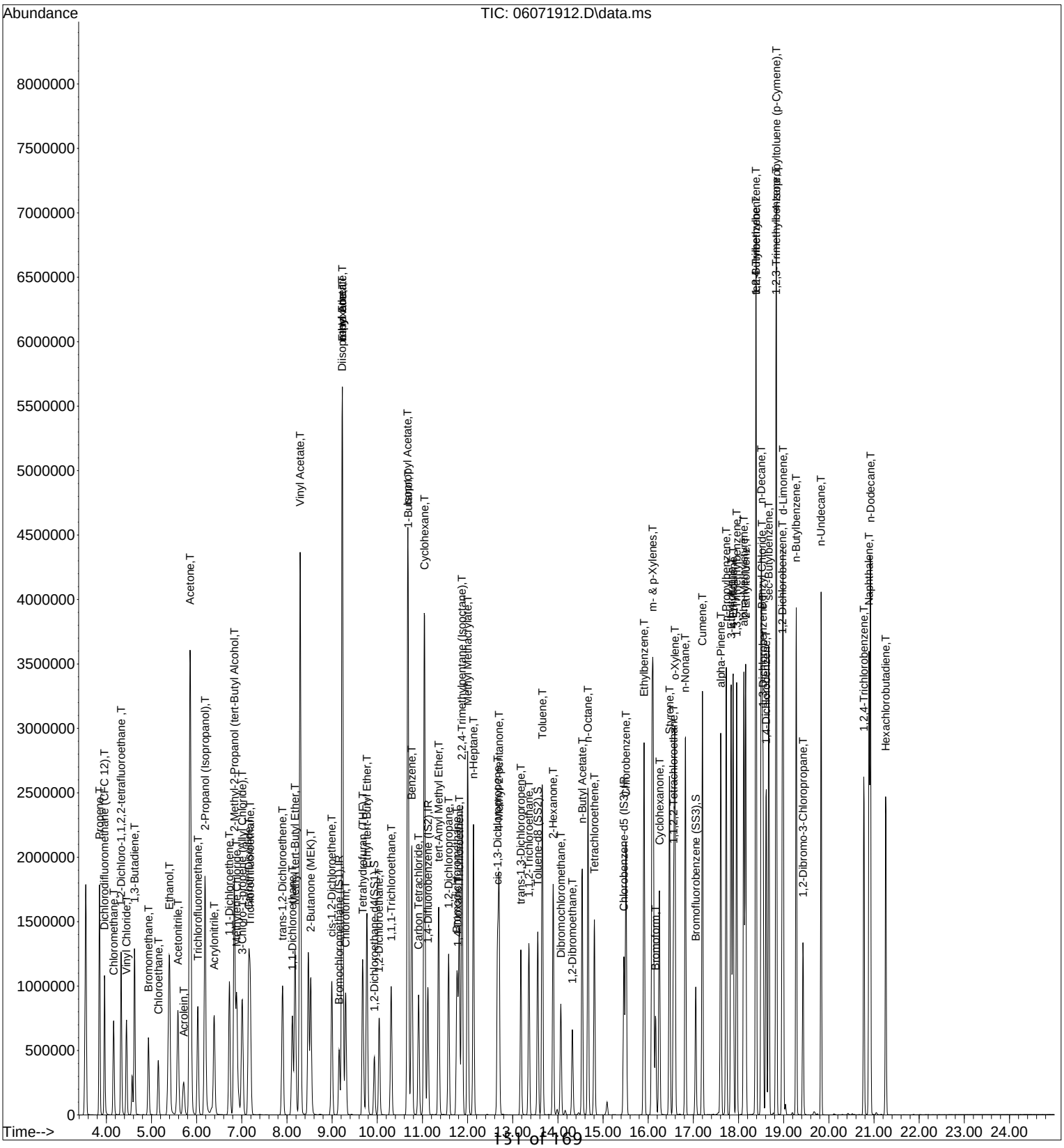
Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
50) Methyl Methacrylate	12.00	100	438876	55.053	ng	94
51) n-Heptane	12.13	71	587470	25.420	ng	98
52) cis-1,3-Dichloropropene	12.66	75	930458	26.107	ng	100
53) 4-Methyl-2-pentanone	12.70	58	579625	25.696	ng	94
54) trans-1,3-Dichloropropene	13.18	75	848439	26.628	ng	100
55) 1,1,2-Trichloroethane	13.36	97	509928	25.857	ng	99
58) Toluene	13.65	91	2197692	24.609	ng	100
59) 2-Hexanone	13.90	43	1429306	24.788	ng	97
60) Dibromochloromethane	14.07	129	569855	27.015	ng	100
61) 1,2-Dibromoethane	14.32	107	564411	26.460	ng	100
62) n-Butyl Acetate	14.54	43	1634281	25.619	ng	98
63) n-Octane	14.67	57	530485	24.917	ng	97
64) Tetrachloroethene	14.81	166	533826	26.213	ng	100
65) Chlorobenzene	15.51	112	1397030	25.757	ng	100
66) Ethylbenzene	15.91	91	2503054	24.979	ng	100
67) m- & p-Xylenes	16.10	91	3955184	51.237	ng	99
68) Bromoform	16.16	173	445161	28.102	ng	99
69) Styrene	16.47	104	1546841	27.252	ng	99
70) o-Xylene	16.59	91	1950082	25.645	ng	99
71) n-Nonane	16.82	43	1287565	24.368	ng	97
72) 1,1,2,2-Tetrachloroethane	16.56	83	936562	25.038	ng	100
74) Cumene	17.20	105	2445863	25.799	ng	100
75) alpha-Pinene	17.61	93	1310307	26.808	ng	99
76) n-Propylbenzene	17.73	91	3044104	26.082	ng	99
77) 3-Ethyltoluene	17.84	105	2477608	26.394	ng	97
78) 4-Ethyltoluene	17.88	105	2308278	26.078	ng	96
79) 1,3,5-Trimethylbenzene	17.96	105	1996655	25.612	ng	100
80) alpha-Methylstyrene	18.12	118	1124469	30.434	ng	99
81) 2-Ethyltoluene	18.16	105	2376136	25.925	ng	99
82) 1,2,4-Trimethylbenzene	18.39	105	2071384	26.213	ng	99
83) n-Decane	18.50	57	1307314	25.578	ng	99
84) Benzyl Chloride	18.52	91	1956142	29.299	ng	99
85) 1,3-Dichlorobenzene	18.54	146	1101176	26.495	ng	99
86) 1,4-Dichlorobenzene	18.61	146	1110979	26.510	ng	100
87) sec-Butylbenzene	18.67	105	2703151	25.854	ng	99
88) 4-Isopropyltoluene (p-...	18.84	119	2525216	26.058	ng	99
89) 1,2,3-Trimethylbenzene	18.83	105	2118360	26.752	ng	100
90) 1,2-Dichlorobenzene	18.97	146	1072511	26.726	ng	99
91) d-Limonene	18.99	68	948597	28.121	ng	98
92) 1,2-Dibromo-3-Chloropr...	19.43	157	392229	28.281	ng	94
93) n-Undecane	19.83	57	1386000	26.249	ng	99
94) 1,2,4-Trichlorobenzene	20.77	180	809409	28.742	ng	99
95) Naphthalene	20.89	128	2745466	29.410	ng	100
96) n-Dodecane	20.92	57	1414280	31.375	ng	98
97) Hexachlorobutadiene	21.26	225	480488	26.867	ng	99
98) Cyclohexanone	16.25	55	897571	22.724	ng	97
99) tert-Butylbenzene	18.39	119	1961954	26.020	ng	100
100) n-Butylbenzene	19.28	91	2281708	25.850	ng	99

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\07\06071912.D
Acq On : 7 Jun 2019 15:06 Operator: SC
Sample : 25ng TO-15 ICV STD
Misc : S31-05131901/S31-05241901 (6/22)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 07 15:32:01 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



Initial Calibration Verification/LABORATORY CONTROL SAMPLE CHECK SHEET

Data File Name: **06071912.D** Acq. Method File: **TO15.M** 6/7/19

Data File Path: **I:\MS09\Data\2019_06\07** Sample Name: **25ng TO-15 ICV STD**

Operator: **SC** Misc Info: **S31-05131901/S31-05241901 (**

Date Acquired: **6/7/19** **15:06** Instrument Name: **MS09**

#	Compound Name	Ret. Time	Amt. (ng)	Spike Amt.(ng)	% Rec.	Lower Limit	Upper Limit	* OR Fail	ICV/AZ 70-130%
2)	**Propene**	**3.85**	**24.4**	26.43	92	**53**	**112**	*	*
3)	**Dichlorodifluoromethane (CFC 1**	**3.96**	**23.7**	**26.30**	90	**62**	**103**	*	*
4)	**Chloromethane**	**4.16**	**24.8**	**26.38**	94	**51**	**121**	*	*
5)	**1,2-Dichloro-1,1,2,2-tetrafluoroet**	**4.33**	**25.3**	**26.38**	96	**56**	**111**	*	*
6)	**Vinyl Chloride**	**4.45**	**25.1**	**26.73**	94	**57**	**117**	*	*
7)	**1,3-Butadiene**	**4.62**	**26.0**	**26.28**	99	**53**	**134**	*	*
8)	**Bromomethane**	**4.93**	**25.7**	**26.48**	97	**65**	**110**	*	*
9)	**Chloroethane**	**5.15**	**24.8**	**26.75**	93	**64**	**111**	*	*
10)	**Ethanol**	**5.39**	**115**	**128.10**	90	**57**	**124**	*	*
11)	**Acetonitrile**	**5.59**	**23.7**	**25.73**	92	**57**	**126**	*	*
12)	**Acrolein**	**5.71**	**22.7**	**25.63**	89	**62**	**121**	*	*
13)	**Acetone**	**5.86**	**121**	**132.33**	91	**60**	**113**	*	*
14)	**Trichlorofluoromethane**	**6.03**	**24.6**	**26.40**	93	**63**	**104**	*	*
15)	**2-Propanol (Isopropanol)**	**6.19**	**47.2**	**51.60**	91	**60**	**124**	*	*
16)	**Acrylonitrile**	**6.39**	**24.0**	**25.88**	93	**66**	**125**	*	*
17)	**1,1-Dichloroethene**	**6.72**	**25.5**	**27.23**	94	**68**	**107**	*	*
18)	2-Methyl-2-Propanol (tert-Butyl Alc	6.83	50.1	54.25	92	64	114	*	*
19)	**Methylene Chloride**	**6.88**	**25.2**	**27.08**	93	**66**	**105**	*	*
20)	**3-Chloro-1-propene (Allyl Chloric**	**7.01**	**24.9**	**27.00**	92	**63**	**127**	*	*
21)	**Trichlorotrifluoroethane**	**7.19**	**26.1**	**26.95**	97	**59**	**109**	*	*
22)	**Carbon Disulfide**	**7.15**	**24.5**	**27.20**	90	**67**	**109**	*	*
23)	**trans-1,2-Dichloroethene**	**7.90**	**24.5**	**26.73**	92	**70**	**115**	*	*
24)	**1,1-Dichloroethane**	**8.12**	**24.7**	**26.95**	92	**66**	**106**	*	*
25)	**Methyl tert-Butyl Ether**	**8.18**	**25.6**	**26.80**	96	**67**	**109**	*	*
26)	**Vinyl Acetate**	**8.29**	**129**	**133.03**	97	**68**	**136**	*	*
27)	**2-Butanone (MEK)**	**8.53**	**22.4**	**25.95**	86	**71**	**116**	*	*
28)	**cis-1,2-Dichloroethene**	**8.99**	**23.9**	**26.35**	91	**67**	**110**	*	*
29)	Diisopropyl Ether	9.22	27.1	27.18	100	62	109	*	*
30)	**Ethyl Acetate**	**9.23**	**51.0**	**54.45**	94	**64**	**127**	*	*
31)	**n-Hexane**	**9.23**	**24.7**	**26.95**	92	**60**	**115**	*	*
32)	**Chloroform**	**9.30**	**24.8**	**27.08**	92	**66**	**105**	*	*
34)	**Tetrahydrofuran (THF)**	**9.68**	**24.4**	**27.00**	90	**65**	**110**	*	*
35)	Ethyl tert-Butyl Ether	9.77	25.6	26.80	96	69	109	*	*
36)	**1,2-Dichloroethane**	**10.04**	**24.0**	**26.85**	89	**60**	**110**	*	*
38)	**1,1,1-Trichloroethane**	**10.31**	**25.0**	**26.90**	93	**64**	**108**	*	*
39)	Isopropyl Acetate	10.67	50.0	51.55	97	66	119	*	*
40)	1-Butanol	10.68	49.5	51.58	96	54	143	*	*
41)	**Benzene**	**10.77**	**22.9**	**26.38**	87	**67**	**106**	*	*
42)	**Carbon Tetrachloride**	**10.91**	**24.8**	**26.45**	94	**64**	**112**	*	*
43)	**Cyclohexane**	**11.05**	**50.1**	**52.05**	96	**67**	**110**	*	*
44)	tert-Amyl Methyl Ether	11.36	25.6	**27.08**	95	68	112	*	*
45)	**1,2-Dichloropropane**	**11.58**	**25.0**	**26.98**	93	**66**	**112**	*	*
46)	**Bromodichloromethane**	**11.76**	**25.7**	**26.83**	96	**67**	**113**	*	*
47)	**Trichloroethene**	**11.82**	**25.8**	**26.68**	97	**66**	**108**	*	*
48)	**1,4-Dioxane**	**11.78**	**25.1**	**26.73**	94	**70**	**116**	*	*
49)	2,2,4-Trimethylpentane (Isooctane)	11.88	24.3	26.65	91	64	113	*	*

Initial Calibration Verification/LABORATORY CONTROL SAMPLE CHECK SHEET

Data File Name: **06071912.D** **TO15.M**
Data File Path: **I:\MS09\Data\2019_06\07** Sample Name: **25ng TO-15 ICV STD**
Operator: **SC** Misc Info: **S31-05131901/S31-05241901 (**
Date Acquired: **6/7/19** **15:06** Instrument Name: **MS09**

#	Compound Name	Ret. Time	Amt. (ng)	Spike Amt.(ng)	% Rec.	Lower Limit	Upper Limit	* OR Fail	ICV/AZ 70-130%
50)	**Methyl Methacrylate**	**12.00**	**55.1**	**53.88**	102	**73**	**118**	*	*
51)	**n-Heptane**	**12.13**	**25.4**	**26.90**	94	**66**	**110**	*	*
52)	**cis-1,3-Dichloropropene**	**12.66**	**26.1**	**26.78**	97	**75**	**120**	*	*
53)	**4-Methyl-2-pentanone**	**12.70**	**25.7**	**26.15**	98	**65**	**124**	*	*
54)	**trans-1,3-Dichloropropene**	**13.18**	**26.6**	**26.60**	100	**77**	**123**	*	*
55)	**1,1,2-Trichloroethane**	**13.36**	**25.9**	**26.85**	96	**68**	**112**	*	*
58)	**Toluene**	**13.65**	**24.6**	**26.50**	93	**62**	**111**	*	*
59)	**2-Hexanone**	**13.90**	**24.8**	**26.78**	93	**59**	**128**	*	*
60)	**Dibromochloromethane**	**14.07**	**27.0**	**26.60**	102	**67**	**123**	*	*
61)	**1,2-Dibromoethane**	**14.32**	**26.5**	**27.03**	98	**66**	**122**	*	*
62)	**n-Butyl Acetate**	**14.54**	**25.6**	**27.35**	94	**64**	**128**	*	*
63)	**n-Octane**	**14.67**	**24.9**	**27.13**	92	**65**	**114**	*	*
64)	**Tetrachloroethene**	**14.81**	**26.2**	**26.60**	98	**55**	**120**	*	*
65)	**Chlorobenzene**	**15.51**	**25.8**	**26.83**	96	**61**	**114**	*	*
66)	**Ethylbenzene**	**15.91**	**25.0**	**26.53**	94	**64**	**113**	*	*
67)	**m- & p-Xylenes**	**16.10**	**51.2**	**53.28**	96	**64**	**114**	*	*
68)	**Bromoform**	**16.16**	**28.1**	**26.68**	105	**65**	**132**	*	*
69)	**Styrene**	**16.47**	**27.3**	**26.50**	103	**67**	**124**	*	*
70)	**o-Xylene**	**16.59**	**25.6**	**26.75**	96	**65**	**114**	*	*
71)	**n-Nonane**	**16.82**	**24.4**	**26.83**	91	**64**	**117**	*	*
72)	**1,1,2,2-Tetrachloroethane**	**16.56**	**25.0**	**26.80**	93	**66**	**119**	*	*
74)	**Cumene**	**17.20**	**25.8**	**26.80**	96	**61**	**116**	*	*
75)	**alpha-Pinene**	**17.61**	**26.8**	**26.40**	102	**65**	**120**	*	*
76)	**n-Propylbenzene**	**17.73**	**26.1**	**27.23**	96	**63**	**117**	*	*
77)	3-Ethyltoluene	17.84	26.4	26.83	98	60	117	*	*
78)	**4-Ethyltoluene**	**17.88**	**26.1**	**26.80**	**97**	**63**	**124**	*	*
79)	**1,3,5-Trimethylbenzene**	**17.96**	**25.6**	**26.73**	**96**	**60**	**117**	*	*
80)	alpha-Methylstyrene	18.12	30.4	26.75	**114**	64	131	*	*
81)	2-Ethyltoluene	18.16	25.9	27.08	**96**	62	116	*	*
82)	**1,2,4-Trimethylbenzene**	**18.39**	**26.2**	**26.90**	**97**	**61**	**122**	*	*
83)	n-Decane	18.50	25.6	26.88	**95**	67	120	*	*
84)	**Benzyl Chloride**	**18.52**	**29.3**	**27.08**	**108**	**77**	**142**	*	*
85)	**1,3-Dichlorobenzene**	**18.54**	**26.5**	**26.98**	**98**	**61**	**125**	*	*
86)	**1,4-Dichlorobenzene**	**18.61**	**26.5**	**27.00**	**98**	**59**	**123**	*	*
87)	sec-Butylbenzene	18.67	25.9	26.55	**98**	62	117	*	*
88)	4-Isopropyltoluene (p-Cymene)	18.84	26.1	26.95	**97**	58	122	*	*
89)	1,2,3-Trimethylbenzene	18.83	26.8	26.95	**99**	62	124	*	*
90)	**1,2-Dichlorobenzene**	**18.97**	**26.7**	**26.95**	**99**	**61**	**126**	*	*
91)	**d-Limonene**	**18.99**	**28.1**	**26.38**	**107**	**66**	**124**	*	*
92)	**1,2-Dibromo-3-Chloropropane**	**19.43**	**28.3**	**26.15**	**108**	**67**	**138**	*	*
93)	n-Undecane	19.83	26.2	27.03	**97**	68	127	*	*
94)	**1,2,4-Trichlorobenzene**	**20.77**	**28.7**	**26.78**	**107**	**62**	**141**	*	*
95)	**Naphthalene**	**20.89**	**29.4**	**25.38**	**116**	**62**	**145**	*	*
96)	n-Dodecane	20.92	31.4	25.63	**123**	64	152	*	*
97)	**Hexachlorobutadiene**	**21.26**	**26.9**	**26.13**	**103**	49	131	*	*
98)	Cyclohexanone	16.25	22.7	24.45	93	61	127	*	*
99)	tert-Butylbenzene	18.39	26.0	26.88	97	58	122	*	*
100)	n-Butylbenzene	19.28	25.9	27.00	96	64	121	*	*

Bold = 75 Compound List

*** = Pass**

Evaluate Continuing Calibration Report

Data File: I:\MS09\Data\2019 06\12\06121902.D
Acq On : 12 Jun 2019 6:14 Operator: SC
Sample : CCV R9061219 25ng
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

6/12/19

Quant Time: Jun 12 08:50:03 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.33min
Max. RRF Dev : 30% Max. Rel. Area : 200%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
1	IR	Bromochloromethane (IS1)	1.000	1.000	0.0	108	-0.02
2	T	Propene	1.603	1.570	2.1	103	0.00
3	T	Dichlorodifluoromethane (CF	2.349	2.147	8.6	102	0.00
4	T	Chloromethane	2.117	2.141	-1.1	104	-0.01
5	T	1,2-Dichloro-1,1,2,2-tetraf	1.063	0.964	9.3	103	-0.01
6	T	Vinyl Chloride	1.987	1.853	6.7	104	-0.01
7	T	1,3-Butadiene	1.458	1.500	-2.9	107	-0.02
8	T	Bromomethane	1.071	1.001	6.5	105	-0.01
9	T	Chloroethane	1.010	0.940	6.9	104	-0.02
10	T	Ethanol	1.240	1.122	9.5	102	-0.06
11	T	Acetonitrile	3.030	2.896	4.4	102	-0.04
12	T	Acrolein	0.978	0.880	10.0	104	-0.03
13	T	Acetone	1.097	0.995	9.3	103	-0.03
14	T	Trichlorofluoromethane	1.973	1.802	8.7	102	-0.02
15	T	2-Propanol (Isopropanol)	4.032	3.787	6.1	102	-0.04
16	T	Acrylonitrile	2.045	1.929	5.7	103	-0.03
17	T	1,1-Dichloroethene	1.178	1.077	8.6	103	-0.02
18	T	2-Methyl-2-Propanol (tert-B	3.463	3.321	4.1	104	-0.04
19	T	Methylene Chloride	1.278	1.166	8.8	104	-0.02
20	T	3-Chloro-1-propene (Allyl C	2.357	2.188	7.2	101	-0.02
21	T	Trichlorotrifluoroethane	0.921	0.845	8.3	103	-0.01
22	T	Carbon Disulfide	4.948	4.452	10.0	103	-0.01
23	T	trans-1,2-Dichloroethene	2.014	1.876	6.9	103	-0.02
24	T	1,1-Dichloroethane	2.438	2.281	6.4	103	-0.01
25	T	Methyl tert-Butyl Ether	3.760	3.573	5.0	104	-0.02
26	T	Vinyl Acetate	0.306	0.294	3.9	104	-0.03
27	T	2-Butanone (MEK)	1.056	0.904	14.4	104	-0.03
28	T	cis-1,2-Dichloroethene	1.948	1.791	8.1	102	-0.02
29	T	Diisopropyl Ether	0.990	0.973	1.7	104	0.00
30	T	Ethyl Acetate	0.526	0.501	4.8	103	-0.02
31	T	n-Hexane	2.509	2.320	7.5	103	0.00
32	T	Chloroform	2.128	1.960	7.9	102	-0.03
33	S	1,2-Dichloroethane-d4(SS1)	1.822	1.826	-0.2	107	-0.02
34	T	Tetrahydrofuran (THF)	0.941	0.857	8.9	104	-0.01
35	T	Ethyl tert-Butyl Ether	1.403	1.352	3.6	105	-0.01
36	T	1,2-Dichloroethane	1.743	1.596	8.4	101	-0.01
37	IR	1,4-Difluorobenzene (IS2)	1.000	1.000	0.0	109	-0.01
38	T	1,1,1-Trichloroethane	0.409	0.378	7.6	102	-0.01
39	T	Isopropyl Acetate	0.203	0.194	4.4	103	-0.02
40	T	1-Butanol	0.372	0.345	7.3	103	-0.03
41	T	Benzene	1.282	1.090	15.0	103	-0.01
42	T	Carbon Tetrachloride	0.355	0.331	6.8	102	-0.01
43	T	Cyclohexane	0.453	0.421	7.1	103	-0.01
44	T	tert-Amyl Methyl Ether	0.776	0.740	4.6	105	-0.01
45	T	1,2-Dichloropropane	0.313	0.290	7.3	102	-0.01
46	T	Bromodichloromethane	0.374	0.352	5.9	102	-0.01
47	T	Trichloroethene	0.278	0.249	10.4	103	-0.01
48	T	1,4-Dioxane	0.242	0.221	8.7	103	-0.01
49	T	2,2,4-Trimethylpentane (Iso	1.387	1.268	8.6	102	-0.01
50	T	Methyl Methacrylate	0.107	0.105	1.9	104	-0.02
51	T	n-Heptane	0.310	0.285	8.1	103	0.00
52	T	cis-1,3-Dichloropropene	0.478	0.463	3.1	102	0.00
53	T	4-Methyl-2-pentanone	0.302	0.290	4.0	102	-0.01
54	T	trans-1,3-Dichloropropene	0.427	0.426	0.2	102	0.00

Data File: I:\MS09\Data\2019 06\12\06121902.D
Acq On : 12 Jun 2019 6:14 Operator: SC
Sample : CCV R9061219 25ng
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 12 08:50:03 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.33min
Max. RRF Dev : 30% Max. Rel. Area : 200%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
55	T	1,1,2-Trichloroethane	0.264	0.246	6.8	103	-0.01
56	IR	Chlorobenzene-d5 (IS3)	1.000	1.000	0.0	109	0.00
57	S	Toluene-d8 (SS2)	2.332	2.289	1.8	108	0.00
58	T	Toluene	2.323	2.026	12.8	103	0.00
59	T	2-Hexanone	1.500	1.345	10.3	101	-0.02
60	T	Dibromochloromethane	0.549	0.509	7.3	102	0.00
61	T	1,2-Dibromoethane	0.555	0.503	9.4	102	-0.01
62	T	n-Butyl Acetate	1.659	1.516	8.6	101	0.00
63	T	n-Octane	0.554	0.494	10.8	103	0.00
64	T	Tetrachloroethene	0.530	0.473	10.8	102	0.00
65	T	Chlorobenzene	1.411	1.252	11.3	103	0.00
66	T	Ethylbenzene	2.607	2.339	10.3	102	0.00
67	T	m- & p-Xylenes	2.008	1.805	10.1	102	-0.01
68	T	Bromoform	0.412	0.398	3.4	101	-0.01
69	T	Styrene	1.477	1.370	7.2	101	-0.01
70	T	o-Xylene	1.978	1.764	10.8	102	0.00
71	T	n-Nonane	1.375	1.223	11.1	101	0.00
72	T	1,1,2,2-Tetrachloroethane	0.973	0.881	9.5	102	-0.01
73	S	Bromofluorobenzene (SS3)	0.625	0.625	0.0	109	0.00
74	T	Cumene	2.466	2.189	11.2	102	0.00
75	T	alpha-Pinene	1.271	1.190	6.4	102	0.00
76	T	n-Propylbenzene	3.036	2.710	10.7	102	0.00
77	T	3-Ethyltoluene	2.442	2.146	12.1	102	-0.01
78	T	4-Ethyltoluene	2.303	2.119	8.0	101	-0.01
79	T	1,3,5-Trimethylbenzene	2.028	1.804	11.0	102	0.00
80	T	alpha-Methylstyrene	0.961	0.929	3.3	100	0.00
81	T	2-Ethyltoluene	2.384	2.101	11.9	101	0.00
82	T	1,2,4-Trimethylbenzene	2.056	1.858	9.6	101	-0.01
83	T	n-Decane	1.330	1.195	10.2	101	0.00
84	T	Benzyl Chloride	1.737	1.784	-2.7	101	-0.01
85	T	1,3-Dichlorobenzene	1.081	0.958	11.4	101	-0.01
86	T	1,4-Dichlorobenzene	1.090	0.967	11.3	100	0.00
87	T	sec-Butylbenzene	2.720	2.409	11.4	101	0.00
88	T	4-Isopropyltoluene (p-Cymen	2.521	2.246	10.9	101	0.00
89	T	1,2,3-Trimethylbenzene	2.060	1.864	9.5	100	0.00
90	T	1,2-Dichlorobenzene	1.044	0.920	11.9	101	0.00
91	T	d-Limonene	0.878	0.856	2.5	100	0.00
92	T	1,2-Dibromo-3-Chloropropane	0.361	0.342	5.3	100	0.00
93	T	n-Undecane	1.374	1.265	7.9	100	0.00
94	T	1,2,4-Trichlorobenzene	0.733	0.685	6.5	98	0.00
95	T	Naphthalene	2.428	2.483	-2.3	98	0.00
96	T	n-Dodecane	1.173	1.219	-3.9	101	0.00
97	T	Hexachlorobutadiene	0.465	0.415	10.8	98	0.00
98	T	Cyclohexanone	1.028	0.877	14.7	101	-0.02
99	T	tert-Butylbenzene	1.962	1.738	11.4	101	0.00
100	T	n-Butylbenzene	2.296	2.053	10.6	100	0.00

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\12\06121902.D
Acq On : 12 Jun 2019 6:14 Operator: SC
Sample : CCV R9061219 25ng
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

6/12/19

Quant Time: Jun 12 08:50:03 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units		Dev(Min)
1) Bromochloromethane (IS1)	9.15	130	202233	12.500	ng		-0.02
37) 1,4-Difluorobenzene (IS2)	11.12	114	917369	12.500	ng		-0.01
56) Chlorobenzene-d5 (IS3)	15.46	82	490228	12.500	ng		0.00
System Monitoring Compounds							
33) 1,2-Dichloroethane-d4(...	9.93	65	369297	12.530	ng		-0.02
Spiked Amount 12.500	Range 70 - 130		Recovery = 100.24%				
57) Toluene-d8 (SS2)	13.55	98	1122310	12.274	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 98.16%				
73) Bromofluorobenzene (SS3)	17.05	174	306522	12.496	ng		0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 100.00%				
Target Compounds							Qvalue
2) Propene	3.84	42	654807	25.249	ng		100
3) Dichlorodifluoromethan...	3.95	85	907285	23.878	ng		100
4) Chloromethane	4.15	50	873067	25.487	ng		99
5) 1,2-Dichloro-1,1,2,2-t...	4.32	135	400913	23.310	ng		100
6) Vinyl Chloride	4.44	62	787694	24.508	ng		100
7) 1,3-Butadiene	4.61	54	636377	26.982	ng		99
8) Bromomethane	4.93	94	408648	23.577	ng		100
9) Chloroethane	5.14	64	388371	23.762	ng		100
10) Ethanol	5.38	45	2331645	116.225	ng		100
11) Acetonitrile	5.58	41	1209798	24.678	ng		100
12) Acrolein	5.70	56	365789	23.111	ng		100
13) Acetone	5.84	58	2162063	121.779	ng		97
14) Trichlorofluoromethane	6.02	101	772378	24.198	ng		100
15) 2-Propanol (Isopropanol)	6.17	45	3159885	48.436	ng		100
16) Acrylonitrile	6.38	53	806739	24.382	ng		100
17) 1,1-Dichloroethene	6.72	96	467831	24.548	ng		98
18) 2-Methyl-2-Propanol (t...	6.82	59	2879706	51.393	ng		99
19) Methylene Chloride	6.88	84	504578	24.395	ng		98
20) 3-Chloro-1-propene (Al...	7.00	41	944412	24.770	ng		98
21) Trichlorotrifluoroethane	7.18	151	363878	24.414	ng		100
22) Carbon Disulfide	7.15	76	1935528	24.177	ng		100
23) trans-1,2-Dichloroethene	7.90	61	805922	24.732	ng		99
24) 1,1-Dichloroethane	8.12	63	950306	24.092	ng		100
25) Methyl tert-Butyl Ether	8.17	73	1573904	25.871	ng		100
26) Vinyl Acetate	8.29	86	623802	125.952	ng	#	93
27) 2-Butanone (MEK)	8.52	72	375484	21.970	ng		96
28) cis-1,2-Dichloroethene	8.98	61	763400	24.224	ng		100
29) Diisopropyl Ether	9.22	87	425299	26.554	ng	#	94
30) Ethyl Acetate	9.22	61	438738	51.533	ng		99
31) n-Hexane	9.23	57	1015300	25.015	ng		100
32) Chloroform	9.29	83	853815	24.799	ng		100
34) Tetrahydrofuran (THF)	9.67	72	370383	24.336	ng		97
35) Ethyl tert-Butyl Ether	9.77	87	579632	25.530	ng		99
36) 1,2-Dichloroethane	10.04	62	685115	24.294	ng		100
38) 1,1,1-Trichloroethane	10.30	97	750541	25.024	ng		100
39) Isopropyl Acetate	10.67	61	737010	49.550	ng		96
40) 1-Butanol	10.68	56	1306873	47.806	ng		98
41) Benzene	10.76	78	2065985	21.957	ng		100
42) Carbon Tetrachloride	10.91	117	629574	24.162	ng		100
43) Cyclohexane	11.04	84	1610917	48.425	ng		99
44) tert-Amyl Methyl Ether	11.35	73	1459109	25.620	ng		100
45) 1,2-Dichloropropane	11.57	63	570759	24.817	ng		100
46) Bromodichloromethane	11.76	83	690441	25.132	ng		100
47) Trichloroethene	11.81	130	485126	23.799	ng		99
48) 1,4-Dioxane	11.78	88	431824	24.347	ng		100
49) 2,2,4-Trimethylpentane...	11.87	57	2469152	24.263	ng		99

Data File: I:\MS09\Data\2019 06\12\06121902.D
Acq On : 12 Jun 2019 6:14 Operator: SC
Sample : CCV R9061219 25ng
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 12 08:50:03 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

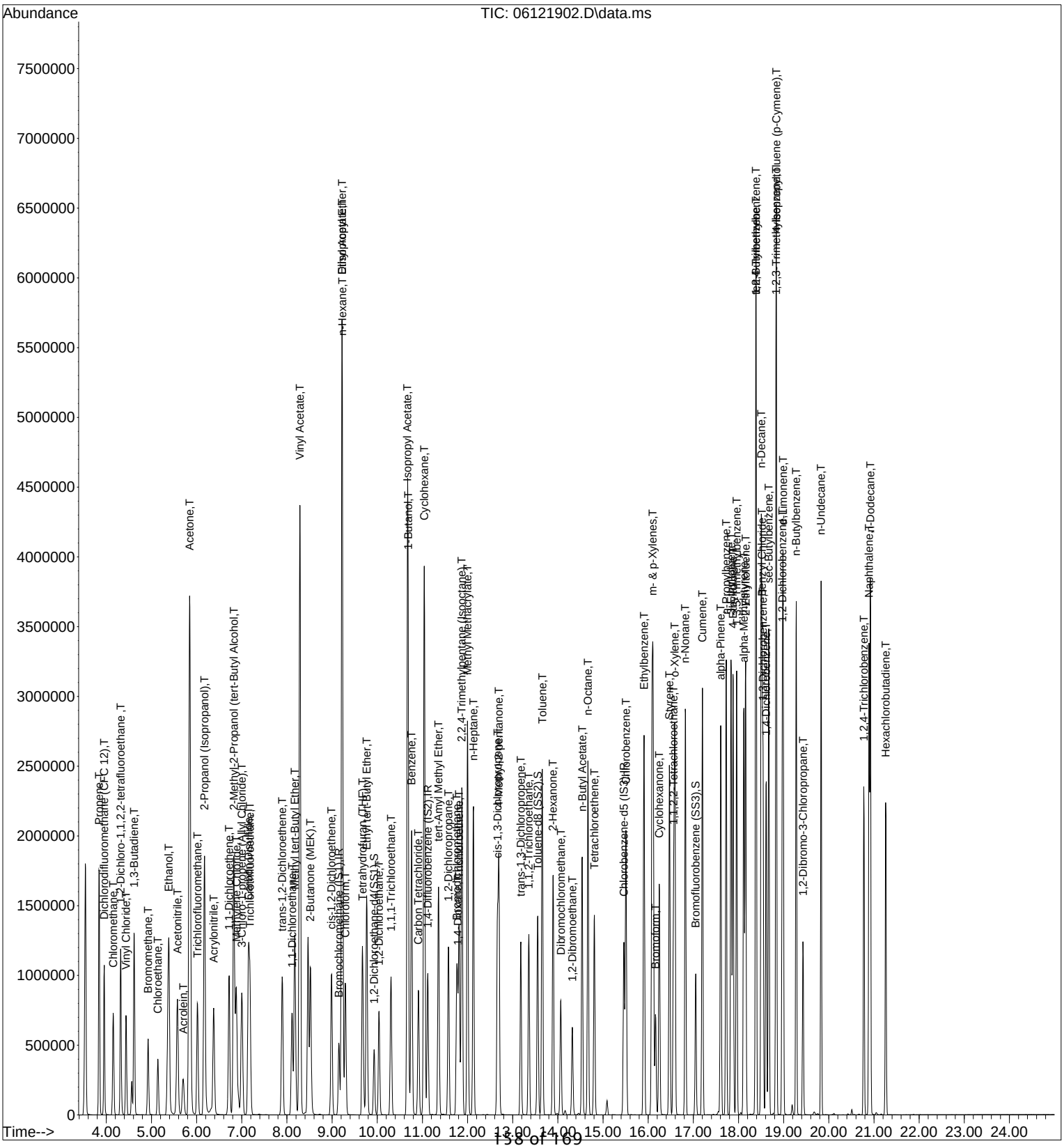
Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
50) Methyl Methacrylate	12.00	100	411384	52.458	ng	98
51) n-Heptane	12.13	71	562687	24.751	ng	100
52) cis-1,3-Dichloropropene	12.66	75	951149	27.129	ng	100
53) 4-Methyl-2-pentanone	12.69	58	563655	25.402	ng	98
54) trans-1,3-Dichloropropene	13.18	75	824653	26.310	ng	99
55) 1,1,2-Trichloroethane	13.36	97	484710	24.985	ng	99
58) Toluene	13.65	91	2089564	22.934	ng	100
59) 2-Hexanone	13.89	43	1416617	24.081	ng	99
60) Dibromochloromethane	14.07	129	536769	24.942	ng	100
61) 1,2-Dibromoethane	14.32	107	530458	24.375	ng	100
62) n-Butyl Acetate	14.54	43	1612282	24.774	ng	100
63) n-Octane	14.67	57	520991	23.986	ng	100
64) Tetrachloroethene	14.81	166	490804	23.623	ng	100
65) Chlorobenzene	15.51	112	1308522	23.647	ng	100
66) Ethylbenzene	15.91	91	2368672	23.169	ng	100
67) m- & p-Xylenes	16.10	91	3756873	47.703	ng	100
68) Bromoform	16.16	173	414320	25.637	ng	99
69) Styrene	16.47	104	1424197	24.594	ng	100
70) o-Xylene	16.59	91	1836962	23.679	ng	100
71) n-Nonane	16.82	43	1284123	23.821	ng	99
72) 1,1,2,2-Tetrachloroethane	16.56	83	919407	24.092	ng	100
74) Cumene	17.20	105	2268846	23.458	ng	100
75) alpha-Pinene	17.61	93	1207641	24.218	ng	100
76) n-Propylbenzene	17.73	91	2858900	24.010	ng	100
77) 3-Ethyltoluene	17.83	105	2234450	23.332	ng	100
78) 4-Ethyltoluene	17.88	105	2204202	24.408	ng	100
79) 1,3,5-Trimethylbenzene	17.96	105	1869759	23.509	ng	99
80) alpha-Methylstyrene	18.12	118	963566	25.563	ng	100
81) 2-Ethyltoluene	18.16	105	2208712	23.621	ng	100
82) 1,2,4-Trimethylbenzene	18.39	105	1946025	24.138	ng	100
83) n-Decane	18.50	57	1260422	24.172	ng	100
84) Benzyl Chloride	18.52	91	1837955	26.983	ng	100
85) 1,3-Dichlorobenzene	18.54	146	1014237	23.920	ng	100
86) 1,4-Dichlorobenzene	18.61	146	1025227	23.979	ng	100
87) sec-Butylbenzene	18.67	105	2511218	23.542	ng	100
88) 4-Isopropyltoluene (p-...	18.84	119	2294988	23.213	ng	100
89) 1,2,3-Trimethylbenzene	18.83	105	1904076	23.570	ng	100
90) 1,2-Dichlorobenzene	18.97	146	981938	23.984	ng	100
91) d-Limonene	18.99	68	847339	24.621	ng	100
92) 1,2-Dibromo-3-Chloropr...	19.43	157	349535	24.703	ng	100
93) n-Undecane	19.83	57	1310779	24.332	ng	100
94) 1,2,4-Trichlorobenzene	20.77	180	714326	24.863	ng	100
95) Naphthalene	20.89	128	2495247	26.199	ng	100
96) n-Dodecane	20.92	57	1232252	26.795	ng	100
97) Hexachlorobutadiene	21.26	225	428703	23.496	ng	99
98) Cyclohexanone	16.24	55	844267	20.951	ng	99
99) tert-Butylbenzene	18.39	119	1817690	23.629	ng	100
100) n-Butylbenzene	19.28	91	2141741	23.783	ng	100

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\12\06121902.D
Acq On : 12 Jun 2019 6:14 Operator: SC
Sample : CCV R9061219 25ng
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 12 08:50:03 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



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Data File: I:\MS09\Data\2019 06\13\06131902.D
Acq On : 13 Jun 2019 6:14 Operator: SC
Sample : CCV R9061319 25ng
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

6/13/19

Quant Time: Jun 13 09:29:34 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.33min
Max. RRF Dev : 30% Max. Rel. Area : 200%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
1	IR	Bromochloromethane (IS1)	1.000	1.000	0.0	101	-0.02
2	T	Propene	1.603	1.652	-3.1	101	0.00
3	T	Dichlorodifluoromethane (CF	2.349	2.205	6.1	98	0.00
4	T	Chloromethane	2.117	2.223	-5.0	101	0.00
5	T	1,2-Dichloro-1,1,2,2-tetraf	1.063	0.965	9.2	97	0.00
6	T	Vinyl Chloride	1.987	1.891	4.8	99	0.00
7	T	1,3-Butadiene	1.458	1.520	-4.3	101	0.00
8	T	Bromomethane	1.071	1.016	5.1	100	0.00
9	T	Chloroethane	1.010	0.963	4.7	99	-0.01
10	T	Ethanol	1.240	1.161	6.4	99	-0.04
11	T	Acetonitrile	3.030	3.009	0.7	99	-0.03
12	T	Acrolein	0.978	0.894	8.6	99	-0.02
13	T	Acetone	1.097	1.019	7.1	99	-0.02
14	T	Trichlorofluoromethane	1.973	1.844	6.5	98	-0.01
15	T	2-Propanol (Isopropanol)	4.032	3.922	2.7	98	-0.03
16	T	Acrylonitrile	2.045	1.982	3.1	99	-0.03
17	T	1,1-Dichloroethene	1.178	1.086	7.8	97	-0.01
18	T	2-Methyl-2-Propanol (tert-B	3.463	3.406	1.6	100	-0.04
19	T	Methylene Chloride	1.278	1.178	7.8	98	-0.02
20	T	3-Chloro-1-propene (Allyl C	2.357	2.290	2.8	98	-0.01
21	T	Trichlorotrifluoroethane	0.921	0.840	8.8	96	0.00
22	T	Carbon Disulfide	4.948	4.530	8.4	98	0.00
23	T	trans-1,2-Dichloroethene	2.014	1.919	4.7	98	-0.01
24	T	1,1-Dichloroethane	2.438	2.334	4.3	98	-0.01
25	T	Methyl tert-Butyl Ether	3.760	3.647	3.0	99	-0.01
26	T	Vinyl Acetate	0.306	0.295	3.6	98	-0.02
27	T	2-Butanone (MEK)	1.056	0.917	13.2	98	-0.02
28	T	cis-1,2-Dichloroethene	1.948	1.843	5.4	98	-0.01
29	T	Diisopropyl Ether	0.990	0.980	1.0	98	0.00
30	T	Ethyl Acetate	0.526	0.511	2.9	98	-0.02
31	T	n-Hexane	2.509	2.378	5.2	98	0.00
32	T	Chloroform	2.128	1.995	6.3	97	-0.02
33	S	1,2-Dichloroethane-d4(SS1)	1.822	1.894	-4.0	103	-0.01
34	T	Tetrahydrofuran (THF)	0.941	0.870	7.5	98	0.00
35	T	Ethyl tert-Butyl Ether	1.403	1.374	2.1	99	0.00
36	T	1,2-Dichloroethane	1.743	1.657	4.9	98	-0.01
37	IR	1,4-Difluorobenzene (IS2)	1.000	1.000	0.0	102	-0.01
38	T	1,1,1-Trichloroethane	0.409	0.380	7.1	97	-0.01
39	T	Isopropyl Acetate	0.203	0.196	3.4	98	-0.01
40	T	1-Butanol	0.372	0.349	6.2	98	-0.03
41	T	Benzene	1.282	1.094	14.7	98	-0.01
42	T	Carbon Tetrachloride	0.355	0.333	6.2	96	0.00
43	T	Cyclohexane	0.453	0.419	7.5	97	-0.01
44	T	tert-Amyl Methyl Ether	0.776	0.748	3.6	100	-0.01
45	T	1,2-Dichloropropane	0.313	0.293	6.4	98	0.00
46	T	Bromodichloromethane	0.374	0.357	4.5	98	-0.01
47	T	Trichloroethene	0.278	0.247	11.2	96	0.00
48	T	1,4-Dioxane	0.242	0.220	9.1	97	-0.01
49	T	2,2,4-Trimethylpentane (Iso	1.387	1.291	6.9	98	0.00
50	T	Methyl Methacrylate	0.107	0.103	3.7	97	-0.01
51	T	n-Heptane	0.310	0.288	7.1	98	0.00
52	T	cis-1,3-Dichloropropene	0.478	0.466	2.5	97	0.00
53	T	4-Methyl-2-pentanone	0.302	0.296	2.0	98	0.00
54	T	trans-1,3-Dichloropropene	0.427	0.430	-0.7	97	0.00

Data File: I:\MS09\Data\2019 06\13\06131902.D
Acq On : 13 Jun 2019 6:14 Operator: SC
Sample : CCV R9061319 25ng
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 13 09:29:34 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.33min
Max. RRF Dev : 30% Max. Rel. Area : 200%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
55	T	1,1,2-Trichloroethane	0.264	0.244	7.6	96	-0.01
56	IR	Chlorobenzene-d5 (IS3)	1.000	1.000	0.0	104	0.00
57	S	Toluene-d8 (SS2)	2.332	2.272	2.6	102	0.00
58	T	Toluene	2.323	2.011	13.4	97	0.00
59	T	2-Hexanone	1.500	1.375	8.3	98	-0.01
60	T	Dibromochloromethane	0.549	0.505	8.0	96	0.00
61	T	1,2-Dibromoethane	0.555	0.499	10.1	96	-0.01
62	T	n-Butyl Acetate	1.659	1.550	6.6	98	0.00
63	T	n-Octane	0.554	0.500	9.7	99	0.00
64	T	Tetrachloroethene	0.530	0.463	12.6	95	0.00
65	T	Chlorobenzene	1.411	1.234	12.5	96	0.00
66	T	Ethylbenzene	2.607	2.331	10.6	97	0.00
67	T	m- & p-Xylenes	2.008	1.797	10.5	97	-0.01
68	T	Bromoform	0.412	0.394	4.4	95	-0.01
69	T	Styrene	1.477	1.363	7.7	95	0.00
70	T	o-Xylene	1.978	1.758	11.1	97	0.00
71	T	n-Nonane	1.375	1.255	8.7	98	0.00
72	T	1,1,2,2-Tetrachloroethane	0.973	0.883	9.2	97	-0.01
73	S	Bromofluorobenzene (SS3)	0.625	0.617	1.3	102	0.00
74	T	Cumene	2.466	2.181	11.6	96	0.00
75	T	alpha-Pinene	1.271	1.188	6.5	96	0.00
76	T	n-Propylbenzene	3.036	2.716	10.5	97	0.00
77	T	3-Ethyltoluene	2.442	2.260	7.5	102	0.00
78	T	4-Ethyltoluene	2.303	1.993	13.5	90	-0.01
79	T	1,3,5-Trimethylbenzene	2.028	1.792	11.6	96	0.00
80	T	alpha-Methylstyrene	0.961	0.921	4.2	94	0.00
81	T	2-Ethyltoluene	2.384	2.101	11.9	96	0.00
82	T	1,2,4-Trimethylbenzene	2.056	1.855	9.8	96	-0.01
83	T	n-Decane	1.330	1.213	8.8	97	0.00
84	T	Benzyl Chloride	1.737	1.787	-2.9	96	-0.01
85	T	1,3-Dichlorobenzene	1.081	0.948	12.3	94	-0.01
86	T	1,4-Dichlorobenzene	1.090	0.957	12.2	94	0.00
87	T	sec-Butylbenzene	2.720	2.405	11.6	96	0.00
88	T	4-Isopropyltoluene (p-Cymen	2.521	2.240	11.1	95	0.00
89	T	1,2,3-Trimethylbenzene	2.060	1.863	9.6	95	0.00
90	T	1,2-Dichlorobenzene	1.044	0.913	12.5	95	0.00
91	T	d-Limonene	0.878	0.862	1.8	95	0.00
92	T	1,2-Dibromo-3-Chloropropane	0.361	0.340	5.8	94	0.00
93	T	n-Undecane	1.374	1.289	6.2	97	0.00
94	T	1,2,4-Trichlorobenzene	0.733	0.678	7.5	92	0.00
95	T	Naphthalene	2.428	2.485	-2.3	93	0.00
96	T	n-Dodecane	1.173	1.236	-5.4	97	0.00
97	T	Hexachlorobutadiene	0.465	0.411	11.6	92	0.00
98	T	Cyclohexanone	1.028	0.891	13.3	98	-0.02
99	T	tert-Butylbenzene	1.962	1.733	11.7	96	0.00
100	T	n-Butylbenzene	2.296	2.060	10.3	95	0.00

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Quantitation Report (QT Reviewed)

Data File: I:\MS09\Data\2019 06\13\06131902.D
Acq On : 13 Jun 2019 6:14 Operator: SC
Sample : CCV R9061319 25ng
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

6/13/19

Quant Time: Jun 13 09:29:34 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
1) Bromochloromethane (IS1)	9.16	130	188687	12.500	ng	-0.02
37) 1,4-Difluorobenzene (IS2)	11.12	114	865051	12.500	ng	-0.01
56) Chlorobenzene-d5 (IS3)	15.46	82	464814	12.500	ng	0.00
System Monitoring Compounds						
33) 1,2-Dichloroethane-d4(...	9.94	65	357306	12.993	ng	-0.01
Spiked Amount 12.500	Range 70 - 130		Recovery = 103.92%			
57) Toluene-d8 (SS2)	13.55	98	1056155	12.182	ng	0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 97.44%			
73) Bromofluorobenzene (SS3)	17.05	174	286844	12.333	ng	0.00
Spiked Amount 12.500	Range 70 - 130		Recovery = 98.64%			
Target Compounds						Qvalue
2) Propene	3.84	42	642647	26.559	ng	100
3) Dichlorodifluoromethan...	3.96	85	869438	24.524	ng	100
4) Chloromethane	4.16	50	845501	26.454	ng	100
5) 1,2-Dichloro-1,1,2,2-t...	4.32	135	374535	23.340	ng	100
6) Vinyl Chloride	4.44	62	750181	25.017	ng	100
7) 1,3-Butadiene	4.62	54	601532	27.335	ng	99
8) Bromomethane	4.93	94	386961	23.929	ng	99
9) Chloroethane	5.15	64	371404	24.355	ng	100
10) Ethanol	5.39	45	2252359	120.333	ng	100
11) Acetonitrile	5.58	41	1172958	25.645	ng	100
12) Acrolein	5.71	56	346628	23.472	ng	99
13) Acetone	5.86	58	2065209	124.674	ng	100
14) Trichlorofluoromethane	6.02	101	737491	24.764	ng	100
15) 2-Propanol (Isopropanol)	6.19	45	3053730	50.169	ng	100
16) Acrylonitrile	6.38	53	773464	25.055	ng	100
17) 1,1-Dichloroethene	6.72	96	440176	24.755	ng	99
18) 2-Methyl-2-Propanol (t...	6.83	59	2755603	52.709	ng	100
19) Methylene Chloride	6.88	84	475478	24.638	ng	99
20) 3-Chloro-1-propene (Al...	7.01	41	921902	25.915	ng	100
21) Trichlorotrifluoroethane	7.19	151	337797	24.291	ng	99
22) Carbon Disulfide	7.15	76	1837828	24.604	ng	100
23) trans-1,2-Dichloroethene	7.90	61	768942	25.291	ng	99
24) 1,1-Dichloroethane	8.12	63	907129	24.648	ng	100
25) Methyl tert-Butyl Ether	8.18	73	1498853	26.406	ng	100
26) Vinyl Acetate	8.29	86	584590	126.508	ng	97
27) 2-Butanone (MEK)	8.53	72	355412	22.288	ng	100
28) cis-1,2-Dichloroethene	8.99	61	732887	24.925	ng	99
29) Diisopropyl Ether	9.22	87	399728	26.750	ng	99
30) Ethyl Acetate	9.23	61	417704	52.584	ng	100
31) n-Hexane	9.23	57	971058	25.642	ng	100
32) Chloroform	9.30	83	810680	25.237	ng	100
34) Tetrahydrofuran (THF)	9.68	72	350557	24.686	ng	99
35) Ethyl tert-Butyl Ether	9.77	87	549702	25.950	ng	99
36) 1,2-Dichloroethane	10.04	62	663519	25.218	ng	100
38) 1,1,1-Trichloroethane	10.30	97	710954	25.137	ng	100
39) Isopropyl Acetate	10.67	61	701461	50.012	ng	100
40) 1-Butanol	10.68	56	1247163	48.381	ng	100
41) Benzene	10.76	78	1954616	22.030	ng	100
42) Carbon Tetrachloride	10.92	117	596449	24.275	ng	100
43) Cyclohexane	11.04	84	1514407	48.277	ng	99
44) tert-Amyl Methyl Ether	11.35	73	1390252	25.887	ng	100
45) 1,2-Dichloropropane	11.58	63	544703	25.116	ng	100
46) Bromodichloromethane	11.76	83	659090	25.442	ng	100
47) Trichloroethene	11.82	130	453201	23.577	ng	99
48) 1,4-Dioxane	11.78	88	404597	24.192	ng	99
49) 2,2,4-Trimethylpentane...	11.88	57	2370106	24.698	ng	100

Data File: I:\MS09\Data\2019 06\13\06131902.D
Acq On : 13 Jun 2019 6:14 Operator: SC
Sample : CCV R9061319 25ng
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

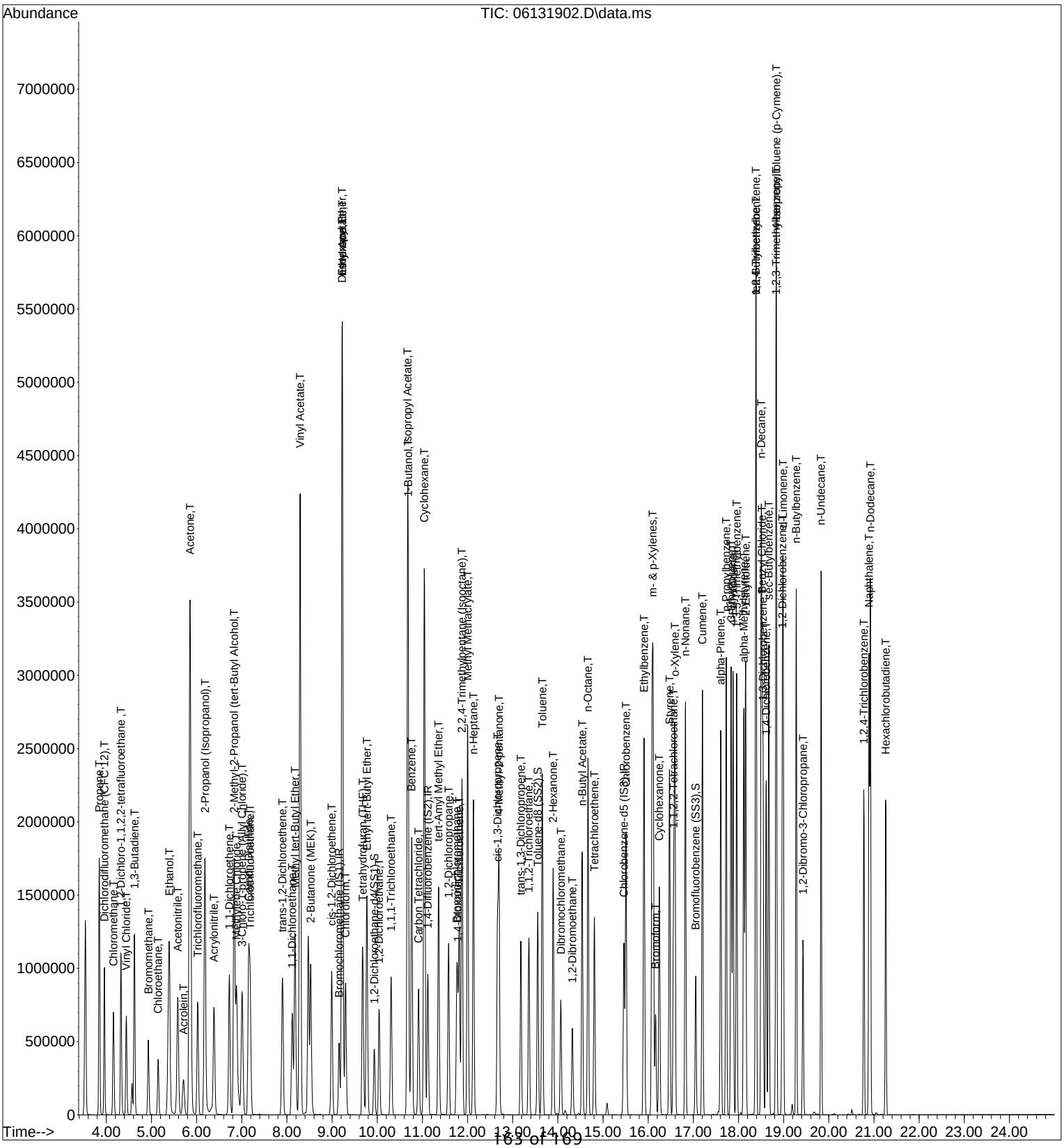
Quant Time: Jun 13 09:29:34 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M

Internal Standards	R.T.	QIon	Response	Conc	Units	Dev(Min)
50) Methyl Methacrylate	12.00	100	381850	51.637	ng	99
51) n-Heptane	12.13	71	535357	24.973	ng	99
52) cis-1,3-Dichloropropene	12.66	75	903653	27.333	ng	100
53) 4-Methyl-2-pentanone	12.70	58	542029	25.904	ng	99
54) trans-1,3-Dichloropropene	13.18	75	784216	26.533	ng	100
55) 1,1,2-Trichloroethane	13.36	97	454386	24.839	ng	100
58) Toluene	13.65	91	1966578	22.764	ng	100
59) 2-Hexanone	13.90	43	1373315	24.622	ng	100
60) Dibromochloromethane	14.07	129	504783	24.739	ng	100
61) 1,2-Dibromoethane	14.32	107	498659	24.167	ng	100
62) n-Butyl Acetate	14.54	43	1563151	25.332	ng	100
63) n-Octane	14.67	57	500101	24.283	ng	99
64) Tetrachloroethene	14.81	166	454903	23.092	ng	100
65) Chlorobenzene	15.51	112	1223275	23.315	ng	100
66) Ethylbenzene	15.91	91	2238080	23.089	ng	99
67) m- & p-Xylenes	16.10	91	3546536	47.494	ng	100
68) Bromoform	16.16	173	389020	25.387	ng	99
69) Styrene	16.47	104	1343586	24.470	ng	100
70) o-Xylene	16.59	91	1735950	23.600	ng	100
71) n-Nonane	16.83	43	1249179	24.440	ng	99
72) 1,1,2,2-Tetrachloroethane	16.56	83	873618	24.144	ng	100
74) Cumene	17.20	105	2143087	23.369	ng	100
75) alpha-Pinene	17.61	93	1142701	24.169	ng	100
76) n-Propylbenzene	17.73	91	2716323	24.060	ng	99
77) 3-Ethyltoluene	17.84	105	2230858	24.568	ng	96
78) 4-Ethyltoluene	17.88	105	1965745	22.958	ng	97
79) 1,3,5-Trimethylbenzene	17.96	105	1761078	23.353	ng	99
80) alpha-Methylstyrene	18.12	118	905920	25.347	ng	100
81) 2-Ethyltoluene	18.16	105	2093446	23.612	ng	100
82) 1,2,4-Trimethylbenzene	18.39	105	1841727	24.094	ng	100
83) n-Decane	18.50	57	1213096	24.536	ng	100
84) Benzyl Chloride	18.52	91	1746330	27.040	ng	99
85) 1,3-Dichlorobenzene	18.54	146	951372	23.664	ng	100
86) 1,4-Dichlorobenzene	18.61	146	961647	23.721	ng	100
87) sec-Butylbenzene	18.67	105	2376366	23.496	ng	100
88) 4-Isopropyltoluene (p-...	18.84	119	2170146	23.150	ng	100
89) 1,2,3-Trimethylbenzene	18.83	105	1805093	23.566	ng	100
90) 1,2-Dichlorobenzene	18.97	146	923954	23.802	ng	100
91) d-Limonene	18.99	68	809308	24.802	ng	100
92) 1,2-Dibromo-3-Chloropr...	19.43	157	329739	24.578	ng	97
93) n-Undecane	19.83	57	1266181	24.789	ng	99
94) 1,2,4-Trichlorobenzene	20.77	180	670499	24.613	ng	100
95) Naphthalene	20.89	128	2367799	26.221	ng	100
96) n-Dodecane	20.92	57	1184203	27.158	ng	99
97) Hexachlorobutadiene	21.26	225	402506	23.266	ng	100
98) Cyclohexanone	16.24	55	813500	21.291	ng	100
99) tert-Butylbenzene	18.39	119	1718768	23.564	ng	100
100) n-Butylbenzene	19.28	91	2037107	23.858	ng	100

(#) = qualifier out of range (m) = manual integration (+) = signals summed

Data File: I:\MS09\Data\2019 06\13\06131902.D
Acq On : 13 Jun 2019 6:14 Operator: SC
Sample : CCV R9061319 25ng
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

Quant Time: Jun 13 09:29:34 2019
Quant Method : I:\MS09\Methods\R9060719.M
Quant Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
QLast Update : Fri Jun 07 14:29:19 2019
Response via : Initial Calibration
DataAcq Meth:TO15.M



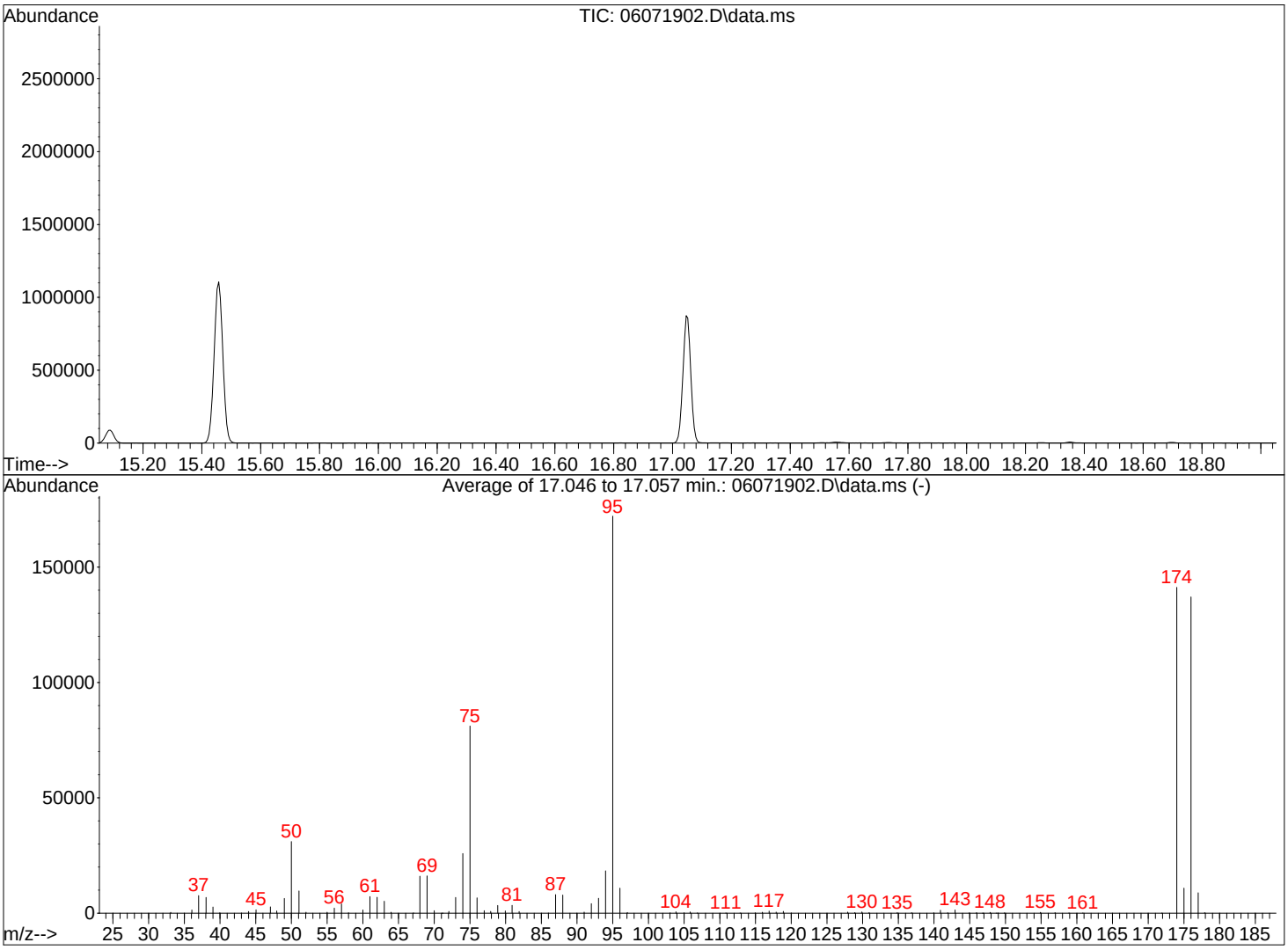
00942967

Data Path : I:\MS09\Data\2019 06\07\
Data File : 06071902.D
Acq On : 7 Jun 2019 9:31
Operator : SC
Sample : 12.5ng TO-15 BFB STD
Misc : S31-05131901
ALS Vial : 2 Sample Multiplier: 1

6/7/19

Integration File: LSCINT.P

Method : I:\MS09\Methods\R9060719.M
Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
Last Update : Fri Jun 07 13:38:27 2019



AutoFind: Scans 2485, 2486, 2487; Background Corrected with Scan 2476

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50	95	8	40	18.0	31024	PASS
75	95	30	66	47.1	81109	PASS
95	95	100	100	100.0	172075	PASS
96	95	5	9	6.3	10880	PASS
173	174	0.00	2	0.0	0	PASS
174	95	50	120	82.1	141224	PASS
175	174	4	9	7.7	10846	PASS
176	174	93	101	97.1	137061	PASS
177	176	5	9	6.5	8841	PASS

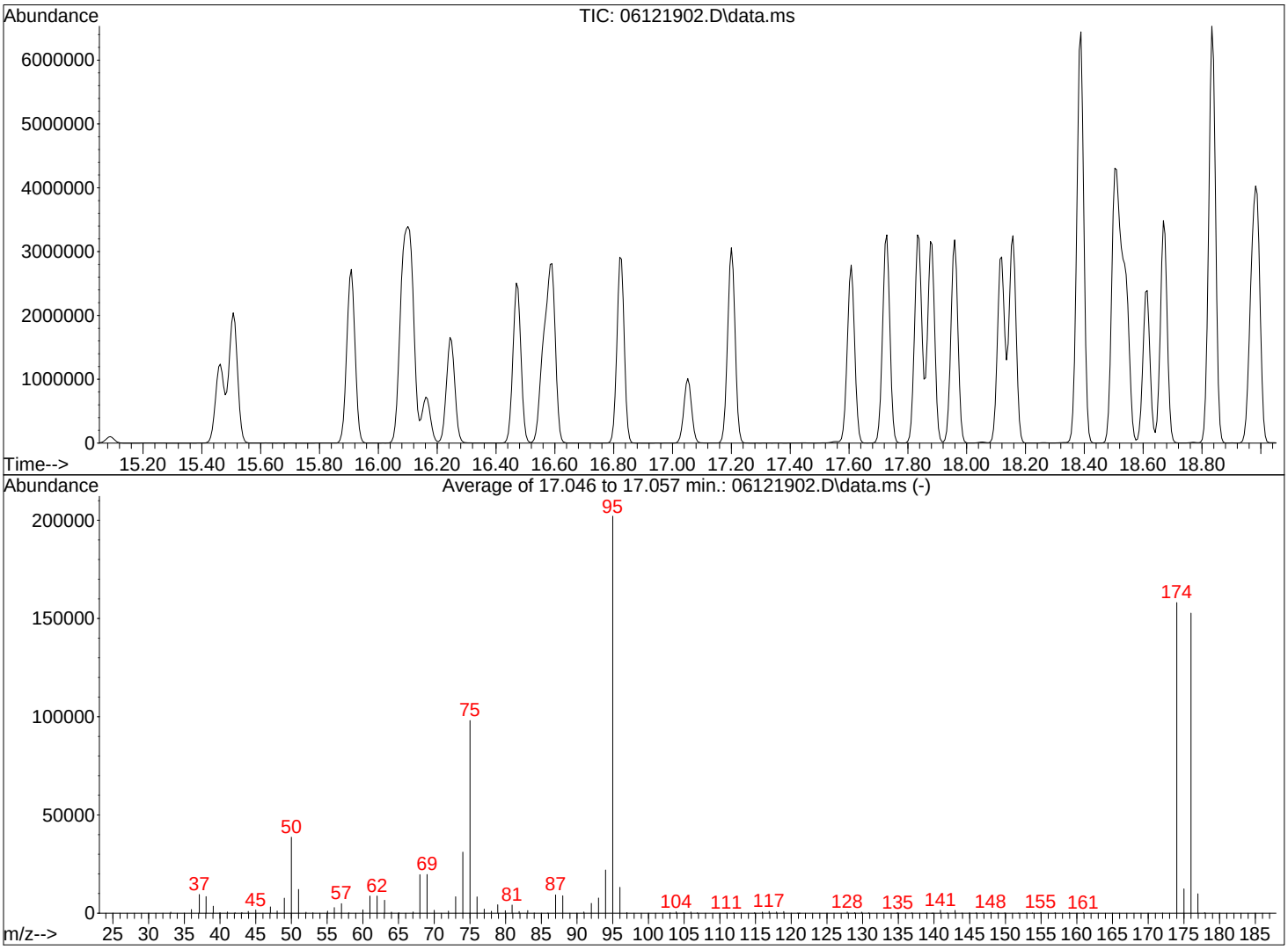
00942968

Data Path : I:\MS09\Data\2019 06\12\
Data File : 06121902.D
Acq On : 12 Jun 2019 6:14
Operator : SC
Sample : CCV R9061219 25ng
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

6/12/19

Integration File: LSCINT.P

Method : I:\MS09\Methods\R9060719.M
Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
Last Update : Fri Jun 07 14:29:19 2019



AutoFind: Scans 2485, 2486, 2487; Background Corrected with Scan 2476

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50	95	8	40	19.1	38667	PASS
75	95	30	66	48.5	98069	PASS
95	95	100	100	100.0	202091	PASS
96	95	5	9	6.5	13190	PASS
173	174	0.00	2	0.0	0	PASS
174	95	50	120	78.2	158101	PASS
175	174	4	9	7.8	12389	PASS
176	174	93	101	96.6	152725	PASS
177	176	5	9	6.5	9924	PASS

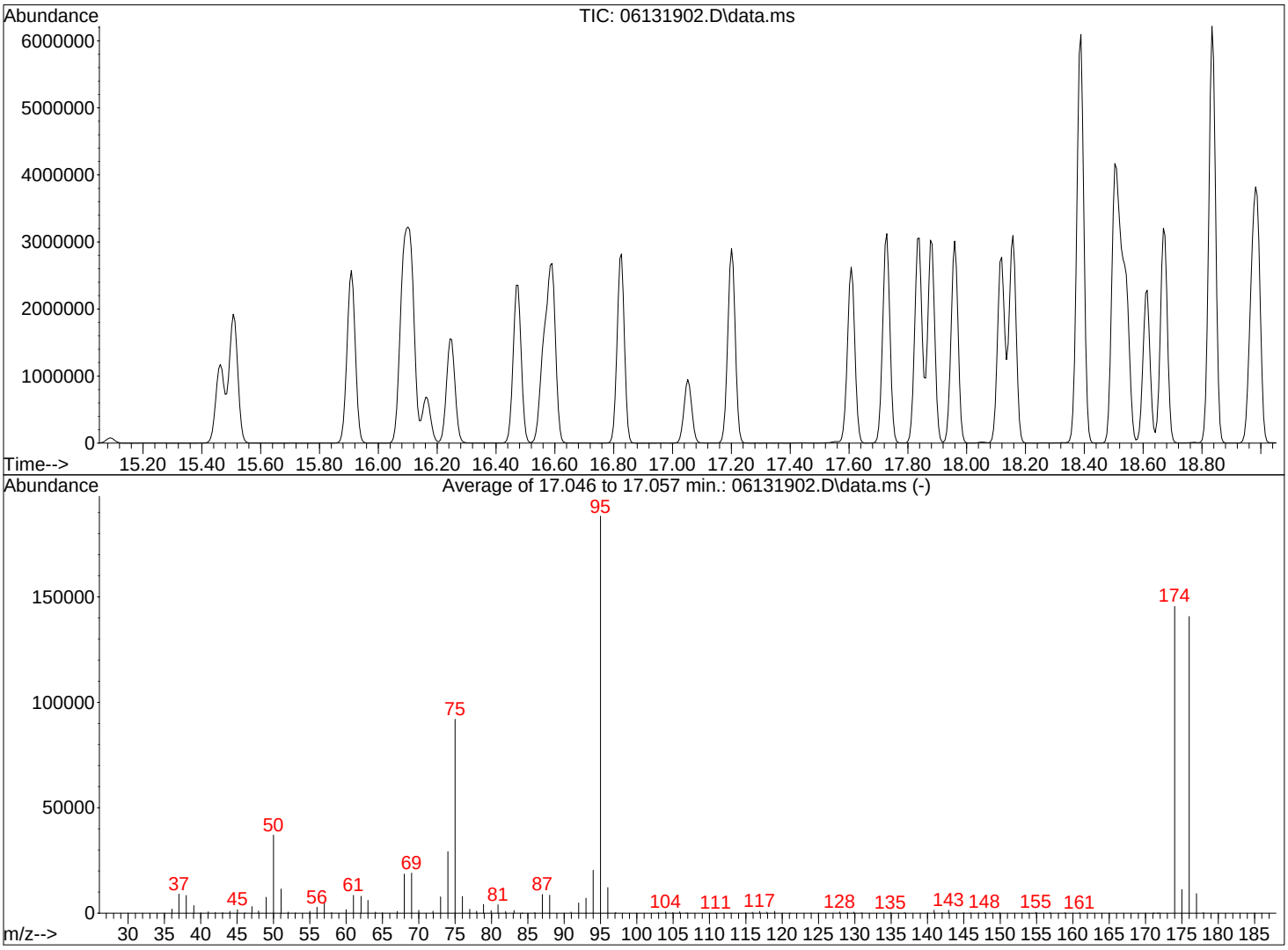
00942969

Data Path : I:\MS09\Data\2019 06\13\
Data File : 06131902.D
Acq On : 13 Jun 2019 6:14
Operator : SC
Sample : CCV R9061319 25ng
Misc : S31-05131901/S31-05311906 (6/29)
ALS Vial : 2 Sample Multiplier: 1

6/13/19

Integration File: LSCINT.P

Method : I:\MS09\Methods\R9060719.M
Title : EPA TO-15 per SOP VOA-TO15 (CASS TO-15/GC-MS)
Last Update : Fri Jun 07 14:29:19 2019



AutoFind: Scans 2485, 2486, 2487; Background Corrected with Scan 2476

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50	95	8	40	19.7	37019	PASS
75	95	30	66	48.8	91944	PASS
95	95	100	100	100.0	188288	PASS
96	95	5	9	6.5	12165	PASS
173	174	0.00	2	0.0	0	PASS
174	95	50	120	77.3	145515	PASS
175	174	4	9	7.7	11185	PASS
176	174	93	101	96.7	140709	PASS
177	176	5	9	6.6	9284	PASS

Injection Log

Directory: J:\MS09\Data\2019_06\07\

	Date/Time	File Name	Sample ID	Misc Info	Operator	Vial	Comment
1	6/7/19 8:57	06071901.D	Blank (100mL)	S31-05131901	SC	2	
2	6/7/19 9:31	06071902.D	12.5ng TO-15 BFB STD	S31-05131901	SC	2	pass
3	6/7/19 10:04	06071903.D	0.1ng TO-15 ICAL STD	S31-05131901/S31-05201906 (6/18)	SC	4	
4	6/7/19 10:38	06071904.D	0.2ng TO-15 ICAL STD	S31-05131901/S31-05201906 (6/18)	SC	4	
5	6/7/19 11:11	06071905.D	0.5ng TO-15 ICAL STD	S31-05131901/S31-05201906 (6/18)	SC	4	
6	6/7/19 11:45	06071906.D	1.0ng TO-15 ICAL STD	S31-05131901/S31-05201906 (6/18)	SC	4	
7	6/7/19 12:18	06071907.D	5.0ng TO-15 ICAL STD	S31-05131901/S31-06061905 (7/4)	SC	8	
8	6/7/19 12:52	06071908.D	25ng TO-15 ICAL STD	S31-05131901/S31-05311906 (6/29)	SC	2	
9	6/7/19 13:25	06071909.D	50ng TO-15 ICAL STD	S31-05131901/S31-05311906 (6/29)	SC	2	
10	6/7/19 13:59	06071910.D	100ng TO-15 ICAL STD	S31-05131901/S31-05311906 (6/29)	SC	2	
11	6/7/19 14:33	06071911.D	Blank (100mL)	S31-05131901	SC	2	
12	6/7/19 15:06	06071912.D	25ng TO-15 ICV STD	S31-05131901/S31-05241901 (6/22)	SC	2	pass
38							
39							
40							6/11/19
41							
42							
43							
44							
45							

Injection Log

00942971

Directory: I:\MS09\Data\2019_06\12\

	Date/Time	File Name	Sample ID	Misc Info	Operator	Vial	Comment
1	6/12/19 5:40	06121901.D	CCV C9061219_25ng	S31-05131901/S31-05151909 (6/13)	SC	3	pass
2	6/12/19 6:14	06121902.D	CCV R9061219_25ng	S31-05131901/S31-05311906 (6/29)	SC	2	pass
3	6/12/19 6:48	06121903.D	Blank (100mL)	S31-05131901	SC	2	
4	6/12/19 7:21	06121904.D	MB R9061219_ 1000mL	S31-05131901/AC00463	SC	2	pass
5	6/12/19 7:54	06121905.D	LCS R9061219_25ng	S31-05131901/S31-05241901 (6/22)	SC	2	pass
6	6/12/19 8:28	06121906.D	LCSD R9061219_25ng	S31-05131901/S31-05241901 (6/22)	SC	2	pass
7	6/12/19 9:06	06121907.D	Blank (100mL)	S31-05131901	SC	1	
8	6/12/19 9:39	06121908.D	P1903279-001Dil (40mL)	S31-05131901	SC	6	
9	6/12/19 10:13	06121909.D	P1903109-001 (400mL)	S31-05131901	SC	15	
10	6/12/19 10:47	06121910.D	P1903109-002 (400mL)	S31-05131901	SC	16	
11	6/12/19 11:20	06121911.D	P1903225-003Dil (100mL)	S31-05131901	SC	11	
12	6/12/19 12:03	06121912.D	P1903197-001 (10mL)	S31-05131901	SC	1	
13	6/12/19 12:39	06121913.D	P1903373-001 (0.1mL)	S31-05131901	SC	1	
14	6/12/19 13:12	06121914.D	P1903119-001Dil (15mL)	S31-05131901	SC	5	
15	6/12/19 13:45	06121915.D	P1903119-002 (15mL)	S31-05131901	SC	6	
16	6/12/19 14:19	06121916.D	P1903119-003 (100mL)	S31-05131901	SC	7	
17	6/12/19 14:52	06121917.D	P1903119-001 (100mL)	S31-05131901	SC	5	
18	6/12/19 15:26	06121918.D	P1903119-002 (60mL)	S31-05131901	SC	6	
19	6/12/19 15:59	06121919.D	P1903119-003 (400mL)	S31-05131901	SC	7	
20	6/12/19 16:51	06121920.D	P1903177-001 (8.0mL)	S31-05131901	SC	1	
21	6/12/19 17:25	06121921.D	P1903177-002 (8.0mL)	S31-05131901	SC	1	
22	6/12/19 17:58	06121922.D	P1903375-001 (400mL)	S31-05131901	SC	8	
23	6/12/19 18:32	06121923.D	P1903177-003 (1000mL)	S31-05131901	SC	9	
24	6/12/19 19:05	06121924.D	P1903177-003Dil (100mL)	S31-05131901	SC	9	
25	6/12/19 19:39	06121925.D	P1903177-004 (1000mL)	S31-05131901	SC	10	
26	6/12/19 20:12	06121926.D	P1903177-004Dil (100mL)	S31-05131901	SC	10	
27	6/12/19 20:46	06121927.D	P1903313-001 (1000mL)	S31-05131901	SC	11	
28	6/12/19 21:20	06121928.D	P1903313-002 (1000mL)	S31-05131901	SC	12	
29	6/12/19 21:53	06121929.D	P1903313-003 (1000mL)	S31-05131901	SC	13	
30	6/12/19 22:27	06121930.D	P1903313-004 (1000mL)	S31-05131901	SC	14	
31	6/12/19 23:00	06121931.D	P1903313-005 (1000mL)	S31-05131901	SC	15	
32	6/12/19 23:34	06121932.D	P1903313-006 (1000mL)	S31-05131901	SC	16	
33	6/13/19 0:08	06121933.D	P1903313-006dup (1000mL)	S31-05131901	SC	16	pass
							6/13/19

Injection Log

00942972

Directory: I:\MS09\Data\2019_06\13\

	Date/Time	File Name	Sample ID	Misc Info	Operator	Vial	Comment
1	6/13/19 5:40	06131901.D	CCV C9061319_25ng	S31-05131901/S31-05151909 (6/13)	SC	3	pass
2	6/13/19 6:14	06131902.D	CCV R9061319_25ng	S31-05131901/S31-05311906 (6/29)	SC	2	pass
3	6/13/19 6:47	06131903.D	Blank (100mL)	S31-05131901	SC	2	
4	6/13/19 7:21	06131904.D	MB R9061319_ 1000mL	S31-05131901/AC00463	SC	2	pass
5	6/13/19 7:55	06131905.D	LCS R9061319_25ng	S31-05131901/S31-05241901 (6/22)	SC	2	pass
6	6/13/19 8:28	06131906.D	LCSD R9061319_25ng	S31-05131901/S31-05241901 (6/22)	SC	2	pass
7	6/13/19 9:02	06131907.D	Blank (100mL)	S31-05131901	SC	1	
8	6/13/19 10:00	06131908.D	P1903177-001Dil (4.0mL)	S31-05131901	SC	1	
9	6/13/19 10:33	06131909.D	P1903177-002Dil (4.0mL)	S31-05131901	SC	1	
10	6/13/19 11:24	06131910.D	P1903377-001 (10mL)	S31-05131901	SC	1	
11	6/13/19 12:08	06131911.D	P1903377-005 (10mL)	S31-05131901	SC	1	
12	6/13/19 12:42	06131912.D	P1903377-003 (25mL)	S31-05131901	SC	5	
13	6/13/19 13:41	06131913.D	P1903346-001 (1000mL)	S31-05131901	SC	6	
14	6/13/19 14:14	06131914.D	P1903397-001 (25mL)	S31-05131901	SC	7	
15	6/13/19 14:48	06131915.D	P1903399-001 (100mL)	S31-05131901	SC	8	
16	6/13/19 15:21	06131916.D	P1903397-001Dil (2.5mL)	S31-05131901	SC	1	
17	6/13/19 16:05	06131917.D	P1903399-001Dil (25mL)	S31-05131901	SC	8	
18	6/13/19 16:49	06131918.D	P1903187-001 (1000mL)PF2	S31-05131901	SC	16	
19	6/13/19 17:26	06131919.D	P1903377-005Dil (5.0mL)	S31-05131901	SC	1	
20	6/13/19 18:00	06131920.D	P1903326-001 (1000mL)	S31-05131901	SC	9	
21	6/13/19 18:33	06131921.D	P1903326-002 (1000mL)	S31-05131901	SC	10	
22	6/13/19 19:07	06131922.D	P1903326-003 (1000mL)	S31-05131901	SC	11	
23	6/13/19 19:44	06131923.D	P1903326-004 (1000mL)	S31-05131901	SC	12	
24	6/13/19 20:18	06131924.D	P1903326-005 (1000mL)	S31-05131901	SC	13	
25	6/13/19 20:51	06131925.D	P1903326-006 (1000mL)	S31-05131901	SC	14	
26	6/13/19 21:25	06131926.D	P1903341-001 (1000mL)	S31-05131901	SC	15	
27	6/13/19 21:59	06131927.D	P1903342-001 (1000mL)	S31-05131901	SC	5	
28	6/13/19 22:32	06131928.D	P1903342-002 (1000mL)	S31-05131901	SC	6	
29	6/13/19 23:06	06131929.D	P1903342-002dup (1000mL)	S31-05131901	SC	6	pass
30	6/13/19 23:40	06131930.D	P1901814-001 0.3ng	S31-05131901/S31-05311904 (6/29)	SC	7	
31	6/14/19 0:13	06131931.D	P1901814-001 0.5ng	S31-05131901/S31-05311904 (6/29)	SC	7	
							6/14/19

APPENDIX I
PROTOCOL FOR DISCHARGING GWTP EFFLUENT

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MEMORANDUM

DATE: August 28, 2017

PROJECT NAME: Remediation of Multiple Sites, Longhorn Army Ammunition Plant, Karnack, TX

TO:	Richard Mayer	Senior Project Engineer US Environmental Protection Agency Federal Facilities Section (6PD-F)
	April Palmie	Project and Grant Manager Superfund Section, Remediation Division Texas Commission on Environmental Quality
FROM:	Rose M. Zeiler, Ph.D.	Longhorn AAP Site Manager

SUBJECT: **Protocol for Discharging GWTP Effluent**
Longhorn Army Ammunition Plant, Karnack, TX
(Contract: W912DY-09-D-0059, Task Order DS01)

INTRODUCTION

The purpose of this memo is to document the protocol for discharging Longhorn Army Ammunition Plant groundwater treatment plant (GWTP) effluent to Harrison Bayou, the INF-Pond, or LHAAP-18/24.

The GWTP is designed to:

- Extract groundwater from LHAAP-18/24 and LHAAP-16 for hydraulic control;
- Remove metals by pH adjustment, polymer addition, and gravity separation;
- Remove volatile organic compounds (VOCs) by air stripping;
- Remove perchlorate in a fluidized bed reactor (FBR) and an ion exchange scavenger system; and
- Discharge the effluent continuously.

DISCHARGE CRITERIA

The discharge criteria established for discharge to Harrison Bayou are:

Parameter	Discharge Criteria (µg/L)	
	Daily Average	Daily Maximum
Volatiles		
1,1,1-Trichloroethane	3,417	7,230
1,1,2-Trichloroethane	102.5	216.9
1,1-Dichloroethane	6,633	14,032
1,1-Dichloroethene	119	253
1,2-Dichloroethane	85	181
Acetone	1,132	2,395
Benzene	85	181
Carbon Tetrachloride	85	181
Chlorobenzene	22,300	47,180
Chloroform	1,708	3,615
Ethylbenzene	26,954	57,025
Xylenes	39.5	83.6
Methylene Chloride	803	1,699
Styrene	2,829	5,987
Tetrachloroethene	85.4	180.7
Toluene	1,980	4,189
Trichloroethene	85	181
Vinyl Chloride	34	72
Anions		
Chloride	*	*
Sulfate	*	*
Perchlorate**	278	589
Metals		
Aluminum	777	1,644
Arsenic	365	772
Barium	1,000	2,000
Cadmium	1.6	3.4
Chromium, Total	355	752
Chromium, Hexavalent	58	124
Cobalt	5,433	11,495
Iron	1,132	2,395
Lead	2.2	4.6
Nickel	87	184
Manganese	7,323	15,494
Silver	1.4	3
Selenium	5.7	12
Vanadium	1,698	3,592
Zinc	146	310
Other		
Hexachlorobenzene	0.22	0.47
1,4-Dioxane		134.2
Oil and Grease		15
Chemical Oxygen Demand		200

* - Based upon flow in Harrison Bayou

** - Discharge criteria, when diverted to the INF Pond, is 17 µg/L

PROTOCOL FOR DISCHARGING GWTP EFFLUENT

In accordance with the *Sampling and Analysis Plan, Groundwater Treatment Plant and Well Fields* (SAP) Table 2-2, indicator parameters for the FBR, such as temperature, pH and oxidation reduction potential (ORP), are monitored in real time to predict FBR performance and perchlorate removal. Based upon these indicator parameters, the operator of the GWTP can make adjustments such as:

- Bring the ion exchange system online;
- Increase or decrease the addition rate of electron donor (acetic acid);
- Increase or decrease the nutrient addition rate (urea or phosphoric acid); or
- Increase or decrease the FBR recirculation rate

Samples of the GWTP effluent are collected weekly, analyzed for perchlorate, nutrients (ammonia-nitrogen and ortho-phosphate), total organic carbon (TOC), chloride, and sulfate, with the results received from the laboratory 14 days later. Other parameters (e.g. Record of Decision metals and volatiles) are collected and analyzed in GWTP effluent samples according to the frequencies listed in Table 2-1 of the SAP.

As shown in Figure 1, groundwater is continuously extracted, treated, and discharged. If Harrison Bayou is flowing and indicator parameters are within their historical optimal ranges, then the ion exchange vessels can be bypassed and the GWTP effluent sample will be collected after the FBR. If Harrison Bayou is not flowing or the indicator parameters are not within historical optimal ranges, then the ion exchange vessels will be put on line, and the GWTP effluent sample will be collected between the lead and lag ion exchange vessel. Professional judgement may also be used as to when to bring the ion exchange vessels online, such as after a power outage or during anticipated cold temperatures when the FBR has historically not performed optimally.

If a parameter is measured in the effluent at a concentration above the discharge criteria, then a confirmation sample and an effluent sample after the lag ion exchange vessel will be collected and analyzed for the parameter with a 24-hour turnaround time. Corrective measures (e.g. increased nutrient or electron donor addition rates, bring ion exchange vessels on line) will be implemented as appropriate to bring the parameter back within the discharge criteria. ***If an upset condition in the FBR leads to high concentrations of perchlorate going into the lead ion exchange vessel and breaking through at the sample location between the vessels, the lag vessel will still remove perchlorate before it is discharged to Harrison Bayou, the INF Pond, or LHAAP-18/24.*** It is estimated that the lag ion exchange vessel can remove all of the perchlorate from two weeks of typical groundwater extraction at a concentration of 920 µg/L. If the residual perchlorate concentration after the FBR and lead ion exchange vessel is only 600 µg/L, the lag ion exchange vessel could last almost 2.5 years before perchlorate would be detected in the discharged effluent.

If a parameter exceeds the discharge criteria by more than 40% (see Appendix A-2, SAP, Section 7c of Monitoring and Reporting Requirements) or reaches 920 µg/L of perchlorate, then the GWTP will be put into full recycle mode (no discharge) until the parameter is below the discharge criteria again. Appendix A-2 of the SAP requires GWTP data to be provided to TCEQ monthly including a list of noncompliance(s), if applicable.

Discharge to Harrison Bayou

As shown in Figure 1, the GWTP effluent will be discharged to Harrison Bayou as long as it has a measurable flow. The flowrate in Harrison Bayou is estimated by measuring the height of water with a staff gauge and velocity in feet/sec at intervals along the width as described in the Installation-Wide Work Plan, Standard Operating Procedures, Attachment 18 – Water Depth and Velocity Measurements (AECOM, July 2014).

The allowable flow rate of GWTP effluent that can be discharged to Harrison Bayou is given by:

$$QE \leq \frac{QS\ (CC - CA)}{(CE - CC)}$$

where Q_E = GWTP effluent flow Q_S = Harrison Bayou flow

C_C = Criteria concentration (100 mg/L for chloride, 50 mg/L for sulfate)

C_A = Ambient concentration = 10 mg/L

C_E = Chloride or sulfate concentration in GWTP effluent

The allowable GWTP effluent flow will be the lower of the calculated values given the measured concentrations of chloride and sulfate in the discharge stream. For each day that GWTP effluent is discharged to Harrison Bayou, the measured Harrison Bayou flow, the allowable effluent flow, and the actual effluent flow are recorded.

Discharge to INF Pond

If Harrison Bayou is not flowing, then GWTP effluent will be discharged to the Intermediate-Range Nuclear Forces (INF) Pond for temporary storage until Harrison Bayou flow resumes. Perchlorate concentration detected in the effluent must be 17 µg/L or less, when this occurs.

The INF Pond has a flexible membrane liner protected by a soil cover with a gravity discharge pipe (and valve) to Harrison Bayou. The INF Pond has a nominal capacity of 3 million gallons with a staff gage to measure the height of water stored in the pond. The GWTP operator maintains the INF Pond by visually inspecting for erosion, vegetative growth including tree growth along the anchor trench, and liner integrity and making necessary repairs. Periodically, accumulated debris must be removed from the influent and effluent piping to the INF Pond.

Prior to discharging to the INF Pond, a lead and lag ion exchange vessel will be brought online. The GWTP Operator will also confirm that the discharge valve is closed, will record the reading on the effluent totalizer, and will record the height of water using the staff gage. The GWTP Operator will then configure valves and pumps to direct GWTP effluent to the INF Pond. The height of water in the INF Pond and totalizer reading will be recorded at the beginning and end of each shift for the duration of active discharge. When the height of water in the pond reaches 3 feet below the height of the berm (freeboard), the GWTP Operator will stop discharging to the INF Pond and TCEQ will be notified. After the TCEQ acknowledges the INF Pond level, GWTP effluent may be discharged to the INF Pond again until 2 feet of freeboard is reached. The GWTP Operator will stop discharging to the INF Pond and TCEQ will be notified again. After the TCEQ acknowledges 2 feet of freeboard in the INF Pond,GWTP effluent may be discharged again until 1 foot of freeboard remains. No additional GWTP effluent can be accepted at the INF Pond until greater than 1 foot of freeboard is measured.

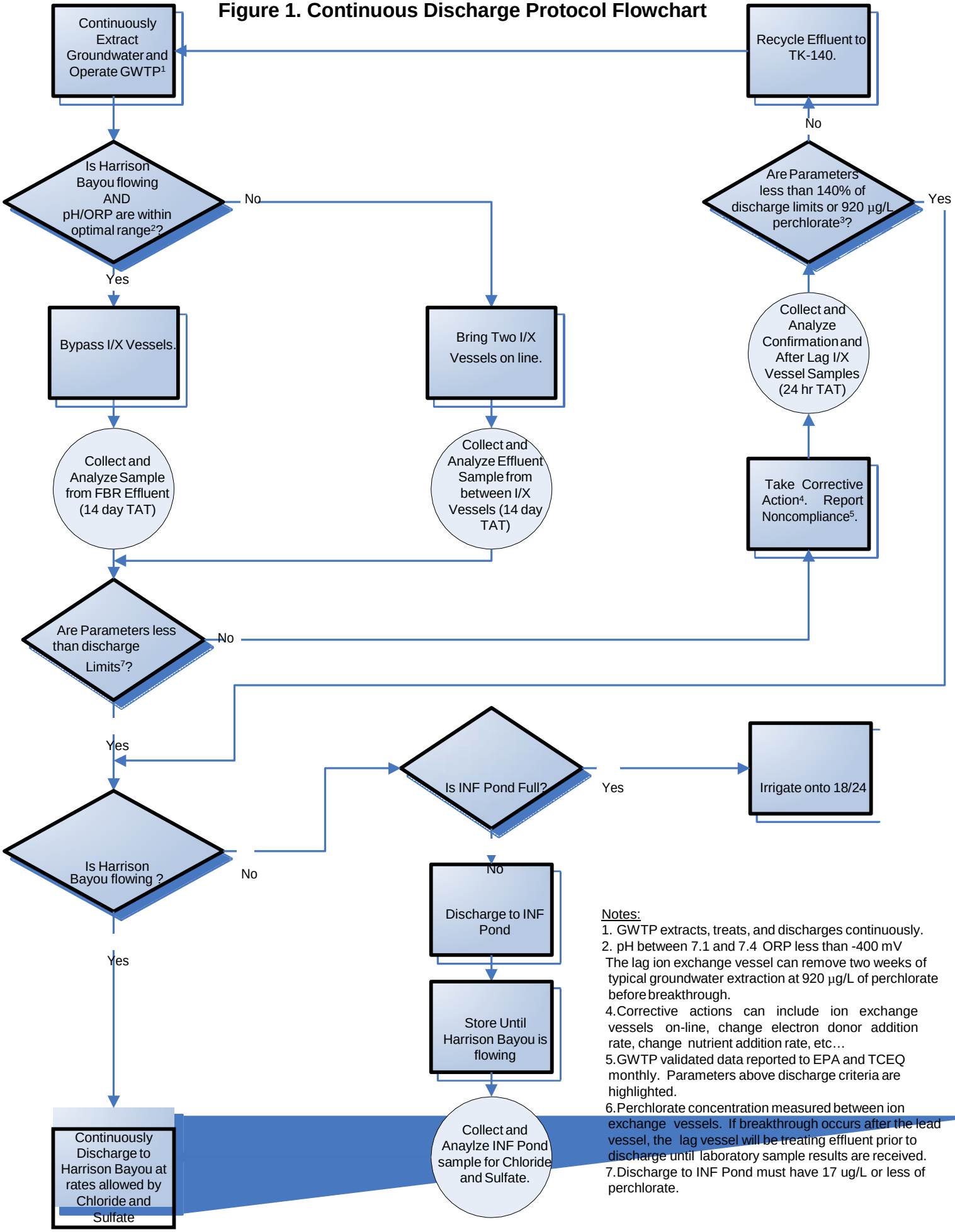
As soon as flow in Harrison Bayou returns, stored GWTP effluent from the INF Pond will be discharged. As with direct discharges from the GWTP to Harrison Bayou, the allowable flowrate of effluent from the INF Pond is calculated based upon the chloride and sulfate concentrations in the pond and the flow in Harrison Bayou. If effluent from the INF Pond and the GWTP are discharged simultaneously, total flow of both streams together should not exceed the calculated discharge level for either discharge location. For each day that INF Pond contents are discharged to Harrison Bayou, the measured Harrison Bayou flow, the allowable effluent flow, and the actual effluent flow are recorded.

Irrigation onto LHAAP-18/24

If Harrison Bayou is not flowing and the INF Pond has less than 1 foot of freeboard, then GWTP effluent will be irrigated onto LHAAP-18/24 using one of the three main sprinkler lines. To avoid pooling and runoff of irrigation water, only one line will be used for half a day at a time, with a separate line being used the second half of the day. If needed, the irrigation will occur 5 days a week for 8 hours each day (using 3 sprinklers in each line). If conditions are wet due to rain events, irrigation will not be conducted to avoid ponding and potential runoff, the GWTP will be put into recycle mode, and groundwater extraction will be interrupted if storage space is not available.

While irrigating, site inspections will be performed to ensure pooling and runoff are not occurring. During the irrigation activities, inspections will be performed twice a day, once approximately three hours and again approximately six hours into the 8-hour irrigation shift. The system will be inspected to ensure that the sprinkler heads are operating properly and not leaking large amounts of water. If ponding or runoff is observed, irrigation at that sprinkler line will cease, and irrigation at another sprinkler line will be started if possible. Volumes of GWTP effluent and twice daily inspections will be recorded daily and reported monthly until flow resumes in Harrison Bayou or greater than 1 foot of freeboard is available in the INF Pond.

Figure 1. Continuous Discharge Protocol Flowchart



Notes:

1. GWTP extracts, treats, and discharges continuously.
2. pH between 7.1 and 7.4 ORP less than -400 mV
The lag ion exchange vessel can remove two weeks of typical groundwater extraction at 920 µg/L of perchlorate before breakthrough.
4. Corrective actions can include ion exchange vessels on-line, change electron donor addition rate, change nutrient addition rate, etc…
5. GWTP validated data reported to EPA and TCEQ monthly. Parameters above discharge criteria are highlighted.
6. Perchlorate concentration measured between ion exchange vessels. If breakthrough occurs after the lead vessel, the lag vessel will be treating effluent prior to discharge until laboratory sample results are received.
7. Discharge to INF Pond must have 17 ug/L or less of perchlorate.

APPENDIX J
AIR DATA TABLES, PID READINGS, AND CALIBRATION LOGS

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Table 1. Ambient Air Data - May 2019
Longhorn Army Ammunition Plant
Groundwater Treatment Plant

Pollutant	CAS #	Short Term ESL March 2012	AMCVs (ST Health)	GWTP Ambient Air Concentrations (1)		Status (3)	Downwind Ambient Air Concentrations (2)		Status (3)
		µg/m^3	µg/m^3	µg/m^3			µg/m^3		
1,1-Dichloroethane	75-34-3	4,000	4,047	0.76	U	PASS	0.64	U	PASS
1,1-Dichloroethene	75-35-4	210	714	0.79	U	PASS	0.66	U	PASS
1,2-Dichloroethane	107-06-2	160	162	0.78	U	PASS	**1.50**		PASS
Acetone	67-64-1	5,900	NA	**11.0**		PASS	**33.0**		PASS
Benzene	71-43-2	170	575	0.76	U	PASS	**1.7**		PASS
Carbon disulfide	75-15-0	30	NA	1.6	U	PASS	**3.2**		PASS
Chloroform	67-66-3	100	98	0.79	U	PASS	**0.74**		PASS
cis-1,2-Dichloroethene	156-59-2	7,900	NA	**4.2**		PASS	0.65	U	PASS
Methylene chloride	75-09-2	3,600	12,158	**2.1**		PASS	0.66	U	PASS
Tetrachloroethene	127-18-4	2,000	6,782	0.78	U	PASS	**2.70**		PASS
trans-1,2-Dichloroethene	156-60-5	7,900	NA	0.78	U	PASS	0.65	U	PASS
Trichloroethene	79-01-6	540	537	**12.0**		PASS	0.65	U	PASS
Vinyl chloride	75-01-4	20,000	66,460	0.78	U	PASS	0.65	U	PASS
n-Hexane	110-54-3	5,300	6,336	**0.86**		PASS	**8.90**		PASS
Styrene	100-42-5	110	21,725	0.78	U	PASS	**0.87**		PASS
Toluene	108-88-3	640	15,074	**3.6**		PASS	**30.0**		PASS
Ethylbenzene	100-41-4	740	86,844	0.76	U	PASS	**3.10**		PASS
m,p-Xylenes	179601-23-1	180	7,382	**1.6**		PASS	**9.9**		PASS
o-Xylene	95-47-6	1,600	7,382	0.78	U	PASS	**3.50**		PASS
1,3-Dichlorobenzene	541-73-1	720	NA	0.79	U	PASS	0.66	U	PASS
Propene (C3 H6)	115-07-1	Asphyxiant	Asphyxiant	**1.60**		NA	**3.90**		NA
Dichlorodifluoromethane (CCl2F2)	75-71-8	50,000	49,452	**2.7**		PASS	**14.0**		PASS
Ethanol	64-17-5	18,800	NA	**8.6**		PASS	**38.0**		PASS
Trichlorofluoromethane (CCl3F)	75-69-4	28,000	56,184	**1.6**		PASS	**13**		PASS
Trichlorotrifluoroethane (C2Cl3F3)	76-13-1	38,000	NA	**23**		PASS	**0.67**		PASS
alpha-Pinene	80-56-8	60	3,499	**1.60**		PASS	**2.20**		PASS
d-Limonene	5989-27-5	1,100	NA	0.75	U	PASS	**1.30**		PASS

Notes:

(1) Sample collected over an 8-hour period on May 29, 2019, between 8 AM and 4 PM

(2) Sample collected over a 24-hour period beginning on May 29, 2019, at 7:00 AM and ending on May 30, 2019 at 7:00 AM

(3) Status based on comparison of air sample result to Air Monitoring Comparison Values (AMCVs). When there is no AMCV value for a chemical, the air sample concentration is compared to the short-term Effects Screening Level (ESL).

CAS # = Chemcial Abstracts Service Number

GWTP = Groundwater Treatment Plant

J = estimated value

U = non-detect

µg/m^3 = micrograms per cubic meter

Table 2. Emission Stack Air Data - May 2019
Longhorn Army Ammunition Plant
Groundwater Treatment Plant

Pollutant	CAS #	Measured Air Stripper Stack Concentrations (1)		Air Stripper Emission Rates (2)		Air Stripper Emission Rates (2a)		Allowable Annual Emission (3)	Status (4)	TLV (L)	TLV Reference	Compliance section	Distance Downwind to nearest off-site Receptor (D)	(K) conversion value	Allowable Maximum Hourly Emission Limit at Nearest off-site Receptor [6][7] (E) = L/K	Status (8)
		µg/m^3		lb/hr		tpy		tpy		mg/m^3			feet		lb/hr	
1,1-Dichloroethane	75-34-3	81	U	6.64E-04	U	4.32E-04	U	5	PASS	405	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.0	PASS
1,1-Dichloroethene	75-35-4	**190**		3.12E-03		2.02E-03		5	PASS	20	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.4	PASS
1,2-Dichloroethane	107-06-2	**180**		2.95E-03		1.92E-03		5	PASS	40	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	2.9	PASS
Acetone	67-64-1	840	U	6.89E-03	U	4.48E-03	U	5	PASS	590	106.262 List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.0	PASS
Benzene	71-43-2	81	U	6.64E-04	U	4.32E-04	U	5	PASS	3	106.262 List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	0.21	PASS
Carbon disulfide	75-15-0	170	U	1.39E-03	U	9.06E-04	U	5	PASS	31	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	2.2	PASS
Chloroform	67-66-3	84	U	6.89E-04	U	4.48E-04	U	5	PASS	10	106.262 List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	0.71	PASS
cis-1,2-Dichloroethene	156-59-2	**9,200**		1.51E-01		9.80E-02		5	PASS	793	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.0	PASS
Methylene chloride	75-09-2	**7,200**		1.18E-01		7.67E-02		5	PASS	26	106.262 List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.9	PASS
Tetrachloroethene	127-18-4	**150**		2.46E-03		1.60E-03		5	PASS	33.5	106.262 List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	2.4	PASS
trans-1,2-Dichloroethene	156-60-5	83	U	6.80E-04	U	4.42E-04	U	5	PASS	793	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.0	PASS
Trichloroethene	79-01-6	**21,000**		3.44E-01		2.24E-01		5	PASS	135	106.262 List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	6.0	PASS
Vinyl chloride	75-01-4	**120**		1.97E-03		1.28E-03		5	PASS	2	106.262 List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	0.14	PASS
n-Hexane	110-54-3	84	U	6.89E-04	U	4.48E-04	U	5	PASS	1,800	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.0	PASS
Styrene	100-42-5	83	U	6.80E-04	U	4.42E-04	U	5	PASS	21	106.262 List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.5	PASS
Toluene	108-88-3	83	U	6.80E-04	U	4.42E-04	U	5	PASS	188	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	6.0	PASS
Ethylbenzene	100-41-4	81	U	6.64E-04	U	4.32E-04	U	5	PASS	434	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.0	PASS
m,p-Xylenes	179601-23-1	170	U	1.39E-03	U	9.06E-04	U	5	PASS	434	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.0	PASS
o-Xylene	95-47-6	83	U	6.80E-04	U	4.42E-04	U	5	PASS	434	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.0	PASS
1,3-Dichlorobenzene	541-73-1	84	U	6.89E-04	U	4.48E-04	U	5	PASS	(5)	--	30 TAC 106.533(f)(1)(A)(i)	2,000	14	1.0	PASS
Propene (C3 H6)	115-07-1	81	U	6.64E-04	U	4.32E-04	U	5	PASS	(5)	--	30 TAC 106.533(f)(1)(A)(i)	2,000	14	6.0	PASS
Dichlorodifluoromethane (CCl2F2)	75-71-8	81	U	6.64E-04	U	4.32E-04	U	5	PASS	4,950	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.0	PASS
Ethanol	64-17-5	800	U	6.56E-03	U	4.26E-03	U	5	PASS	1,880	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.0	PASS
Trichlorofluoromethane (CCl3F)	75-69-4	83	U	6.80E-04	U	4.42E-04	U	5	PASS	5,620	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.0	PASS
Trichlorotrifluoroethane (C2Cl3F3)	76-13-1	**16,000**		2.62E-01		1.71E-01		5	PASS	7,670	ACGIH List	30 TAC 106.533(f)(1)(A)(ii)	2,000	14	1.0	PASS
alpha-Pinene	80-56-8	81	U	6.64E-04	U	4.32E-04	U	5	PASS	(5)	--	30 TAC 106.533(f)(1)(A)(i)	2,000	14	1.0	PASS
d-Limonene	5989-27-5	80	U	6.56E-04	U	4.26E-04	U	5	PASS	(5)	--	30 TAC 106.533(f)(1)(A)(i)	2,000	14	1.0	PASS
		TOTAL		0.912												

Notes:

(1) Sample collected on May 29, 2019. The higher value of the sample or duplicate is reported.

(2) Based on a blower flow rate of 4,390 cubic feet per minute (cfm). Note that plant operations is less than or equal to 25 hours per week. 1/2 of detection limit was used for estimating mass rate

(2a) Based on operation of 25 hours per week, 52 weeks per year.

(3) Per 30 Texas Administrative Code (TAC) 106.533(f)(1)(B)

(4) Based on comparing the calculated air stripper stack sample emission rate in tons per year (tpy) to the allowable annual emission limit per chemical of 5 tpy.

(5) No Threshold Limit Values (TLVs) for these chemicals

(6) The maximum hourly limit allowed by 30 TAC 106.262, per pollutant, is 6 pounds per hour (lb/hr) per "Figure 1: 30 TAC 106.262(a)". The E value was overridden with 6 lb/hr when the calculated E was higher.

(7) The maximum hourly emission rate allowed by 30 TAC 106.261(a)(3) for chemicals with a limit value (L) greater than 200 mg/m^3 is 1 lb/hr.

(8) Based on comparing the calculated air stripper stack sample emission rate in lb/hr to the allowable maximum emission limit per chemical based on distance downwind to nearest off-site receptor.

CAS # = Chemical Abstracts Service Number

mg/m^3 = milligrams per cubic meter

µg/m^3 = micrograms per cubic meter

U = non-detect

Table 3. PID Readings - 2nd Quarter 2019
Longhorn Army Ammunition Plant
Groundwater Treatment Plant

Date	Time	Location	Air Flow Rate at Blower	Instrument ID	Person Collecting	PID Reading	Weather Conditions
4/3/2019	8:00	Outside GWTP Office	3802 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 46 degrees
4/3/2019	8:00	Downwind	3802 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 46 degrees
4/3/2019	8:00	Stripper	3802 ACFM	MiniRAE 3000	Kennie Moore	Max. 22.7 ppm Steady State 7.4 ppm	Clear 46 degrees
4/3/2019	14:00	Outside GWTP Office	3705 ACFM	MiniRAE 3000	Scott Beesinger	0.0 ppm	Clear 74 degrees
4/3/2019	14:00	Downwind	3705 ACFM	MiniRAE 3000	Scott Beesinger	0.0 ppm	Clear 74 degrees
4/3/2019	14:00	Stripper	3705 ACFM	MiniRAE 3000	Scott Beesinger	Max. 24.3 ppm Steady State 8.2 ppm	Clear 74 degrees
4/9/2019	8:00	Outside GWTP Office	3769 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 53 degrees
4/9/2019	8:00	Downwind	3769 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 53 degrees
4/9/2019	8:00	Stripper	3769 ACFM	MiniRAE 3000	Kennie Moore	Max. 20.4 ppm Steady State 4.9 ppm	Clear 53 degrees
4/9/2019	14:00	Outside GWTP Office	3678 ACFM	MiniRAE 3000	Scott Beesinger	0.0 ppm	Clear 81 degrees
4/9/2019	14:00	Downwind	3678 ACFM	MiniRAE 3000	Scott Beesinger	0.0 ppm	Clear 81 degrees
4/9/2019	14:00	Stripper	3678 ACFM	MiniRAE 3000	Scott Beesinger	Max. 22.9 ppm Steady State 6.1 ppm	Clear 81 degrees
4/15/2019	8:00	Outside GWTP Office	3847 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 49 degrees
4/15/2019	8:00	Downwind	3847 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 49 degrees
4/15/2019	8:00	Stripper	3847 ACFM	MiniRAE 3000	Kennie Moore	Max. 19.7 ppm Steady State 4.5 ppm	Clear 49 degrees
4/15/2019	14:00	Outside GWTP Office	3685 ACFM	MiniRAE 3000	Scott Beesinger	0.0 ppm	Clear 77 degrees
4/15/2019	14:00	Downwind	3685 ACFM	MiniRAE 3000	Scott Beesinger	0.0 ppm	Clear 77 degrees
4/15/2019	14:00	Stripper	3685 ACFM	MiniRAE 3000	Scott Beesinger	Max. 22.0 ppm Steady State 6.2 ppm	Clear 77 degrees
4/30/2019	8:00	Outside GWTP Office	3735 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Cloudy 74 degrees
4/30/2019	8:00	Downwind	3735 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Cloudy 74 degrees
4/30/2019	8:00	Stripper	3735 ACFM	MiniRAE 3000	Kennie Moore	Max. 23.4 ppm Steady State 5.9 ppm	Cloudy 74 degrees
4/30/2019	14:00	Outside GWTP Office	3689 ACFM	MiniRAE 3000	Scott Beesinger	0.0 ppm	Clear 83 degrees
4/30/2019	14:00	Downwind	3689 ACFM	MiniRAE 3000	Scott Beesinger	0.0 ppm	Clear 83 degrees
4/30/2019	14:00	Stripper	3689 ACFM	MiniRAE 3000	Scott Beesinger	Max. 21.9 ppm Steady State 5.0 ppm	Clear 83 degrees
5/6/2019	8:00	Outside GWTP Office	3845 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 67 degrees
5/6/2019	8:00	Downwind	3845 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 67 degrees
5/6/2019	8:00	Stripper	3845 ACFM	MiniRAE 3000	Kennie Moore	Max. 21.6 ppm Steady State 7.8 ppm	Clear 67 degrees
5/6/2019	14:00	Outside GWTP Office	3671 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 85 degrees
5/6/2019	14:00	Downwind	3671 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 85 degrees
5/6/2019	14:00	Stripper	3671 ACFM	MiniRAE 3000	Kennie Moore	Max. 23.1 ppm Steady State 8.3 ppm	Clear 85 degrees
5/13/2019	8:00	Outside GWTP Office	3841 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 58 degrees
5/13/2019	8:00	Downwind	3841 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 58 degrees
5/13/2019	8:00	Stripper	3841 ACFM	MiniRAE 3000	Kennie Moore	Max. 22.9 ppm Steady State 5.3 ppm	Clear 58 degrees
5/13/2019	14:00	Outside GWTP Office	3670 ACFM	MiniRAE 3000	Scott Beesinger	0.0 ppm	Clear 80 degrees
5/13/2019	14:00	Downwind	3670 ACFM	MiniRAE 3000	Scott Beesinger	0.0 ppm	Clear 80 degrees
5/13/2019	14:00	Stripper	3670 ACFM	MiniRAE 3000	Scott Beesinger	Max. 20.2 ppm Steady State 4.9 ppm	Clear 80 degrees
5/20/2019	8:00	Outside GWTP Office	3875 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Cloudy 73 degrees
5/20/2019	8:00	Downwind	3875 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Cloudy 73 degrees
5/20/2019	8:00	Stripper	3875 ACFM	MiniRAE 3000	Kennie Moore	Max. 21.7 ppm Steady State 7.6 ppm	Cloudy 73 degrees

Table 3. PID Readings - 2nd Quarter 2019
Longhorn Army Ammunition Plant
Groundwater Treatment Plant

Date	Time	Location	Air Flow Rate at Blower	Instrument ID	Person Collecting	PID Reading	Weather Conditions
5/20/2019	14:00	Outside GWTP Office	3602 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Cloudy 86 degrees
5/20/2019	14:00	Downwind	3602 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Cloudy 86 degrees
5/20/2019	14:00	Stripper	3602 ACFM	MiniRAE 3000	Kennie Moore	Max. 23.4 ppm Steady State 8.1 ppm	Cloudy 86 degrees
5/23/2019	8:00	Outside GWTP Office	3860 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 75 degrees
5/23/2019	8:00	Downwind	3860 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 75 degrees
5/23/2019	8:00	Stripper	3860 ACFM	MiniRAE 3000	Kennie Moore	Max. 20.6 ppm Steady State 6.7 ppm	Clear 75 degrees
5/23/2019	13:00	Outside GWTP Office	3700 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 88 degrees
5/23/2019	13:00	Downwind	3700 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 88 degrees
5/23/2019	13:00	Stripper	3700 ACFM	MiniRAE 3000	Kennie Moore	Max. 22.2 ppm Steady State 7.1 ppm	Clear 88 degrees
5/28/2019	8:00	Outside GWTP Office	3685 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 77 degrees
5/28/2019	8:00	Downwind	3685 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 77 degrees
5/28/2019	8:00	Stripper	3685 ACFM	MiniRAE 3000	Kennie Moore	Max. 19.9 ppm Steady State 5.8 ppm	Clear 77 degrees
5/28/2019	14:00	Outside GWTP Office	3660 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 89 degrees
5/28/2019	14:00	Downwind	3660 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 89 degrees
5/28/2019	14:00	Stripper	3660 ACFM	MiniRAE 3000	Kennie Moore	Max. 21.5 ppm Steady State 6.2 ppm	Clear 89 degrees
5/30/2019	8:00	Outside GWTP Office	3734 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 74°F
5/30/2019	8:00	Downwind	3734 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 74°F
5/30/2019	8:00	Stripper	3734 ACFM	MiniRAE 3000	Kennie Moore	Max. 20.9 ppm Steady State 4.8 ppm	Clear 74°F
5/30/2019	12:00	Outside GWTP Office	3671 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 83°F
5/30/2019	12:00	Downwind	3671 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 83°F
5/30/2019	12:00	Stripper	3671 ACFM	MiniRAE 3000	Kennie Moore	Max. 22.5 ppm Steady State 6.1 ppm	Clear 83°F
6/3/2019	8:00	Outside GWTP Office	3875 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 76°F
6/3/2019	8:00	Downwind	3875 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 76°F
6/3/2019	8:00	Stripper	3875 ACFM	MiniRAE 3000	Kennie Moore	Max. 19.8 ppm Steady State 7.5 ppm	Clear 76°F
6/3/2019	14:00	Outside GWTP Office	3732 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 90°F
6/3/2019	14:00	Downwind	3732 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 90°F
6/3/2019	14:00	Stripper	3732 ACFM	MiniRAE 3000	Kennie Moore	Max. 21.7 ppm Steady State 8.2 ppm	Clear 90°F
6/6/2019	8:00	Outside GWTP Office	3780 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 74°F
6/6/2019	8:00	Downwind	3780 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 74°F
6/6/2019	8:00	Stripper	3780 ACFM	MiniRAE 3000	Kennie Moore	Max. 19.7 ppm Steady State 6.2 ppm	Clear 74°F
6/6/2019	12:00	Outside GWTP Office	3625 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 80°F
6/6/2019	12:00	Downwind	3625 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 80°F
6/6/2019	12:00	Stripper	3625 ACFM	MiniRAE 3000	Kennie Moore	Max. 21.3 ppm Steady State 5.7 ppm	Clear 80°F
6/10/2019	8:00	Outside GWTP Office	3860 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 75°F
6/10/2019	8:00	Downwind	3860 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 75°F
6/10/2019	8:00	Stripper	3860 ACFM	MiniRAE 3000	Kennie Moore	Max. 20.2 ppm Steady State 7.6 ppm	Clear 75°F
6/10/2019	14:00	Outside GWTP Office	3700 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 85°F
6/10/2019	14:00	Downwind	3700 ACFM	MiniRAE 3000	Kennie Moore	0.0 ppm	Clear 85°F
6/10/2019	14:00	Stripper	3700 ACFM	MiniRAE 3000	Kennie Moore	Max. 22.2 ppm Steady State 8.7 ppm	Clear 85°F

00942987

EQUIPMENT CALIBRATION DAILY LOG

Date: 4/3/19

Project Number: NW01312.0150

Project Name: LHAAP-GWTP

Recorded By: Scott Beesinger

					Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
PID	Model: MiniRae 3000		Bulb: ~~10.6~~ 11.7 eV				
	Equipment ID #: PGM 7320						
	Parameter	Standard	Exp. Date	Lot #	Time: 0630	Time:	Time:
					Initials: SB	Initials:	Initials:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Value: To zero SB	Value:	Value:
Second Point Calibration	Vapor conc. (ppm)	100 ppm (isobutylene)	10/5/21	SBH-248-100-19	Value: SB	Value:	Value:

					Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
COMB. GAS/O_2 METER	Model:						
	Equipment ID #:						
	Parameter	Standard	Exp. Date	Lot #	Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration	O2 (%)				Value:	Value:	Value:
	% LEL Pentane				Value:	Value:	Value:

					Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
WATER QUALITY METER	Model:						
	Equipment ID #:						
	Parameter	Standard	Exp. Date	Lot #	Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration (Auto)	pH	4.00			Value:	Value:	Value:
	Conductivity (mS/cm)	4.49			Value:	Value:	Value:
	Turbidity (NTU)	0			Value:	Value:	Value:
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA	Value:	Value:	Value:
Second Point Calibration	pH	6.86			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:
Third Point Calibration	pH	9.18			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:

Additional Remarks:

00942988

EQUIPMENT CALIBRATION DAILY LOG

Date: 4/9/19

Project Number: NWD1312.0150

Project Name: LHAAP - GWTP

Recorded By: Scott BEESINGER

PID

Model: Mini Rae 3000 Bulb: ~~10.6~~ 11.7 meV

Equipment ID #: PGM 7320

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time: 0645	Time:	Time:
					Initials: SB	Initials:	Initials:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Value: TO ZERO SB	Value:	Value:
Second Point Calibration	Vapor conc. (ppm)	100 ppm (isobutylene)	10/5/21	SBH-248-100-19	Value: SB	Value:	Value:

COMB. GAS/O_2 METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration	O2 (%)				Value:	Value:	Value:
	% LEL Pentane				Value:	Value:	Value:

WATER QUALITY METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration (Auto)	pH	4.00			Value:	Value:	Value:
	Conductivity (mS/cm)	4.49			Value:	Value:	Value:
	Turbidity (NTU)	0			Value:	Value:	Value:
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA	Value:	Value:	Value:
Second Point Calibration	pH	6.86			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:
Third Point Calibration	pH	9.18			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:

Additional Remarks:

00942989

EQUIPMENT CALIBRATION DAILY LOG

Date: 4/15/19

Project Number: NW01312.0150

Project Name: LHAAP - GWTP

Recorded By: Scott BEESINGER

					Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
PID	Model: Mini Rae 3000		Bulb: ~~10.6~~ 11.7 meV				
	Equipment ID #: PGM 7320						
	Parameter	Standard	Exp. Date	Lot #	Time: 0640	Time:	Time:
					Initials: SB	Initials:	Initials:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Value: TO ZERO SB	Value:	Value:
Second Point Calibration	Vapor conc. (ppm)	100 ppm (isobutylene)	10/5/21	SBH-248-100-19	Value: SB	Value:	Value:

					Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
COMB. GAS/O_2 METER	Model:						
	Equipment ID #:						
	Parameter	Standard	Exp. Date	Lot #	Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration	O2 (%)				Value:	Value:	Value:
	% LEL Pentane				Value:	Value:	Value:

					Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
WATER QUALITY METER	Model:						
	Equipment ID #:						
	Parameter	Standard	Exp. Date	Lot #	Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration (Auto)	pH	4.00			Value:	Value:	Value:
	Conductivity (mS/cm)	4.49			Value:	Value:	Value:
	Turbidity (NTU)	0			Value:	Value:	Value:
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA	Value:	Value:	Value:
Second Point Calibration	pH	6.86			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:
Third Point Calibration	pH	9.18			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:

Additional Remarks:

00942990

EQUIPMENT CALIBRATION DAILY LOG

Date: 4/30/19

Project Number: NW01312.0150

Project Name: LHAAP - GWTP

Recorded By: Scott Beesinger

PID

Model: Mini Rae 3000 Bulb: ~~10.6~~ 11.7 meV

Equipment ID #: PGM 7320

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time: 0625	Time:	Time:
					Initials: SB	Initials:	Initials:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Value: To zero SB	Value:	Value:
Second Point Calibration	Vapor conc. (ppm)	100 ppm (isobutylene)	10/5/21	SBH-248-100-19	Value: SB	Value:	Value:

COMB. GAS/O_2 METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration	O2 (%)				Value:	Value:	Value:
	% LEL Pentane				Value:	Value:	Value:

WATER QUALITY METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration (Auto)	pH	4.00			Value:	Value:	Value:
	Conductivity (mS/cm)	4.49			Value:	Value:	Value:
	Turbidity (NTU)	0			Value:	Value:	Value:
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA	Value:	Value:	Value:
Second Point Calibration	pH	6.86			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:
Third Point Calibration	pH	9.18			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:

Additional Remarks:

00942991

EQUIPMENT CALIBRATION DAILY LOG

Date: 5/6/19

Project Number: NW01312.0150

Project Name: LHAAP - GWTP

Recorded By: Scott BEESINGER

PID

Model: MiniRae 3000

Bulb: ~~10.6~~ 11.7 meV

Equipment ID #: PGM 7320

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time: 0630	Time:	Time:
					Initials: SB	Initials:	Initials:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Value: TO ZERO SB	Value:	Value:
Second Point Calibration	Vapor conc. (ppm)	100 ppm (isobutylene)	10/5/21	SBH-248-100-19	Value: SB	Value:	Value:

COMB. GAS/O_2 METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration	O2 (%)				Value:	Value:	Value:
	% LEL Pentane				Value:	Value:	Value:

WATER QUALITY METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration (Auto)	pH	4.00			Value:	Value:	Value:
	Conductivity (mS/cm)	4.49			Value:	Value:	Value:
	Turbidity (NTU)	0			Value:	Value:	Value:
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA	Value:	Value:	Value:
Second Point Calibration	pH	6.86			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:
Third Point Calibration	pH	9.18			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:

Additional Remarks:

00942992

EQUIPMENT CALIBRATION DAILY LOG

Date: 5/13/19

Project Number: NW01312.0150

Project Name: LHAAP - GWTP

Recorded By: Scott BEESINGER

PID

Model: Mini Rae 3000 Bulb: ~~10.6~~ 11.7 meV

Equipment ID #: PGM 7320

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time: 0645	Time:	Time:
					Initials: SB	Initials:	Initials:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Value: TO ZERO SB	Value:	Value:
Second Point Calibration	Vapor conc. (ppm)	100 ppm (isobutylene)	10/5/21	SBH-248-100-19	Value: SB	Value:	Value:

COMB. GAS/O_2 METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration	O2 (%)				Value:	Value:	Value:
	% LEL Pentane				Value:	Value:	Value:

WATER QUALITY METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration (Auto)	pH	4.00			Value:	Value:	Value:
	Conductivity (mS/cm)	4.49			Value:	Value:	Value:
	Turbidity (NTU)	0			Value:	Value:	Value:
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA	Value:	Value:	Value:
Second Point Calibration	pH	6.86			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:
Third Point Calibration	pH	9.18			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:

Additional Remarks:

00942993

EQUIPMENT CALIBRATION DAILY LOG

Date: 5/20/19

Project Number: NW01312.0150

Project Name: LHAAP - GWTP

Recorded By: Scott Beesinger

PID

Model: MiniRAE 3000 Bulb: ~~10.6~~ 11.7 meV

Equipment ID #: PGM 7320

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time: 0650	Time:	Time:
					Initials: SB	Initials:	Initials:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Value: To zero SB	Value:	Value:
Second Point Calibration	Vapor conc. (ppm)	100 ppm (isobutylene)	10/5/21	SBH-248-100-19	Value: SB	Value:	Value:

COMB. GAS/O_2 METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration	O2 (%)				Value:	Value:	Value:
	% LEL Pentane				Value:	Value:	Value:

WATER QUALITY METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration (Auto)	pH	4.00			Value:	Value:	Value:
	Conductivity (mS/cm)	4.49			Value:	Value:	Value:
	Turbidity (NTU)	0			Value:	Value:	Value:
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA	Value:	Value:	Value:
Second Point Calibration	pH	6.86			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:
Third Point Calibration	pH	9.18			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:

Additional Remarks:

00942994

EQUIPMENT CALIBRATION DAILY LOG

Date: 5/23/19

Project Number: NW01312.0150

Project Name: LHAAP - GWTP

Recorded By: Scott BEESINGER

PID

Model: Mini RAE 3000 Bulb: ~~10.6~~ 11.7 meV

Equipment ID #: PGM 7320

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time: 0725	Time:	Time:
					Initials: SB	Initials:	Initials:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Value: TO ZERO SB	Value:	Value:
Second Point Calibration	Vapor conc. (ppm)	100 ppm (isobutylene)	10/5/21	SBH-248-100-19	Value: SB	Value:	Value:

COMB. GAS/O_2 METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration	O2 (%)				Value:	Value:	Value:
	% LEL Pentane				Value:	Value:	Value:

WATER QUALITY METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration (Auto)	pH	4.00			Value:	Value:	Value:
	Conductivity (mS/cm)	4.49			Value:	Value:	Value:
	Turbidity (NTU)	0			Value:	Value:	Value:
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA	Value:	Value:	Value:
Second Point Calibration	pH	6.86			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:
Third Point Calibration	pH	9.18			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:

Additional Remarks:

00942995

EQUIPMENT CALIBRATION DAILY LOG

Date: 5/28/19

Project Number: NW01312.0150

Project Name: LHAAP - GWTP

Recorded By: Scott BEESINGER

PID

Model: MiniRAE 3000

Bulb: 11.7 ~~10.6~~ meV

Equipment ID #: PGM 7320

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time: 0630	Time:	Time:
					Initials: SB	Initials:	Initials:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Value: TO ZERO SB	Value:	Value:
Second Point Calibration	Vapor conc. (ppm)	100 ppm (isobutylene)	10/5/21	JBH-248-100-19	Value: SB	Value:	Value:

COMB. GAS/O_2 METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration	O2 (%)				Value:	Value:	Value:
	% LEL Pentane				Value:	Value:	Value:

WATER QUALITY METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration (Auto)	pH	4.00			Value:	Value:	Value:
	Conductivity (mS/cm)	4.49			Value:	Value:	Value:
	Turbidity (NTU)	0			Value:	Value:	Value:
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA	Value:	Value:	Value:
Second Point Calibration	pH	6.86			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:
Third Point Calibration	pH	9.18			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:

Additional Remarks:

00942996

EQUIPMENT CALIBRATION DAILY LOG

Date: 5/30/19

Project Number: NW01312.0150

Project Name: LHAAP - GWTP

Recorded By: Scott BEESINGER

PID

Model: Mini RAE 3000 Bulb: ~~10.6~~ 11.7 meV

Equipment ID #: PGM 7320

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time: 0730	Time:	Time:
					Initials: SB	Initials:	Initials:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Value: TO ZERO SB	Value:	Value:
Second Point Calibration	Vapor conc. (ppm)	100 ppm (isobutylene)	10/5/21	SBH-248-100-19	Value: SB	Value:	Value:

COMB. GAS/O_2 METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration	O2 (%)				Value:	Value:	Value:
	% LEL Pentane				Value:	Value:	Value:

WATER QUALITY METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration (Auto)	pH	4.00			Value:	Value:	Value:
	Conductivity (mS/cm)	4.49			Value:	Value:	Value:
	Turbidity (NTU)	0			Value:	Value:	Value:
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA	Value:	Value:	Value:
Second Point Calibration	pH	6.86			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:
Third Point Calibration	pH	9.18			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:

Additional Remarks:

00942997

EQUIPMENT CALIBRATION DAILY LOG

Date: 6/3/19

Project Number: NW01312.0150

Project Name: LHAAP - GWTP

Recorded By: Scott BEESINGER

PID

Model: MiniRAE 3000 Bulb: ~~10.6~~ 11.7 meV

Equipment ID #: PGM 7320

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time: 0630	Time:	Time:
					Initials: SB	Initials:	Initials:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Value: TO ZERO SB	Value:	Value:
Second Point Calibration	Vapor conc. (ppm)	100 ppm (isobutylene)	10/5/21	SBH-248-100-19	Value: SB	Value:	Value:

COMB. GAS/O_2 METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration	O2 (%)				Value:	Value:	Value:
	% LEL Pentane				Value:	Value:	Value:

WATER QUALITY METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration (Auto)	pH	4.00			Value:	Value:	Value:
	Conductivity (mS/cm)	4.49			Value:	Value:	Value:
	Turbidity (NTU)	0			Value:	Value:	Value:
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA	Value:	Value:	Value:
Second Point Calibration	pH	6.86			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:
Third Point Calibration	pH	9.18			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:

Additional Remarks:

00942998

EQUIPMENT CALIBRATION DAILY LOG

Date: 6/6/19

Project Number: NW01312.0150

Project Name: LHAAP - GWTP

Recorded By: Scott Beesinger

PID

Model: Mini RAE 3000 Bulb: ~~10.6~~ 11.7 meV

Equipment ID #: PGM 7320

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time: 0720	Time:	Time:
					Initials: SB	Initials:	Initials:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Value: To zero SB	Value:	Value:
Second Point Calibration	Vapor conc. (ppm)	100 ppm (isobutylene)	10/5/21	SBH-248-100-19	Value: SB	Value:	Value:

COMB. GAS/O_2 METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration	O2 (%)				Value:	Value:	Value:
	% LEL Pentane				Value:	Value:	Value:

WATER QUALITY METER

Model:

Equipment ID #:

	Parameter	Standard	Exp. Date	Lot #	Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
					Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration (Auto)	pH	4.00			Value:	Value:	Value:
	Conductivity (mS/cm)	4.49			Value:	Value:	Value:
	Turbidity (NTU)	0			Value:	Value:	Value:
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA	Value:	Value:	Value:
Second Point Calibration	pH	6.86			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:
Third Point Calibration	pH	9.18			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:

Additional Remarks:

00942999

EQUIPMENT CALIBRATION DAILY LOG

Date: 6/10/19

Project Number: NWO1312.0150

Project Name: LHAAP - GWTP

Recorded By: Scott BEESINGER

					Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
PID	Model: MiniRae 3000		Bulb: ~~10.6~~ 11.7 meV				
	Equipment ID #: PGM 7320						
	Parameter	Standard	Exp. Date	Lot #	Time: 0625	Time:	Time:
					Initials: SB	Initials:	Initials:
First Point Calibration	Vapor conc. (ppm)	0.0 (ambient air)	NA	NA	Value: TO ZERO SB	Value:	Value:
Second Point Calibration	Vapor conc. (ppm)	100 ppm (isobutylene)	10/5/21	SBH-248-100-19	Value: SB	Value:	Value:

					Morning Calibration	Evening Check	Additional Calib./Check (if necessary)
COMB. GAS/O_2 METER	Model:						
	Equipment ID #:						
	Parameter	Standard	Exp. Date	Lot #	Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration	O2 (%)				Value:	Value:	Value:
	% LEL Pentane				Value:	Value:	Value:

					Morning Calibration/Check	Evening Check (one point only)	Additional Calib./Check (if necessary)
WATER QUALITY METER	Model:						
	Equipment ID #:						
	Parameter	Standard	Exp. Date	Lot #	Time:	Time:	Time:
					Initials:	Initials:	Initials:
First Point Calibration (Auto)	pH	4.00			Value:	Value:	Value:
	Conductivity (mS/cm)	4.49			Value:	Value:	Value:
	Turbidity (NTU)	0			Value:	Value:	Value:
	DO (mg/L)	8.9-9.1 (ambient air)	NA	NA	Value:	Value:	Value:
Second Point Calibration	pH	6.86			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:
Third Point Calibration	pH	9.18			Value:	Value:	Value:
	Conductivity (mS/cm)	53.7			Value:	Value:	Value:
	Turbidity (NTU)	100			Value:	Value:	Value:

Additional Remarks:

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

November 14, 2019

DAIM-ODB-LO

Mr. Rich Mayer
US Environmental Protection Agency, R6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102

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

Re: FY2019 Update of the Comprehensive Land Use Control (LUC) Management Plan, Longhorn Army Ammunition Plant, Karnack, Texas, 4 October 2019

Dear Mr. Mayer and Ms. Palmie,

In accordance with the Comprehensive LUC Management Plan, the FY2018 Plan has been revised to include LHAAP-04 and LHAAP-17 as well as the notice for LHAAP-001-R-01 and LHAAP-003-R-01. The 4 October 2019 draft document was approved by EPA and TCEQ without comment and is resubmitted as Final.

The document was revised by Bhate Environmental Associates, Inc., (Bhate) 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

Enclosures: Changed/Added pages

Copies furnished W/O Enclosures:
P. Bruckwicki, Caddo Lake NWR, TX
A. Williams, USACE, Fort Worth District, Located in Tulsa, OK
A. Sherman. USAEC, San Antonio, TX
K. Nemmers, Bhate, Lakewood, CO (for project files)

Comprehensive Land Use Control (LUC) Management Plan

Former Longhorn Army Ammunition Plant (LHAAP)
Karnack, Texas

Date: October 4, 2019

COMPREHENSIVE LUC & NOTIFICATION MANAGEMENT PLAN REVISION LOG

Fiscal Year	Date	Reason for Revision	Approved*		
			Army	EPA	TCEQ
Original	9-13-07	N/A			
2008		None Required			
2009		None Required			
2010		None Required			
2011		None Required			
2012	2-4-13	Add LHAAP-06,-07,-08,-35/36,-35B (37)/67, -46, -49, -50,-51,-55,-35A (58),-59,-60,-66,-68, Pistol Range, LHAAP-001-R-01 and LHAAP-003-R-01			
2013	10-1-13	None Required			
2014	12-17-14	Add LHAAP-02, -03, -19, -56, -65, -68, -69 and Notices for LHAAP-46, and -67			
2015	9-14-15	Add Notices for LHAAP-35B(37), -50 and -35A(58) (LHAAP-02, -03, -56, -59, -60, -65, -68, and -69 are contained within the LHAAP-58 LUC boundary)			
2016	10-20-16	None Required			
2017	10-30-17	Add LUCs for LHAAP-16			

Fiscal Year	Date	Reason for Revision	Approved*		
			Army	EPA	TCEQ
2018	9-5-18	Add LUCs and Notices for LHAAP-001-R-01 and LHAAP-003-R-01			
2019	10-3-19	Add LHAAP-04 and LHAAP-17 and Notices for LHAAP-001-R-01 and LHAAP-003-R-01	10-23-2019	10-23-2019	10-23-2019

* Approval by all three parties required during the first quarter of each fiscal year.

Date: October 4, 2019

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List of Sites

LHAAP-02 Vacuum Truck Overnight Parking (LHAAP-02)

Nonresidential Land Use site included within the groundwater use restriction

LUC boundary for LHAAP-35A(58)- see LHAAP-35A(58)

LHAAP-03 Former Waste Collection Pad Building 722-P Paint Shop (LHAAP-03)

Nonresidential Land Use site included within the groundwater use restriction

LUC boundary for LHAAP-35A(58)- see LHAAP-35A(58)

LHAAP-04 Former Pilot Wastewater Treatment Plant (LHAAP-04)

4-1 RAO Inspection and Maintenance Checklist

4-2 LUCs from Draft Final Remedial Design

4-3 Notice of Land Use Controls and Nonresidential Land Use at LHAAP-04 Filed in Public Records of Harrison County, Texas (including survey plat) (Pending)

4-4 Land Use Control Compliance Inspection Form

LHAAP-06 Building 54F Solvent (LHAAP-06)

Notice of Nonresidential Land Use for LHAAP-06 Filed in Public Records of Harrison County, Texas (including survey plat)

LHAAP-07 Building 50G Drum Processing (LHAAP-07)

Notice of Nonresidential Land Use for LHAAP-07 Filed in Public Records of Harrison County, Texas (including survey plat)

LHAAP-08 Former Sewage Treatment Plant (LHAAP-08)

Notice of Nonresidential Land Use for LHAAP-08 Filed in Public Records of Harrison County, Texas (including survey plat)

LHAAP-12 Landfill 12 (LHAAP-12)
12-1 LUC Inspection and Maintenance Log
12-2 LUCs from Final Remedial Design Addendum
12-3 Notice of Land Use Controls and Nonresidential Land Use at LHAAP-12 Filed in Public Records of Harrison County, Texas (including survey plat)
12-4 Land Use Control Compliance Inspection Form
LHAAP-16 Old Landfill (LHAAP-16)
16-1 Draft LUC Inspection and Maintenance Log
16-2 LUCs from Draft-Final Remedial Design
16-3 Notice of Land Use Controls and Nonresidential Land Use at LHAAP-16 Filed in Public Records of Harrison County, Texas (including survey plat) (Pending)
16-4 Land Use Control Compliance Inspection Form
LHAAP-17 Burning Ground No. 2/ Flashing Area (LHAAP-17)
17-1 RAO Inspection and Maintenance Checklist
17-2 LUCs from Draft Final Remedial Design
17-3 Notice of Land Use Controls and Nonresidential Land Use at LHAAP-17 Filed in Public Records of Harrison County, Texas (including survey plat) (Pending)
17-4 Land Use Control Compliance Inspection Form
LHAAP-19 Construction Materials Landfill (LHAAP-19)
Notice of Nonresidential Land Use at LHAAP-19, Filed in the Public Records of Harrison County, Texas (including survey plat)
LHAAP-35/36 Sumps and Waste Rack Sumps (LHAAP-35/36)
Notice of Nonresidential Land Use at Sumps/Waste Rack Sump locations (LHAAP-35/36) Filed in Public Records of Harrison County, Texas (including survey plat)

LHAAP-37 Chemical Laboratory (LHAAP-35B (37))
37-1 LUCs from Final Remedial Design
37-2 Notice of Land Use Controls and Nonresidential Land Use at LHAAP-35B (37) Filed in Public Records of Harrison County, Texas (including survey plat)
37-3 Land Use Control Compliance Inspection Form
LHAAP-46 Plant 2 Area (LHAAP-46)
46-1 LUCs from Final Remedial Design
46-2 Notice of Land Use Controls and Nonresidential Land Use at LHAAP-46 Filed in Public Records of Harrison County, Texas (including survey plat)
46-3 Land Use Control Compliance Inspection Form
LHAAP-49 Former Acid Storage Area (LHAAP-49)
Notice of Nonresidential Land Use for LHAAP-49 Filed in Public Records of Harrison County, Texas (including survey plat)
LHAAP-50 Sump Water Storage Tank (LHAAP-50)
50-1 LUCs from Final Remedial Design
50-2 Notice of Land Use Controls and Nonresidential Land Use at LHAAP-50 Filed in Public Records of Harrison County, Texas (including survey plat)
50-3 Land Use Control Compliance Inspection Form
LHAAP-51 Building 60-B Photo Lab (LHAAP-51)
Notice of Nonresidential Land Use at LHAAP-51 Filed in Public Records of Harrison County, Texas (including survey plat)
LHAAP-55 Septic Tanks (LHAAP-55)
Notice of Nonresidential Land Use at Septic Tank locations Filed in Public Records of Harrison County, Texas (including survey plat)

LHAAP-56 Grease Rack (LHAAP-56)
Nonresidential Land Use site included within the groundwater use restriction LUC boundary for LHAAP-35A(58)- see LHAAP-35A(58)
LHAAP-58 Shops Area (LHAAP-35A (58))
58-1 LUCs from Final Remedial Design
58-2 Notice of Land Use Controls and Nonresidential Land Use at LHAAP-35A (58) Filed in Public Records of Harrison County, Texas (including survey plat)
58-3 Land Use Control Compliance Inspection Form
LHAAP-59 Former Pesticide Storage Building 725 (LHAAP-59)
Notice of Nonresidential Land Use for LHAAP-59 Filed in Public Records of Harrison County, Texas (including survey plat)
Site included within the groundwater use restriction LUC boundary for LHAAP-35A(58)- see LHAAP-35A(58)
LHAAP-60 Former Storage Building 411 & 714 (LHAAP-60)
Notice of Nonresidential Land Use at LHAAP-60 Filed in Public Records of Harrison County, Texas (including survey plat)
Building 714 included within the groundwater use restriction LUC boundary for LHAAP-35A(58)- see LHAAP-35A(58)
LHAAP-64 Transformer Storage (LHAAP-64)
Notice of Nonresidential Land Use at LHAAP-64 Filed in Public Records of Harrison County, Texas (including survey plat)
LHAAP-65 Flammable Materials Storehouse Building 209 (LHAAP-65)
Nonresidential Land Use site included within the groundwater use restriction LUC boundary for LHAAP-35A(58)- see LHAAP-35A(58)
LHAAP-66 405-L Transformer Yard (LHAAP-66)
Notice of Nonresidential Land Use at LHAAP-66 Filed in Public Records of Harrison County, Texas (including survey plat)

LHAAP-67 Aboveground Storage Tank Farm (LHAAP-67)
67-1 LUCs from Final Remedial Design
67-2 Notice of Land Use Controls and Nonresidential Land Use at LHAAP-67 Filed in Public Records of Harrison County, Texas (including survey plat)
67-3 Land Use Control Compliance Inspection Form
LHAAP-68 Transformer Storage (LHAAP-68)
Notice of Nonresidential Land Use at LHAAP-68 Filed in Public Records of Harrison County, Texas (including survey plat)
Site included within the groundwater use restriction LUC boundary for LHAAP-35A(58)- see LHAAP-35A(58)
LHAAP-69 Service Station Underground Storage Tank (LHAAP-69)
Nonresidential Land Use site included within the groundwater use restriction LUC boundary for LHAAP-35A(58)- see LHAAP-35A(58)
Pistol Range
Notice of Nonresidential Land Use at Pistol Range Filed in Public Records of Harrison County, Texas (including survey plat)
LHAAP-001-R-01/LHAAP-003-R-01 South Test Area (LHAAP-001-R-01) and Ground Signal Test Area (LHAAP-003-R-01)
MMRP-1 Long Term Management Inspection and Maintenance Checklist
MMRP-2 LUCs from Final Remedial Design
MMRP-3 Notice of Land Use Controls and Nonresidential Land Use at LHAAP-001-R-01 and LHAAP-003-R-01 Filed in Public Records of Harrison County, Texas (including survey plat)
MMRP-4 Land Use Control Compliance Inspection Form

Table 1 Summary of Land Use Controls and Notifications

Figure 1 Sites with Land Use Controls

Figure 2 Sites with Nonresidential Use Notifications

List of Appendices

Appendix A GSA Transfer Letters

Comprehensive Land Use Control (LUC) & Notification Management Plan, Former Longhorn Army Ammunition Plant (LHAAP), Texas

The purpose of this management plan is to ensure that all site-specific LUCs are compiled into one comprehensive location for both pre-transfer and post-transfer use. Additionally, all nonresidential use notifications required under 30 TAC §335.560(b) are included. This management plan shall be accessible to the property owner, regulators, local government, and the public and will accompany LHAAP's Administrative Record. This plan will be updated as LUC and notification requirements for additional environmental sites are identified; the revision number, date, reason for revision, and author will be documented in the Revision Log. As a document control measure, an annual approval by the three FFA parties, Army, EPA and TCEQ within the first quarter of the fiscal year will confirm the effective date. This approval is required whether or not a revision took place.

Land Use Controls

Land use controls (LUCs) include any type of physical, legal, or administrative mechanism that restricts the use of, or limits access to, real property. LUCs may be a component of an interim or final remedy selected under CERCLA and used to protect human health, the environment, and/or the integrity of an engineered remedy. The LUC performance objectives are established in the site-specific Record of Decision (ROD). The specific LUCs and implementation details are outlined in the corresponding site-specific Remedial Design (RD), a primary document of the Federal Facilities Agreement.

The land use control area is depicted on Figure 1, the site-specific performance objectives and LUCs are presented in Table 1, and the site-specific section contains a LUC Inspection and Maintenance Log, a copy of an approved LUC Remedial Design, Notice of Land Use Controls (including a survey plat) filed in Harrison County public records, and LUC compliance inspection form. Upon USEPA and TCEQ approval of each LUC RD, the LUC requirements will be effective immediately and this management plan will be updated. Once property is transferred, the plan will be amended to include a copy of the transfer letter describing specific LUC obligations assigned to the transferee.

LUCs will remain in place until applicable or relevant and appropriate requirements (ARARs) as established in accordance with the NCP (40 CFR 300) are met; or in the case of a landfill remedy it will remain in place for perpetuity unless otherwise removed by the U.S. Army per agreement with the USEPA and TCEQ. The continued effectiveness of the selected remedy, including LUCs, will be evaluated with the CERCLA 121(c) five-year review process.

Notifications

The future anticipated use of LHAAP is industrial/refuge and is, therefore, consistent with a nonresidential/industrial reuse under the Risk Reduction Rules. As required by 30 TAC §335.560(b) and in accordance with 30 TAC §335.566, a notification must be filed in the Harrison County records stating that the land is considered suitable for future non-residential use. Limited monitoring will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of the sites is consistent with the non-residential use. The non-residential use notification will remain in place until it is demonstrated that the levels of COCs in soil and groundwater allow for unlimited use and unrestricted exposure.

Table 1 –Summary of Land Use Controls and Notifications

Site Name	Transfer Documents		Decision Documents		Land Use Controls					Notifications
IRP MMRP* LHAAP-	GSA Transfer To USFWS	ECP/ ECOP	ROD	DD	Groundwater Use Restriction	Nonresidential Land Use Restriction	Intrusive Activities Prohibition	MEC Warning	Landfill Cap Maintenance	Nonresidential Use Notification
2					**					**
3					**					**
4			2016		√	√				√
6				2008						√
7				2008						√
8	2015	VI		2008						√
12	2014	V	2007		√	Cap Only	Cap Only		√	√
16			2016		√	√	Cap Only		√	√
17			2016		√	√				√
19		VII		2014		Cap Only	Cap Only			√
35/36	2015	VI		2010						√
37			2010		√					√
46			2010		√					√
49	2015	VI	2010							√
50			2010		√					√
51				2008						√
55	2015	VI		2008						√
56				2014	**					**
58			2010		√					√
59				2008	**					√
60				2008	**					√
64				2008						√
65				2014	**					**

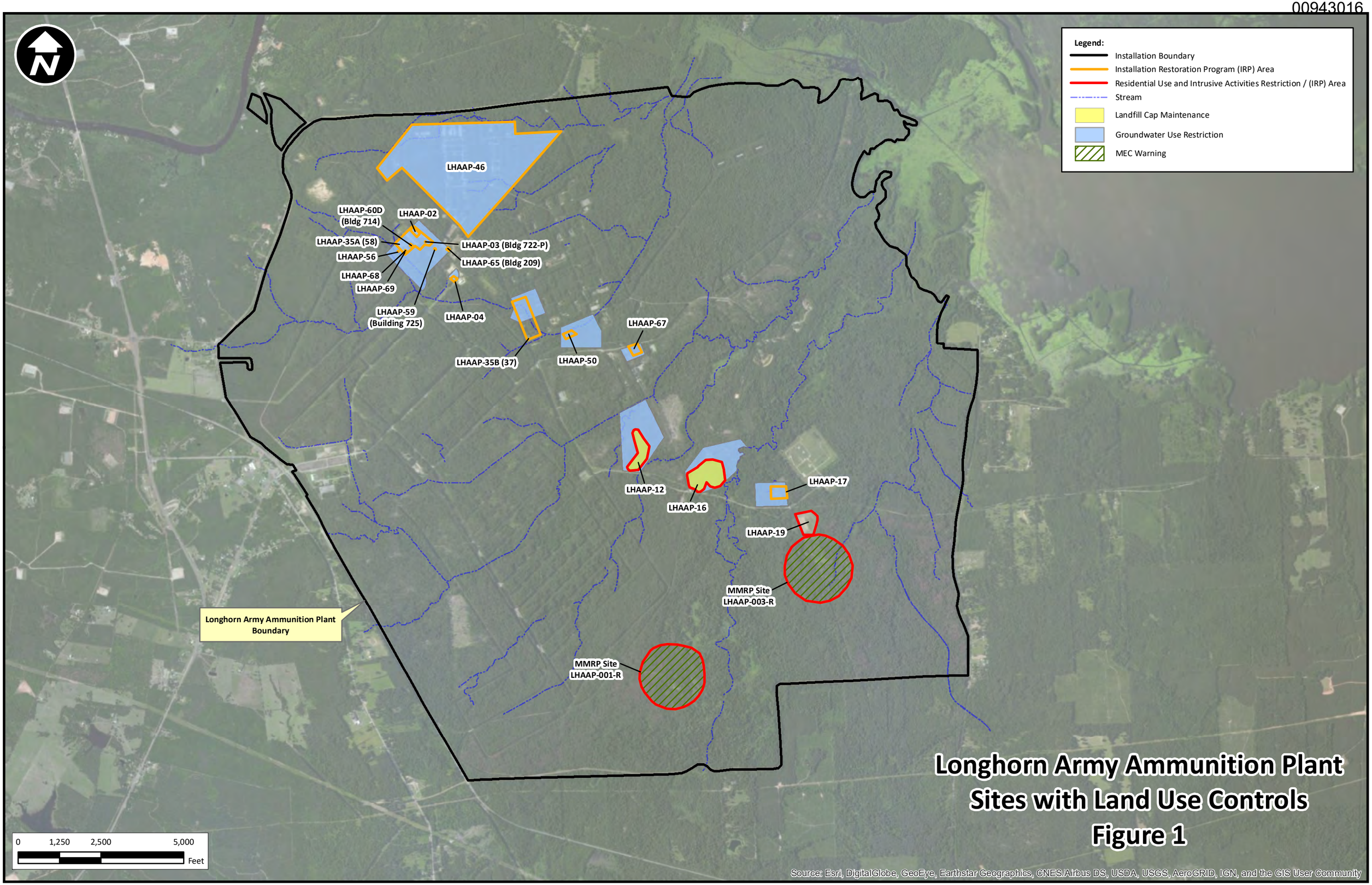
Date October 4, 2019

Site Name	Transfer Documents		Decision Documents		Land Use Controls					Notifications
IRP MMRP* LHAAP-	GSA Transfer To USFWS	ECP/ ECOP	ROD	DD	Groundwater Use Restriction	Nonresidential Land Use Restriction	Intrusive Activities Prohibition	MEC Warning	Landfill Cap Maintenance	Nonresidential Use Notification
66				2008						√
67			2010							√
68				2008	**					√
69				2014	**					**
Pistol Range		VII	2010							√
001-R-01/003-R-01		VII	2016			√	√	√		√

** Nonresidential Land Use site included within the groundwater use restriction LUC boundary for LHAAP-35A(58)-see LHAAP-35A(58)

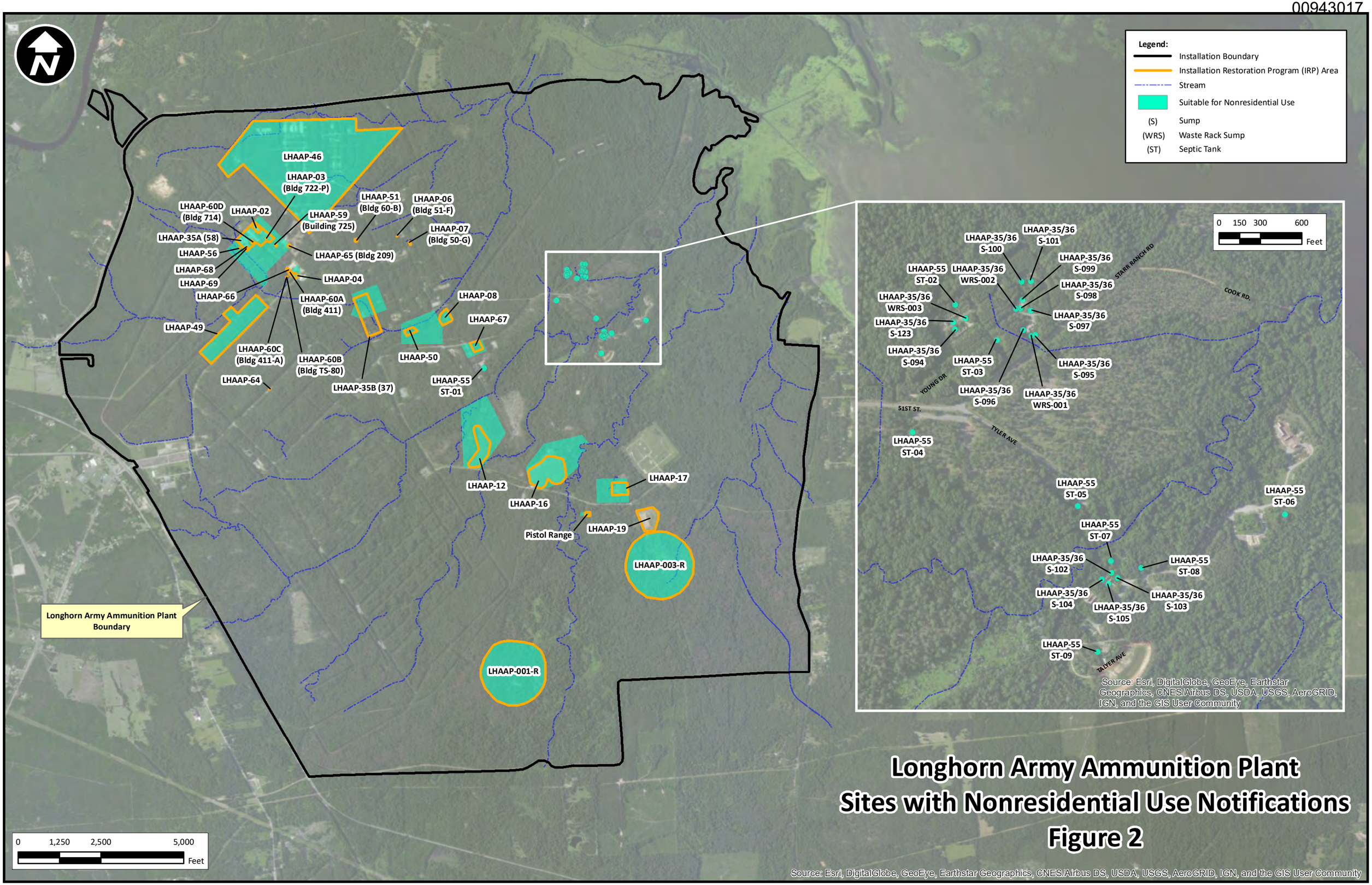
FIGURES

00943016



Longhorn Army Ammunition Plant
Sites with Land Use Controls
Figure 1

00943017



Longhorn Army Ammunition Plant
Sites with Nonresidential Use Notifications
Figure 2

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

LHAAP – 04, 4-1
DRAFT LUC INSPECTION AND MAINTENANCE LOG

(RAO Inspection and Maintenance Checklist)
(Well Inspection Form)

Date October 4, 2019

RAO Inspection and Maintenance Checklist

General Information	
Project Name	RAO Inspection and Maintenance, LHAAP-04 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 ----------

A. Groundwater Monitoring Wells						
A.1	Are the installed groundwater monitoring wells in poor condition?					
A.2	Is the well cleared of vegetation and accessible?					
A.3	Any other relevant observations?					
A.4	Are there any significant cracks present?					
A.5	Are there any damaged areas?					

00943020

WELL INSPECTION FORM

Job Name: _____ Well ID: _____

Job No.: _____ Completed Date: _____

Client: _____ Measured Depth: _____

Site Location: _____ Inspector: _____

☐ **ABOVE GROUND**

Protective casing? ☐ Yes ☐ No

Material _____

Condition: ☐ Good ☐ Broken ☐ Cracked

Lid Condition: ☐ Good ☐ Broken ☐ Cracked

Hinge Condition: ☐ Good ☐ Less than 50% rusted ☐ More than 50% rusted

☐ **FLUSH MOUNTED**

Well cover present? ☐ Yes ☐ No

Condition: ☐ Good ☐ Broken ☐ Cracked

Condition of Sump: ☐ Clean ☐ Dry ☐ Standing Water

CONCRETE PAD:

Visible? ☐ Yes ☐ No

Dimensions _____ Thickness _____

Sloped away from casing? ☐ Yes ☐ No

Check any of the following features that apply:

☐ Many Cracks ☐ Gap Around Casing ☐ Few Cracks ☐ Ponded Water ☐ No Pad Present

CONCRETE PAD:

Inner Diameter (inches) _____

Condition: ☐ Good ☐ Broken ☐ Cracked ☐ Other (describe) _____

Cap present? ☐ Yes ☐ No

Well lock present? ☐ Yes ☐ No

Lock functioning properly? ☐ Yes ☐ No

Bump post? ☐ Yes ☐ No

Well ID visible? ☐ Yes ☐ No

WELL INTEGRITY:

Bailer present? ☐ Yes ☐ No

Visual obstruction? ☐ Yes ☐ No

Is well open to completed depth? ☐ Yes ☐ No

Is silt present in well? ☐ Yes ☐ No

Is silt greater than 25% of well screen length? ☐ Yes ☐ No

COMMENTS:

LHAAP – 04, 4-2

LUCs FROM DRAFT FINAL REMEDIAL DESIGN

Date October 4, 2019

Draft Final
Remedial Design and Remedial Action Work Plan, LHAAP-04 Former Pilot Wastewater Treatment Plant

Longhorn Army Ammunition Plant
Karnack, Texas

Prepared for U.S. Army Corps of Engineers, Tulsa District
Contracting Division
2488 East 81st Street
Tulsa, Oklahoma 74137-4290

Prepared by

bhate ENVIRONMENT & INFRASTRUCTURE

1608 13th Avenue south, Suite 300
Birmingham, Alabama 35205
1-800-806-4001 • www.bhate.com

Prepared by

APTIM

Aptim Federal Services, LLC
2500 CityWest, Suite 1700
Houston, Texas 77042

Contract No. W9128F-13-D-0012
Task Order No. W9128BV17F0150
Project No. 501032
Rev 0
April 2019

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Acronyms and Abbreviations

µg/L	micrograms per liter
APTIM	Aptim Federal Services, LLC
Bhate	Bhate Environmental Associates, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC	constituent of concern
DAP	diammonium phosphate
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DPT	direct-push technology
ECP	Environmental Condition of Property
EDS-ER™	Electron Donor Solution – Extended Release
EPA	see USEPA
EVO	emulsified vegetable oil
ft bgs	feet below ground surface
GPS	global positioning system
GWTP	groundwater treatment plant
ISB	in situ bioremediation
IWWP	Installation-Wide Work Plan
Jacobs	Jacobs Engineering Group, Inc.
LHAAP	Longhorn Army Ammunition Plant
LOE	lines of evidence
LTM	long-term monitoring
LUC	land use controls
MATOC	Multiple Award Task Order Contract
MCL	maximum contaminant level
MEGA	Multiple Environmental Government Acquisition
MMRP	Military Munitions Response Program
MOA	Memorandum of Agreement
mV	millivolts
NCP	National Contingency Plan
O&M	operation and maintenance
O_2	oxygen
ORP	oxidation-reduction potential

Acronyms and Abbreviations (continued)

PCL	Protective Concentration Level
psi	pounds per square inch
RA	remedial action
RACR	Response Action Completion Report
RA-O	Remedial Action-Operation
RAOs	remedial action objectives
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RD	remedial design
ROD	Record of Decision
ROI	radius of influence
Shaw	Shaw Environmental, Inc.
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TOC	total organic carbon
TRRP	Texas Risk Reduction Program
U.S. Army	U.S. Department of the Army
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

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4.0 LAND USE CONTROLS REMEDIAL DESIGN/PLAN

This section describes the LUC RD for LHAAP-04. In accordance with the Final ROD (AECOM 2016), the LUC RD will be finalized as the land use component of the RD.

Per the Final ROD (AECOM 2016), LUCs' performance objectives are to:

- Prohibit the use of groundwater (except for environmental testing and monitoring) as a potable water source
- Restrict land use to nonresidential
- Maintain the integrity of any current or future remedial or monitoring systems

The implementation, maintenance, and inspection requirements associated with each of the performance objectives that comprise this LUC RD are described below. The proposed actions to be taken to implement the LUC objectives during the RA phase are described in **Section 6.0**. The implementation activities, as well as ongoing maintenance, monitoring and reporting requirements will be presented in the Remedial Action Completion Report (RACR), as the final LUC RD. Upon regulatory review and concurrence with the final LUC RD, it will be included as part of the Comprehensive LUC Management Plan.

For portions of the Site subject to LUCs that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of LUCs, and coordinate with federal, state, and local governments and owners and occupants of properties subject to LUCs. The Army remains responsibility for ensuring that the remedy remains protective of human health and the environment.

4.1 LUC Implementation

The actions required to implement the LUCs for LHAAP-04 are described below. The first of these, the initial notice of LUCs, was completed on June 26, 2017. The June 26, 2017, Notice letters that were sent to relevant government officials (U.S. Army 2017) included a preliminary LUC boundary shown on **Figure 4-1**. The following actions will be undertaken to implement the LUCs for LHAAP-04:

- Finalize the boundary for the LUCs as a part of the RA.
  - Revise the boundary, if necessary, based on perchlorate results from the baseline groundwater sampling. The final boundary of the groundwater LUCs (prevent the use of groundwater contaminated above cleanup levels as a potable water source and prohibit access to the contaminated groundwater except for environmental monitoring and testing only); the remedial or monitoring system

LUCs (maintain the integrity of any current or future remedial or monitoring systems); and, the nonresidential land use LUC (restrict land use to nonresidential) will be reviewed during RA activities after an evaluation of the baseline data has been completed and revised if necessary.

  - Survey the LUC Boundaries. The boundaries will be finalized after concurrence by USEPA and TCEQ, and the LUC boundaries will be surveyed by a State-licensed surveyor. A legal description of the surveyed areas will be appended to the survey plat.

- Record the LUCs in Harrison County. The LUC plat, legal description and LUC restriction language will be recorded in the Harrison County Courthouse in accordance with TAC Title 30, §335.566.
- Notify the Texas Department of Licensing and Regulation of the groundwater LUCs. The Texas Department of Licensing and Regulation will be notified of the groundwater restrictions, which include the prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval from the Army, the USEPA, and the TCEQ. The survey plat, legal boundary and description of the groundwater restriction LUCs, in conjunction with a locator map, will be provided in hard and electronic copy.
- Provide notice of the LUCs with the revised LUC boundary.
  - Prepare the notice of the groundwater and soil (surface and subsurface) contamination and any land use restrictions referenced in the ROD. The notice will consist of a brief description of the contaminants in groundwater and soil, a written description of the LUCs and a figure depicting the revised LUC boundary.
  - Transmit the notice to federal, state, and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and LUCs within 90 days of RACR acceptance by the regulators. The notices will be sent to federal, state and local officials including: both U.S. Senators, U.S. Congressman (Texas District 1), State Senator (District 1), State Representative (District 9), Harrison County Judge, Harrison County Commissioner Precinct 1, City of Uncertain Mayor, Leigh Water Supply Corporation Board Members, Caddo Lake Water Supply Corporation Board of Directors, and the Caddo Lake National Wildlife Refuge Manager.

4.2 Maintenance and Monitoring Requirements

The LUCs will be maintained in place as follows:

- The LUCs restricting the use of groundwater to environmental monitoring and testing only and the LUC restricting land use to nonresidential will remain in place until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in Table 2-3 of the ROD) in surface and subsurface soil and groundwater allow for unlimited use and unrestricted exposure.
- The LUC to maintain the integrity of any current or future remedial or monitoring systems will remain in place until groundwater cleanup levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in Table 2-3 of the ROD) are met.

Remedial or Monitoring System LUCs include physical components that require repair and maintenance. These are described in **Section 8.0**. The RAO and Extraction System Inspection and Maintenance Checklists is provided in **Appendix E**.

The administrative maintenance required to ensure the LUCs remain in place and effective until the cleanup levels of the COCs are at levels that allow unrestricted use and unlimited exposure are:

- Annual field inspections of the site to confirm that no violations of the LUCs have occurred. Documentation of the inspection will be included in the Inspection and Maintenance Checklist (see **Appendix E**).
- Annual certifications that no LUC-restricted activities have been authorized and that site conditions and use are consistent with the LUCs. The Certification Form is presented in **Appendix E**.
- Periodic transmittal of a LUC Notice to federal, state, and local authorities and to owners and occupants of LHAAP-04. The notice will include the groundwater and soil (surface and subsurface) contamination and any 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 RD appendix of the RACR will be added to the Comprehensive LUC Management Plan and the plan will be provided to the owner or occupant of LHAAP-04.

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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.

4.3 LUC Inspection and Monitoring

Beginning with finalization of this RD/RAWP and approval of the Inspection form and the Annual Certification Form, the U.S. Army will undertake inspections and certify continued compliance with the LUC objectives. The U.S. Army, or the transferee after transfer, will retain the LUC Inspection and Certification documents in the project files for incorporation into the five-year review reports, and these documents will be made available to USEPA and TCEQ upon request. In addition, should any violations be found during the certification, the U.S. Army will provide to USEPA and TCEQ, along with the document, a separate written explanation indicating the specific violations found and what efforts or measures have or will be taken to correct those violations. The need to continue inspections and certifications will be revisited at five-year reviews.

4.3.1 Notice of Planned Property Conveyances

Upon transfer of Army-owned property, the Army will provide written notice to the transferee of the LHAAP-04 groundwater contamination and any land use restrictions. Within 15 days of transfer, the U.S. Army will provide written notice to USEPA and TCEQ of the division of implementation, maintenance, and enforcement responsibilities unless the information has already been provided in the LUC RD. The notice will describe the mechanism by which the LUC will continue to be implemented, maintained, inspected, reported, and enforced. Upon transfer, such responsibilities may shift to the transferee via appropriate provisions placed in the Environmental Condition of Property (ECP) or other environmental document for transfer. Although the U.S. Army may transfer responsibility for various implementation actions, the U.S. Army will also retain ultimate responsibility for the remedy integrity. This means that the U.S. Army is responsible for addressing substantive violations of the LUC performance objectives that would undermine the U.S. Army's CERCLA remedy. The U.S. Army also will be responsible for incorporating RD information and outlining the transferee's LUC obligations into property transfer documentation. In the event property is transferred out of Federal control, the LUCs relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas.

4.3.2 Opportunity to Review Text of Intended Land Use Controls

The U.S. Army will provide a copy of the groundwater and land use restriction notification to TCEQ for review and approval prior to its recordation in Harrison County. USEPA will also receive a copy for review. The U.S. Army will produce an ECP or other environmental document for transfer of LHAAP-04, but before executing transfer, the U.S. Army will provide USEPA and TCEQ with a copy of the ECP or other environmental document for transfer so

that they may have reasonable opportunity, before transfer, to review all LUC-related provisions.

4.3.3 Notification Should Action(s) which Interfere with Land Use Control Effectiveness be Discovered Subsequent to Conveyance

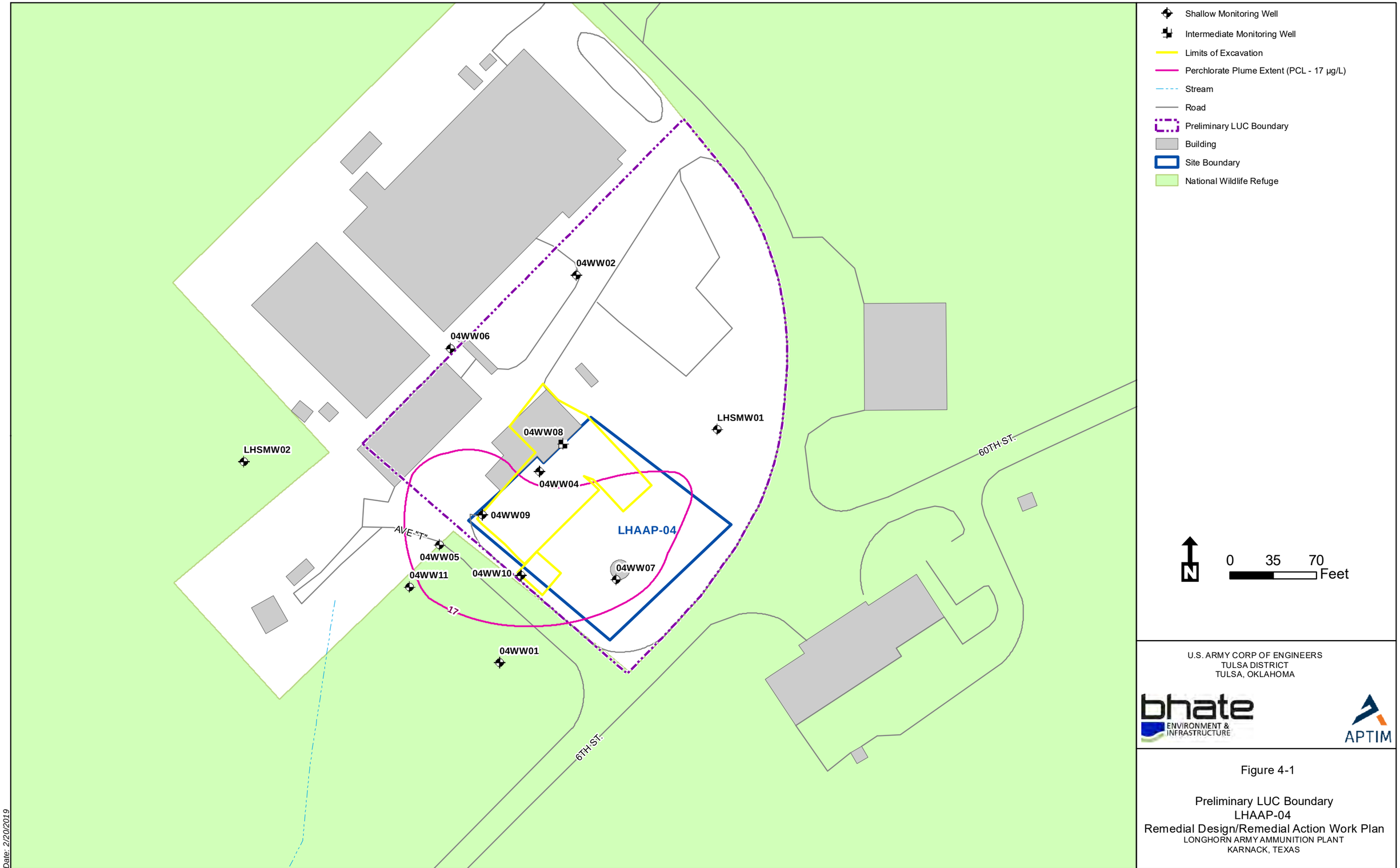
Should the U.S. Army discover after conveyance of the site any activity on the property inconsistent with the LUC performance objectives, the U.S. Army shall notify USEPA and TCEQ within 72 hours of such discovery. Consistent with **Section 4.3.5** below, the U.S. Army will then work with USEPA, TCEQ and the transferee to correct the problem(s) discovered. This reporting requirement does not preclude the U.S. Army from taking immediate action pursuant to its CERCLA authorities to prevent any perceived risk(s) to human health or the environment.

4.3.4 Land Use Control Enforcement

Should the LUC remedy reflected in this RD fail, the U.S. Army will coordinate with USEPA and TCEQ to ensure that appropriate actions are taken to reestablish its protectiveness. These actions are taken to reestablish its protectiveness. These actions may range from informal resolutions with the USFWS or its lessee, to the institution of judicial action against non-federal third parties. Alternatively, should the circumstances warrant such, the U.S. Army could choose to exercise its response authorities under CERCLA. Should the U.S. Army become aware that any future owner or user of the property has violated any LUC requirement over which a local agency may have independent jurisdiction, the U.S. Army may notify those agencies of such violation(s) and work cooperatively with them to re-achieve owner/user compliance with the LUC.

4.3.5 Modification or Termination of Land Use Controls

The LUCs shall remain in effect until such time as the U.S. Army and USEPA agree that the concentrations of perchlorate in groundwater have met cleanup levels and allow unrestricted use. When this occurs, the LUC will be terminated as needed. The decision to terminate the LUC will be documented consistent with the NCP process for post-ROD changes, potentially including an Explanation of Significant Difference or a Remedial Action Completion Report. If the property has been transferred and a determination by the U.S. Army and USEPA has been made to terminate the LUC, the U.S. Army shall provide to the owner of the property an appropriate release for recordation pertaining to the site and will also timely advise other local stakeholders of the action.



U.S. ARMY CORP OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

bhate ENVIRONMENT & INFRASTRUCTURE

APTIM

Figure 4-1

Preliminary LUC Boundary
LHAAP-04
Remedial Design/Remedial Action Work Plan
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 2/20/2019

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP04\RD_RAWP\LHAAP04_ProposedLUCBoundary.mxd

LHAAP – 04, 4-3

NOTICE OF LAND USE CONTROLS AND NONRESIDENTIAL LAND USE AT LHAAP-04 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT) (PENDING)

Date October 4, 2019

LHAAP – 04, 4-4
LAND USE CONTROL COMPLIANCE INSPECTION FORM

Date October 4, 2019

Annual Land Use Control Compliance Certification Form

In accordance with the Remedial Design dated_____for LHAAP-04 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;
- 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 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.

LHAAP - 06

NOTICE OF NONRESIDENTIAL LAND USE FOR LHAAP-06 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2010-000005555

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

7 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 04/27/2010 04:08 PM **Document Number:** 2010-000005555 **Receipt No:** 1006195 **Amount:** $ 36.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW E & I
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. The site, LHAAP-06, is the area of a demolished building location known as Building 51-F located within the Plant 3 production area of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-06 is not itself considered an NPL site. Environmental activities at LHAAP-06 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, that no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-06 (Building 51-F) was a collection point for waste acids and solvents. Its three-sided shed contained a rack that held a single 55-gallon drum set on a 50-square foot pie-shaped concrete pad. Beginning in 1985, the drum was used to collect waste acids and solvents from bench-scale manufacture of the explosive cyclotetramethylenetetranitramine. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to

5:00 p.m. or the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-06 parcel is 119 square foot, more or less, or 0.00273 acre tract 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 United States Department of the Army has undertaken careful environmental study of the LHAAP-06 site and USEPA and TCEQ concluded that no further investigation or action is required for LHAAP-06. Contaminants in soil samples from LHAAP-06 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of LHAAP-06 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of LHAAP-06 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951
Or
Assistant Chief of Staff for Installation Management
ATTN: DAIM-BDO (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 10th day of March, 2010.

BEFORE ME, on this the 10 th day of March, 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 10 day of March, 2010.

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

ANGELA HUMPHRIES
Notary Public State of Texas
COMM. EXP. 3-17-2011

FIELD NOTES DESCRIPTION OF
"LHAAP-06" TRACT
(REMAINS OF DEMOLISHED BUILDING 51-F)
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP-06" being defined by the four external corners of the three concrete walls remaining at demolished Building 51-F (wall defining the West edge of said building is either gone or never existed) in the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract "LHAAP-06" being more particularly described as follows :

Surveyor's Note: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999861727, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "X-11" (N=6960733.698 feet E=3304750.367 feet) and "HORSE" (N=6960008.269 feet E=3309591.340 feet). Said traverse indicates a surface distance of 4895.70 feet between said monuments. The computed land area is based on surface distances. As used herein, the abbreviation E.C.C.W. indicates External Corner of Concrete Wall,

Commencing at monument "HORSE" referenced above,

THENCE N 59deg52'55"W 597.03' to an E.C.C.W. found for the S.E.C. of this tract and this POINT OF BEGINNING,

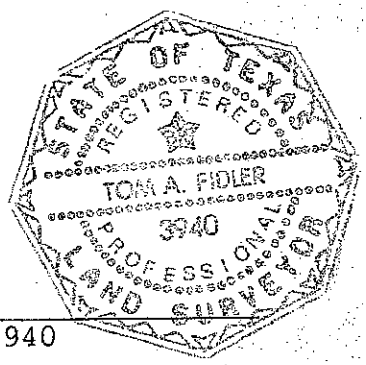
THENCE S 67deg37'19"W 10.93' along the S.B.L. of this tract to an E.C.C.W. found for this tract's S.W.C. ,

THENCE N 22deg14'24"W 10.92' along the W.B.L. of this tract to an E.C.C.W. found for this tract's N.W.C. ,

THENCE N 67deg37'19"E 10.93' along the N.B.L. of this tract to an E.C.C.W. found for this tract's N.E.C. ,

THENCE S 22deg14'24"E 10.92' along the E.B.L. of this tract to this POINT OF BEGINNING. This tract contains 119 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.

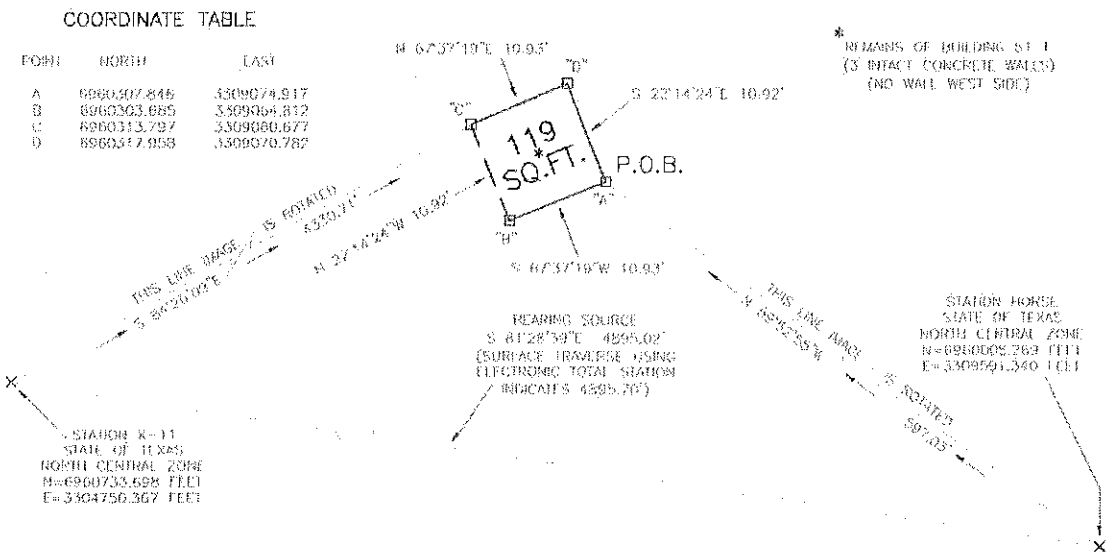


Tom A. Fidler, R.P.L.S. Number 3940

00943045

COORDINATE TABLE

POINT	NORTH	EAST
A	6960307.846	3309074.917
B	6960303.685	3309064.812
C	6960313.797	3309060.677
D	6960317.958	3309070.782



Tom A. Fisher, Registered Professional Land Surveyor, No. 3940

I, Tom A. Fisher, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners of the tract herein described as surveyed on the ground and under my supervision in August 2009.

Witness my hand and seal this the 13th day of August, 2009.

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999861727 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS X-11 & HORSE. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

NOTES:

X INDICATES TYPE "B" CORPS OF ENGINEERS MONUMENT (FOUND)

☐ INDICATES EXTERNAL CORNER OF CONCRETE BUILDING WALL

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

SCALE 1"=10'

10 0 10 20 30

GRAPHIC SCALE - FEET

LANDMARK CONSULTANTS, INC.

PROFESSIONAL LAND SURVEYORS

P.O. BOX 606 LONGVIEW, TEXAS 75606

PHONE (903) 236-3377 FAX (903) 236-3530

E-MAIL landmark@cablelynx.com

LHAAP--06
(119 SQUARE FEET)
(REMAINS OF BUILDING 51-F)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXA

JOB #0407088	0407088.CRD	C.PTS C.LEG
AUG. 13, 2009	0908074C.DWG	DRAWN BY JTJ

LHAAP-07

NOTICE OF NONRESIDENTIAL LAND USE FOR LHAAP-07 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2010-000005556

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

7 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 04/27/2010 04:08 PM **Document Number:** 2010-000005556 **Receipt No:** 1006195 **Amount:** $ 36.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT COUNTY OF HARRISON, 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.

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW E & I
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. The site, LHAAP-07, is the area of a demolished building location known as Building 50-G located within the Plant 3 production area of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-07 is not itself considered an NPL site. Environmental activities at LHAAP-07 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ as the lead regulatory agency that no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-07 (Building 50-G) was the former drum processing building which consisted of a wooden frame building 30 feet by 100 feet in size set on a concrete pad located within the boundary of LHAAP-47. Beginning in 1985, Building 50-G had a separate bay (20 by 30 feet in size) used as a washdown area for empty drums and casting equipment used in ammunition production. The washdown area was an above-grade concrete vault where empty drums were rinsed with hot water and spent sulfuric acid neutralized with limestone. The wastes handled included solvents, oils, and organic liquids. The site ceased operation in 1995. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd,

Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-07 parcel is 3,078 square foot, more or less, or 0.07066 acre tract 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 United States Department of the Army has undertaken careful environmental study of the LHAAP-07 site and USEPA and TCEQ concluded that no further investigation or action is required for LHAAP-07. Contaminants in soil samples from LHAAP-07 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of LHAAP-07 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of LHAAP-07 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951
or
Assistant Chief of Staff for Installation Management
ATTN: DAIM-BDO (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 10 th day of March, 2010.

BEFORE ME, on this the 10 th day of March, personally appeared Rose M. Zeiler, of 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 10 day of March, 2010.

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

NOTARY PUBLIC STATE OF TEXAS
ANGELA HUMPHRIES
Notary Public State of Texas
COMM. EXP. 3-17-2011

FIELD NOTES DESCRIPTION OF
"LHAAP-07" TRACT
(REMAINS OF DEMOLISHED BUILDING 50-G)
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP-07" being defined by the four external corners of the concrete foundation stem wall of demolished Building 50-G in the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract "LHAAP-07" being more particularly described as follows:

Surveyor's Note: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999861727, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "X-11" (N=6960733.698 feet E=3304750.367 feet) and "HORSE" (N=6960008.269 feet E=3309591.340 feet). Said traverse indicates a surface distance of 4895.70 feet between said monuments. The computed land area is based on surface distances. As used herein, the abbreviation E.C.C.F.S.W. indicates External Corner of Concrete Foundation Stem Wall,

Commencing at monument "HORSE" referenced above,

THENCE N 87deg11'48"W 103.14' to an E.C.C.F.S.W. found for the S.E.C. of this tract and this POINT OF BEGINNING,

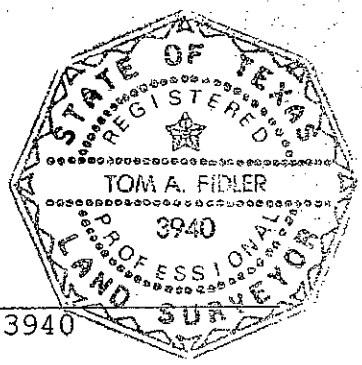
THENCE S 69deg02'55"W 30.36' along the S.B.L. of this tract to an E.C.C.F.S.W. found for this tract's S.W.C. ,

THENCE N 21deg59'26"W 101.90' along the W.B.L. of this tract to an E.C.C.F.S.W. found for this tract's N.W.C. , and being S 82deg14'17"E 4714.65' from monument "X-11" referenced above,

THENCE N 71deg43'04"E 30.53' along the N.B.L. of this tract to an E.C.C.F.S.W. found for this tract's N.E.C. ,

THENCE S 21deg55'35"E 100.48' along the E.B.L. of this tract to this POINT OF BEGINNING. This tract contains 3,078 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

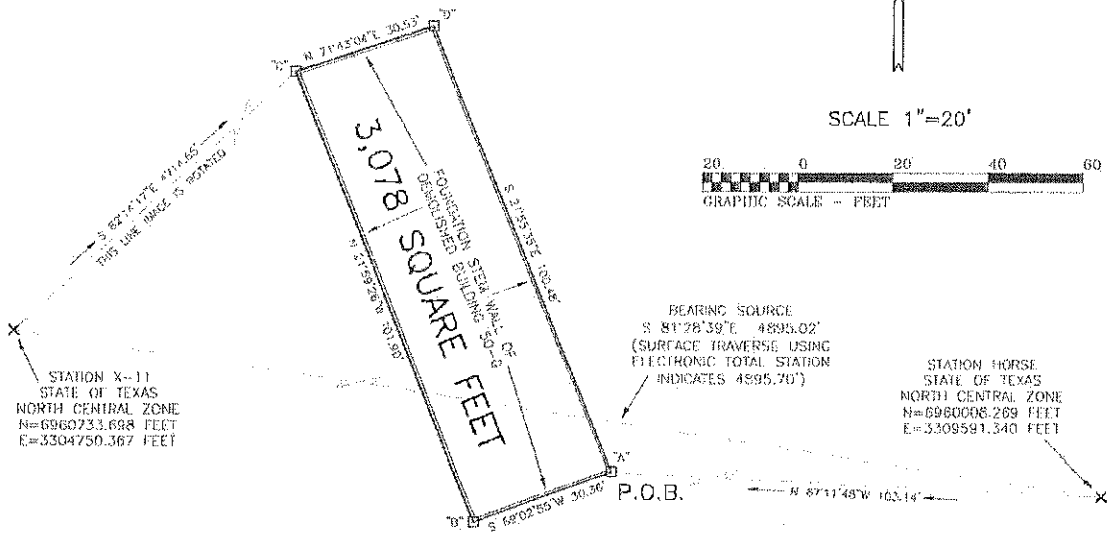
NOTES:

X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)

□ INDICATES EXTERNAL CORNER OF FOUNDATION STEM WALL

COORDINATE TABLE

POINT	NORTH	EAST
A	6960013.313	3309488.323
B	6960002.458	3309459.972
C	6960096.944	3309421.815
D	6960106.521	3309450.803



SCALE 1"=20'

20 0 20 40 60

GRAPHIC SCALE - FEET

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August, 2009.

Witness my hand and seal this the 13th day of August, 2009.

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEET

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999861727 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS X-11 & HORSE. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

LHAAP-07
(3,078 SQUARE FEET)
(REMAINS OF BUILDING 50-G)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	B.PTS B.LOG
AUG. 13, 2009	09080748.DWG	DRAWN BY JTJ

LHAAP-08

NOTICE OF NONRESIDENTIAL LAND USE FOR LHAAP-08 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2011-000003377

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

NOTICE

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 03/24/2011 03:52 PM **Document Number:** 2011-000003377 **Receipt No:** 1103745 **Amount:** $ 32.00 **By:** Lauren Boyd, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT OF HARRISON, TEXAS CDU

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.

Patsy Cox, Harrison County Clerk

Record and Return To:

AARON WILLIAMS EC-ER
1645 SOUTH 101ST EAST AVENUE

TULSA, OK 74128

STATE OF TEXAS HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remedial investigation of the land described herein. The site, LHAAP-08, the former Sewage Treatment Plant, operated from 1942 to 1997. LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-08 is not itself considered an NPL site. Environmental activities at LHAAP-08 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ as the lead regulatory agency that no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-08 included stabilization ponds, Dunbar filters, sludge drying beds, and an Imhoff tank. The plant received storm water, boiler blow down, laundry waste, vehicle wash rack waste, and effluent from film development at the X-ray facility. Treated effluent was discharged into Goose Prairie Creek and Caddo Lake. Soil and groundwater investigations in 2000, 2001, and 2005 included sampling for explosives compounds, metals, semivolatile organic compounds, volatile organic compounds, dioxins and furans, pesticides and PCBs. Soil results included detections of low levels of metals, perchlorate and dioxin. Low levels of metals, dioxin and furan compounds and perchlorate were detected in groundwater. An assessment of risk to exposure to soil and groundwater at LHAAP-08, based on the

nonresidential use scenario, indicated that potential human health risks are within the acceptable range established by EPA. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-08 parcel is a 2.974 acre tract 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 United States Department of the Army has undertaken careful environmental study of the LHAAP-08 site and USEPA and TCEQ concluded that no further investigation or action is required for LHAAP-08. Contaminants in soil samples from LHAAP-08 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of LHAAP-08 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of LHAAP-08 is consistent with the non-residential use scenario evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multifamily residences; child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through
12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

Assistant Chief of Staff for Installation Management
ATTN: DAIM-BDO (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 25 th day of January, ~~2010~~ 2011.

BEFORE ME, on this the 25 th day of Jan 2011, personally appeared Rose M. Zeiler, of 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 25 day of January.

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

NOTARY PUBLIC STATE OF TEXAS
ANGELA HUMPHRIES
Notary Public State of Texas
COMM. EXP. 3-17-2011

FIELD NOTES DESCRIPTION OF
"LHAAP–08" TRACT
(PROPOSED INDUSTRIAL USE NOTIFICATION AREA)
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP–08" being 2.974 acre of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract "LHAAP–08" being more particularly described as follows :

Surveyor's Note: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998636625, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "IGNATIUS–1" (N=6957090.304 feet E=3311081.788 feet) and "IGNATIUS–2" (N=6955582.752 feet E=3311851.704 feet). Said traverse indicates a surface distance of 1693.005 feet between said monuments. The computed land area is based on surface distances. As used herein, the abbreviation I.R.O.P.C. indicates 1/2" iron rebar with orange plastic cap engraved "Fidler" & "RPLS 3940", and the abbreviation C.N.I.B.C. indicates concrete nail in bottle cap.

Commencing at monument "IGNATIUS–1" referenced above,

THENCE N 52deg56'26"W 814.32' to an I.R.O.P.C. set for the Southmost corner of this tract and this POINT OF BEGINNING,

THENCE N 28deg08'32"W 374.05' along the S.W. B.L. of this tract to an I.R.O.P.C. set for this tract's Westmost corner,

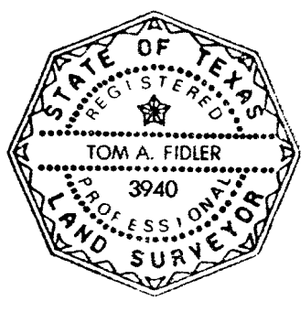
THENCE N 62deg03'14"E 348.01' along the N.W. B.L. of this tract to a C.N.I.B.C. set (in the asphalt pavement of South Houston Road) for this tract's Northmost corner,

THENCE S 27deg43'38"E 328.00' along the N.E. B.L. of this tract to a C.N.I.B.C. set (in the asphalt pavement of South Houston Road) for the North end of a curve,

THENCE along a curve to the right (having a radius of 48.04' and an arc length of 75.57', being subtended by a chord of S 17deg20'14"W 68.02') to a C.N.I.B.C. set (in the asphalt pavement of South Houston Road) for the South end of said curve,

THENCE S 62deg24'07"W 297.15' along the S.E. B.L. of this tract to this POINT OF BEGINNING, containing 2.974 acres, more or less.

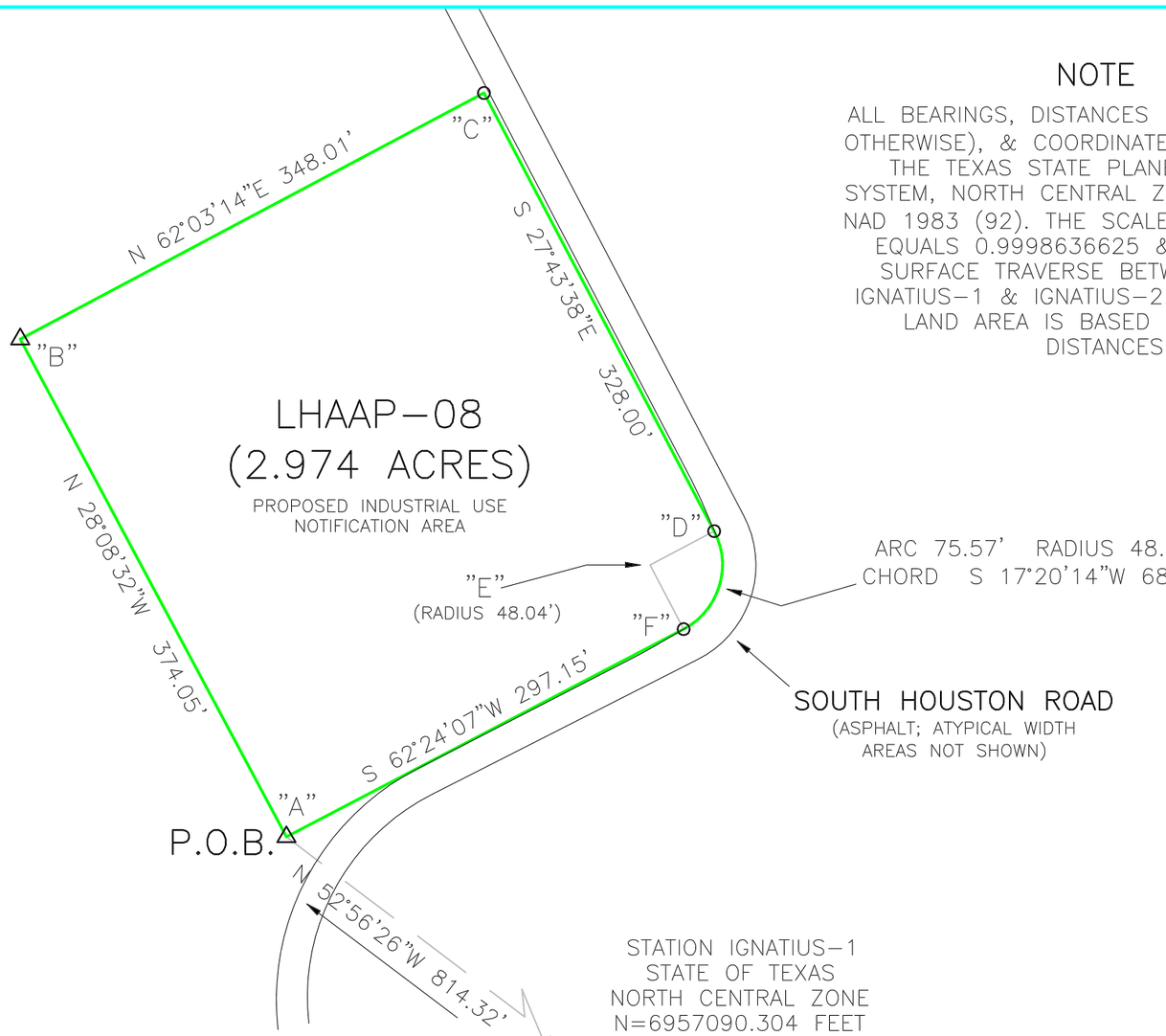
I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler

Tom A. Fidler, R.P.L.S. Number 3940

00943060



ARC 75.57' RADIUS 48.04'
CHORD S 17°20'14"W 68.02'

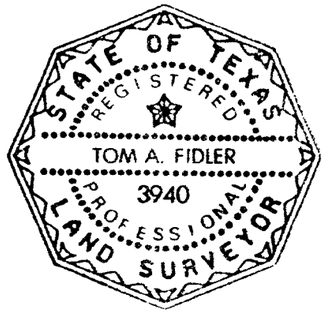
SOUTH HOUSTON ROAD
(ASPHALT; ATYPICAL WIDTH
AREAS NOT SHOWN)

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998636625 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS IGNATIUS-1 & IGNATIUS-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in July 2008.

Witness my hand and seal this the 29th day of July, 2008



Tom A. Fidler

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940



SCALE 1"=100'



STATION IGNATIUS-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957090.304 FEET
E=3311081.788 FEET

BEARING SOURCE
S 27°03'13.2"E 1692.774'
(SURFACE TRAVERSE USING
ELECTRONIC TOTAL STATION
INDICATES 1693.005')

STATION IGNATIUS-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6955582.752 FEET
E=3311851.704 FEET

NOTES:

- X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- O INDICATES CONCRETE NAIL IN BOTTLE CAP (SET IN ASPHALT)
- △ INDICATES 1/2" IRON REBAR WITH ORANGE PLASTIC CAP ENGRAVED "FIDLER" & "RPLS 3940" (SET)
- ——— INDICATES BOUNDARY OF PROPOSED INDUSTRIAL USE NOTIFICATION AREA

COORDINATE TABLE

POINT	NORTH	EAST
A	6957581.048	3310431.952
B	6957910.879	3310255.527
C	6958073.970	3310562.954
D	6957783.633	3310715.561
E	6957761.282	3310673.037
F	6957718.708	3310695.292

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEET

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

LHAAP-8
(2.974 ACRES)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	0605063F.DWG
07/29/2008	0605063.CRD	DRAWN BY JTJ

LHAAP-12, 12-1

LUC INSPECTION AND MAINTENANCE LOG

September 14, 2015

LUC Inspection and Maintenance Log – LHAAP 12

Date	Inspected by:	Inspection / Maintenance Activities					Corrective action or repairs required?	Repairs / Action Taken
		Protect landfill cover integrity				Prevent human exposure to groundwater		
		Vegetative Cover maintained: i.e. grass mowed	Fence and signage maintained	Observance of landfill cover degradation –e.g. desiccation cracks, erosion, or gullying	Continued compliance verified for no digging or disturbance of landfill cover or contents	Verified no withdrawal or use of groundwater (other than environmental testing)		

LHAAP-12, 12-2

LUCs FROM FINAL REMEDIAL DESIGN ADDENDUM

September 14, 2015

FINAL

REMEDIAL DESIGN ADDENDUM
LANDFILL 12 (LHAAP-12)
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS



Prepared for
U.S. Army Corps of Engineers
Tulsa District
1645 South 101st Avenue
Tulsa, Oklahoma

Prepared by
Shaw Environmental, Inc.
3010 Briarpark Drive, Suite 400
Houston, Texas 77042

Contract Number DACA56-94-D-0020
Task Order No. 0109

June 2007

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5.0 Monitored Natural Attenuation 5-1
6.0 Remedy Implementation Actions 6-1
6.1 Land Use Control Implementation Actions 6-1
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Appendix B Sample Annual Land Use Control Compliance Inspection Documentation

4.0 Land Use Controls for the Site

The LUCs to be implemented by the Army or its representatives for LHAAP-12 include:

- Maintenance of the integrity of the landfill cap, including, at a minimum, repairs to desiccation cracks, erosion, or gullying upon observance.
- Maintenance of a vegetative cover on the landfill cap including regular mowing.
- Maintenance of fence line and signage around landfill cap.
- Prohibition of any activities that would affect the integrity of cap.
- Prohibition of any activities that would cause exposure to the contaminated groundwater.

Although groundwater monitoring is not a LUC, it was included as a component of the remedy for LHAAP-12 identified in the 2006 ROD to evaluate the effectiveness of the landfill cap (Shaw, 2006b). The groundwater monitoring plan is included in **Appendix A**.

6.0 Remedy Implementation Actions

6.1 Land Use Control Implementation Actions

Until LHAAP-12 is transferred, the Army or its representatives will be responsible for LUC implementation, maintenance, inspection, reporting and enforcement. The Army shall address LUC problems within its control that are likely to impact remedy integrity and shall address problems as soon as practicable. If periodic LUC inspections and maintenance are required to address site-specific risks, the Army will be responsible for making the results available to the appropriate regulators.

As a condition of property transfer, the Army may require the transferee to assume responsibility for various implementation actions, as indicated below. Although the Army may transfer responsibility for various implementation actions, the Army shall retain its responsibility for remedy integrity. This means that the Army is responsible for addressing substantive violations of performance objectives that would undermine the Army's CERCLA remedy. The Army also will be responsible for: 1) incorporating RD information and outlining the transferee's LUC obligations into property transfer documentation; 2) recording survey plat and notice of restrictions for both the landfill cap and cover system boundary at the Harrison County Courthouse; 3) recording groundwater use restriction and survey plat at the Harrison County Courthouse; and 4) notifying Texas Department of Licensing and Regulation of the groundwater restriction which includes the prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval from the Army, the USEPA, and the TCEQ.

The following LUC implementation actions shall be undertaken by the Army in order to ensure that the aforementioned LUC performance objectives for LHAAP 12 are met and maintained:

6.1.1 Comprehensive Base-wide Land Use Control Management Plan

Within 30 days of receiving USEPA and TCEQ approval of this RD Addendum, the Army will develop a Comprehensive Base-wide LUC Management Plan which shall initially consist of this document and a survey plat showing the locations where the LHAAP-12 LUCs are applied. The purpose of this Comprehensive Base-wide LUC Management Plan is to ensure the all site-specific LUCs are compiled into one comprehensive location for both pre-transfer use by the installation and for post-transfer use by the transferee. This document is also accessible to regulators, the local government and the public. The Army will locate the Comprehensive Base-wide LUC Management Plan in the City of Marshall Public Library to accompany LHAAP's Administrative Record.

As LUC RD documents for additional environmental sites are approved by USEPA and TCEQ, the Army shall likewise add those documents and survey plats to the Comprehensive Base-wide LUC Management Plan as well as update the previous copy of the plan placed in the City of Marshall Public Library.

6.1.2 Site Inspections and Reporting

Beginning with finalization of this RD Addendum, the Army will undertake annual physical inspections and reporting to confirm continued compliance with all LUC objectives. The Army will provide USEPA and TCEQ with an annual LUC Compliance Inspection document consistent with the form attached hereto as **Appendix B**. In addition, should any deficiency(ies) be found during the annual inspection, the Army will provide to USEPA and TCEQ along with the document, a separate written explanation indicating the specific deficiency(ies) found and what efforts or measures have or will be taken to correct those deficiencies. Upon transfer, such responsibilities may shift to the transferee via appropriate provisions placed in the Environmental Condition of Property (ECOP). The need to continue annual inspections will be revisited at five year reviews.

6.1.3 Notice of Planned Property Conveyances

Planned conveyance of LHAAP-12 acreage is to U.S. Fish and Wildlife Service for incorporation into the Caddo Lake National Wildlife Refuge. The Army shall provide notice to USEPA and TCEQ of such intended conveyance. The notice shall describe the mechanism by which LUCs will continue to be implemented, maintained, inspected, reported, and enforced.

6.1.4 Opportunity to Review Text of Intended Land Use Controls

The Army will produce an ECOP for LHAAP-12, but before executing the letter of transfer, the Army will provide USEPA and TCEQ with a draft copy of that ECOP so that they may have reasonable opportunity, before document execution, to review all LUC-related provisions.

6.1.5 Notification Should Action(s) Which Interfere with Land Use Control Effectiveness Be Discovered Subsequent to Conveyance

Should the Army discover after conveyance of the site any activity on the property inconsistent with the LUC performance objectives, the Army shall notify USEPA and TCEQ within 72 hours of such discovery. Consistent with **Section 6.1.6** below, the Army will then work with USEPA, TCEQ and the transferee to correct the problem(s) discovered. This reporting requirement does not preclude the Army from taking immediate action pursuant to its CERCLA authorities to prevent any perceived risk(s) to human health or the environment.

6.1.6 Land Use Control Enforcement

Should the LUC remedy reflected in this LUC RD fail, the Army will coordinate with USEPA and TCEQ to ensure that appropriate actions are taken to reestablish its protectiveness. These

actions may range from informal resolutions with the owner or violator, to the institution of judicial action under the auspices of Texas property law or CERCLA. Alternatively, should the circumstances warrant such, the Army could choose to exercise its response authorities under CERCLA, and then seek cost recovery after the fact from the person(s) or entity(ies) who violated a given LUC. Should the Army become aware that any future owner or user of the property has violated any LUC requirement over which a local agency may have independent jurisdiction, the Army will notify these agencies of such violation(s) and work cooperatively with them to re-achieve owner/user compliance with the LUCs.

6.1.7 Modification or Termination of Land Use Controls

The Army shall not, without USEPA concurrence, make a significant modification to, or terminate a LUC, or make a land use change inconsistent with the LUC objectives and use assumptions of the selected remedy. Likewise, the Army shall seek prior USEPA concurrence before commencing actions that may impact remedy integrity. In the case of an emergency action, the Army shall obtain prior USEPA concurrence as appropriate to the exigencies of the situation.

The LUCs shall remain in effect until such time as the Army and USEPA agree that the concentrations of hazardous substances have been reduced to levels that allow for unlimited exposure and unrestricted use. When this occurs, the LUCs will be terminated as needed. The decision to terminate LUCs will be documented consistent with the NCP process for post-ROD changes, potentially including an explanation of significant differences or a remedial action completion report. If the property has been transferred and a determination by the Army and USEPA has been made to terminate one or more of the LUCs, the Army shall provide to the owner of the property an appropriate release for recordation pertaining to the site and will also timely advise other local stakeholders of the action.

6.2 Monitored Natural Attenuation Implementation Actions

Implementation actions include development of a groundwater monitoring plan, monitoring, and reporting. Groundwater monitoring will be conducted to monitor the effectiveness of MNA in reducing contaminant concentrations over time. Monitoring will also be conducted to evaluate plume migration and ensure that TCE-contaminated groundwater does not impact nearby surface water at unacceptable levels. The Groundwater Monitoring Plan, attached as **Appendix A**, describes the wells, their locations, analytical parameters, and the frequency of the monitoring.

Annual reports will be prepared to document the monitoring program. The first year annual report will include a review of the first four quarters of data which include natural attenuation parameters and provide an evaluation for the evidence of MNA as a remedial method. The TCEQ provides guidance for MNA as a remedial action in *Monitored Natural Attenuation*

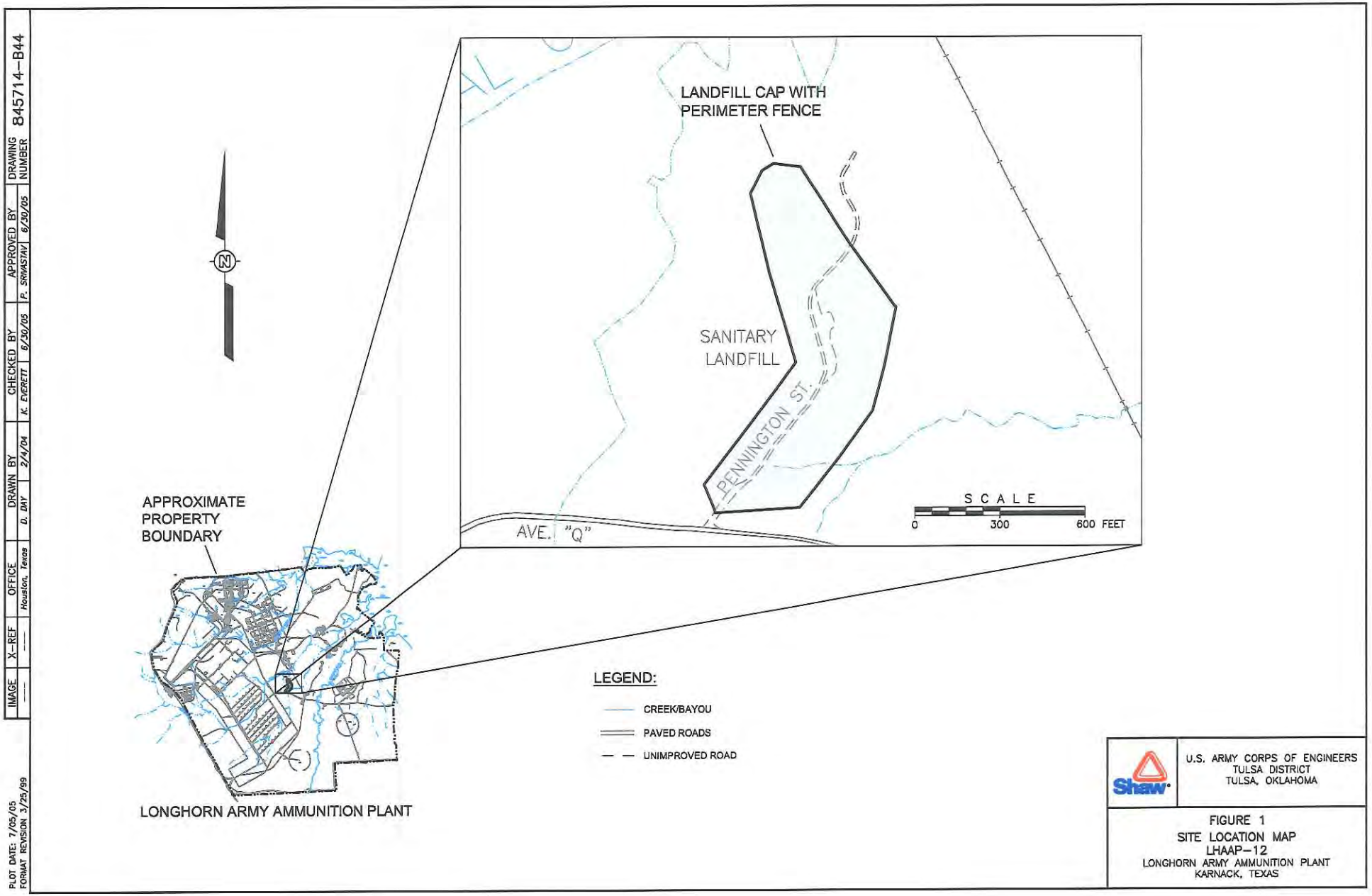


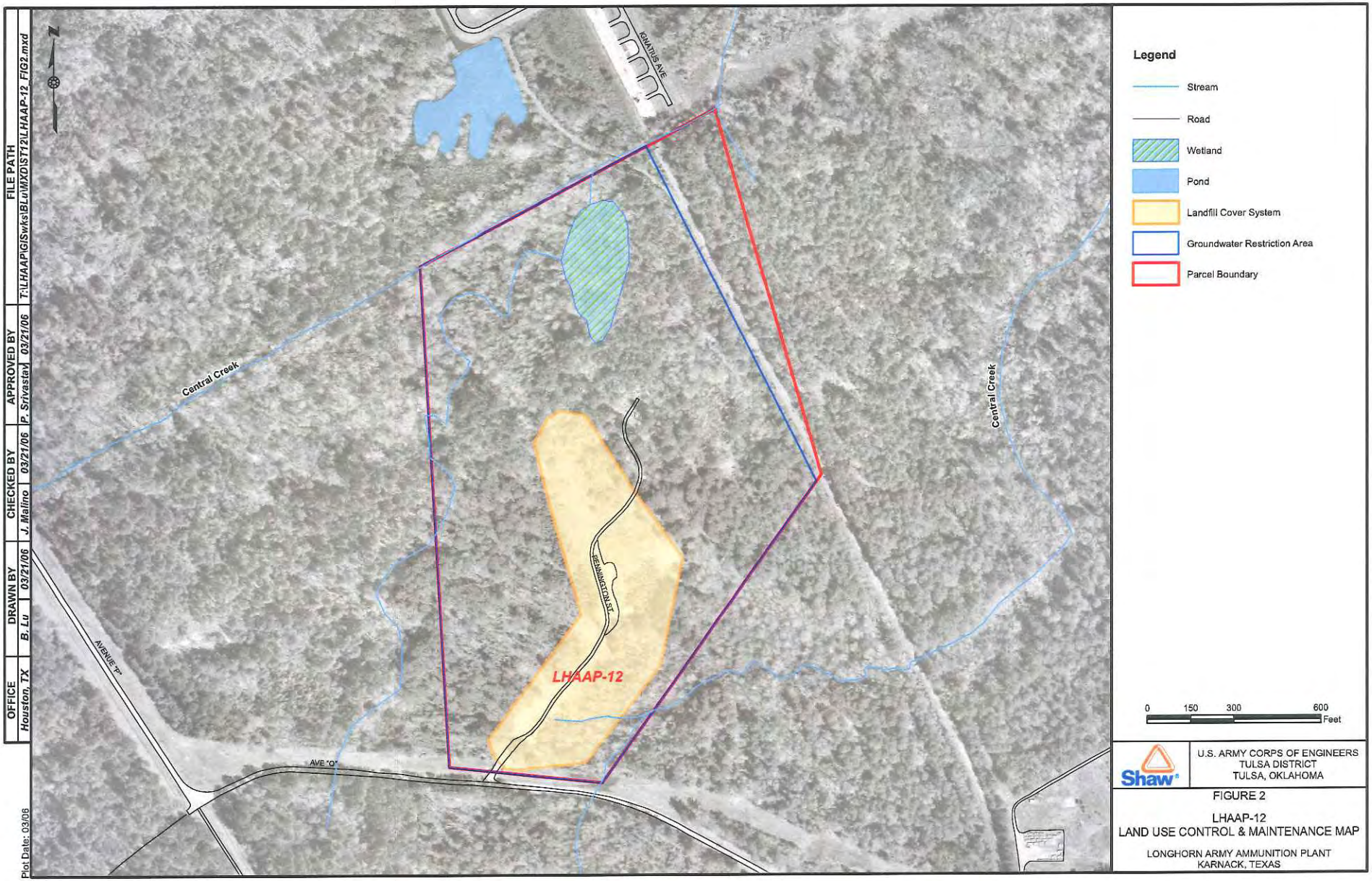
IMAGE	X-REF	OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
		Houston, Texas	D. DAY 2/14/04	K. EVERETT 6/30/05	P. SRIVASTAV 6/30/05	845714-B44

PLOT DATE: 7/05/05
FORMAT REVISION 3/25/99

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 1
SITE LOCATION MAP
LHAAP-12
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

00943071


Legend
Stream
Road
Wetland
Pond
Landfill Cover System
Groundwater Restriction Area
Parcel Boundary
Central Creek
Central Creek
IGNATIUS AVE
REMINGTON ST
AVENUE "P"
AVE "O"
LHAAP-12
0 150 300 600
Feet
Shaw
U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA
FIGURE 2
LHAAP-12
LAND USE CONTROL & MAINTENANCE MAP
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
OFFICE Houston, TX
DRAWN BY B. Lu 03/21/06
CHECKED BY J. Malino 03/21/06
APPROVED BY P. Srivastav 03/21/06
FILE PATH T:\LHAAP\GIS\wrks\BLu\MXD\ST12\LHAAP-12_FIG2.mxd
Plot Date: 03/06

Appendix B

Sample Annual Land Use Control Compliance Inspection Documentation

Sample Annual Land Use Control Compliance Inspection Documentation

In accordance with the Remedial Design Addendum dated _____ for LHAAP-12, an inspection of site was conducted by _____ [indicate transferee] on_____.

A summary of land use control mechanisms is as follows:

- Land use and restriction covenants included in ECOP – [Indicate whether the ECOP is on file with the notice of transfer]
- Groundwater restriction – [Indicate whether groundwater restrictions are still required at LHAAP-12]

A summary of compliance with land use and restriction covenants is as follows:

- No use of groundwater, installation of new groundwater wells, or tampering with existing wells at LHAAP-12
- No reuse activity at LHAAP-12 that would adversely affect the integrity of the landfill cap
- The fence and posted signs are properly maintained at LHAAP-12
- The vegetative cover is properly maintained over the landfill
- Landfill cap is properly maintained with no evidence of erosion, cracking, settlement, or other damage to engineered components

I, the undersigned, do document that the inspection was performed 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: _____

Completed annual compliance inspection forms, with relevant annual compliance certification forms, shall be sent no later than March 1 of each year for the previous calendar year.

U.S. Department of the Army
TCEQ
USEPA Region 6

LHAAP-12, 12-3

NOTICE OF LAND USE CONTROLS AND NONRESIDENTIAL LAND USE AT LHAAP-12 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

Doc 7009064 Bk OR Vol 364 Pg 00943075

FILED FOR RECORD

07 JUN 13 AM 10: 09

PATSY COX
CO CLERK, HARRISON CO

BY _____ DEPUTY

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF LAND USE CONTROLS AT LHAAP-12

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 a remediation of the land described herein. The remediation site is a capped landfill located on the Former Longhorn Army Ammunition Plant (LHAAP) and is designated as LHAAP-12. The site is included in TCEQ Notice of Registration No. 30990 as Unit Number 001. LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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-12 were performed in accordance with the FFA requirements.

The landfill was used intermittently for the disposal of industrial solid waste, possibly containing small quantities of hazardous constituents generated at LHAAP. A Record of Decision (ROD) for LHAAP-12 was signed by USEPA in 1995 establishing the construction of a cap as an interim remedial action for the site to mitigate potential risks posed by the burial of landfill waste. Construction of the landfill cap was completed in 1998. The final remedy consists of land use controls (LUCs) in conjunction with monitored natural attenuation as documented in the Final ROD signed by USEPA on July 24, 2006. The site was not remediated to levels suitable for unrestricted use. LUCs at LHAAP-12 are required to ensure the integrity of the landfill cap and cover system and prevent human exposure to contaminated groundwater. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the

Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-12 parcel is a 50.541 acre tract, 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. Within the LHAAP-12 parcel are designated LUC boundaries including a 9.429 acre tract, more or less, and a 45.939 acre tract, more or less, 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. The United States Department of the Army has undertaken careful environmental study of the LHAAP-12 site and concluded that the LUCs set forth below are required to ensure protection of human health and the environment.

(1) **Landfill Restriction**. A closed non-hazardous landfill (LHAAP-12) of approximately 7 acres is located within the 9.429 acre tract. The landfill restriction boundary consists of the 7-acre capped landfill and an area extending to the surrounding fence. LUCs have been established to protect the integrity of the remedy. No activity shall be conducted or permitted that would damage the integrity of the landfill cover (i.e. digging or disturbing the existing cover or contents of the landfill). The LUCs will remain in place for perpetuity unless otherwise removed by the U.S. Army per agreement with the USEPA and TCEQ.

(2) **Residential Use Restriction**. The residential use restriction boundary consists of the 9.429 acre-tract, more or less, and includes the 7-acre capped landfill and an area extending to the surrounding fence. This tract shall be used solely for the purpose of a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

(3) **Groundwater Restriction.** The groundwater use restriction boundary consists of the 45.939 acre tract, more or less, and extends beyond the landfill

boundary. Groundwater underlying this land is contaminated with trichloroethene (TCE) and other volatile organic compounds and shall not be accessed or used for any purpose without the prior written approval of U.S. Army, the USEPA and the TCEQ. A LUC restricting the use of groundwater has been established for the protection of human health. The U.S. Army will notify the Texas Department of Licensing and Regulation of the groundwater restriction which includes prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval by the U.S. Army, the USEPA and the TCEQ. The LUC will remain in place until applicable or relevant and appropriate requirements (ARARs) as established in accordance with the National Oil and Hazardous Substances Pollution Contingency Plan (40 Code of Federal Regulation 300) are met. Due to the potential for TCE-contaminated groundwater to migrate, monitored natural attenuation will be implemented to assure that TCE-contaminated groundwater will not migrate to nearby surface water at levels that may present an unacceptable risk to human health and the environment. The monitoring and reporting associated with this remedy will continue until ARARs are achieved.

The owner of the site is the Department of the Army, and its address where more specific information may be obtained from is as follows:

ATTN: DAIM-BD-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 13th day of June, 2007.

BEFORE ME, on this the 13th day of June, personally appeared Rose M. Zeiler, of 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 13 day of June, 2007.

NOTARY PUBLIC STATE OF TEXAS
LYNDA G. HAYS
Notary Public State of Texas
COMM. EXP. 5-02-2010

Lynda G. Hays
Notary Public in and for the State of Texas,
County of Harrison

Doc Bk Vol Pg
7009064 OR 3640 4

EXHIBIT A

NOTE

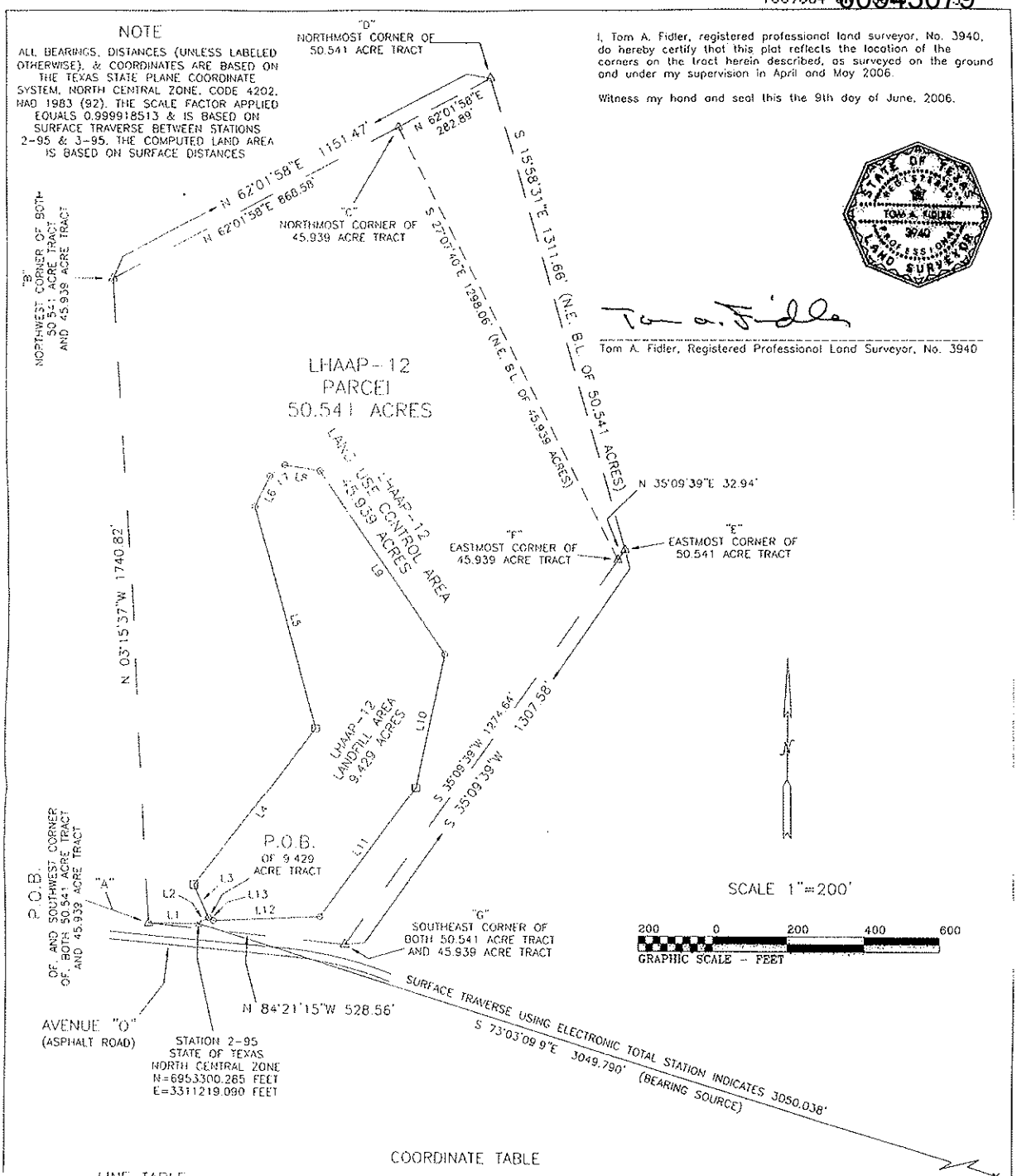
ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999918513 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS 2-95 & 3-95. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in April and May 2006.

Witness my hand and seal this the 9th day of June, 2006.

STATE OF TEXAS REGISTERED TOM A. FIDLER 3940 PROFESSIONAL LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940



LINE TABLE

COURSE	BEARING	DISTANCE
L1	S 89°52'35"W	132.09'
L2	N 58°35'33"E	31.72'
L3	N 23°52'43"W	96.81'
L4	N 37°07'57"E	537.87'
L5	N 15°28'17"W	618.92'
L6	N 26°16'28"E	90.81'
L7	N 54°00'30"E	50.67'
L8	S 81°02'29"E	96.24'
L9	S 34°25'01"E	596.16'
L10	S 12°11'35"W	370.18'
L11	S 36°09'00"W	434.64'
L12	S 87°15'04"W	286.47'
L13	N 57°18'20"W	15.33'

COORDINATE TABLE

POINT	NORTH	EAST
A	6953300.000	3311087.000
B	6955038.000	3310988.000
C	6955445.333	3311755.144
D	6955578.000	3312005.000
E	6954317.000	3312366.000
F	6954290.070	3312347.030
G	6953248.000	3311613.000

NOTES:

- O INDICATES 12" DIAMETER WOODEN FENCE CORNER POST (FOUND)
- □ INDICATES 10" DIAMETER WOODEN FENCE CORNER POST (FOUND)
- × INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- △ INDICATES 1/2" IRON REBAR WITH ORANGE PLASTIC CAP ENGRAVED "FIDLER" & "RPLS 3940" (SET IN CONCRETE)
- ——— INDICATES BARBED WIRE FENCE AND PERIMETER OF 9.429 ACRE TRACT
- — — — INDICATES PERIMETER OF 50.541 ACRE TRACT ONLY
- — · — · — INDICATES PERIMETER OF 45.939 ACRE TRACT ONLY
- ——— ——— INDICATES PERIMETER OF BOTH 50.541 ACRE TRACT AND 45.939 ACRE TRACT

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

SHEET 1 OF 4

50.541 ACRES
45.939 ACRES
9.429 ACRES
LONGHORN army AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	0605063A.DWG
06/09/2006	0605063.CRD	DRAWN BY JTJ

FIELD NOTES DESCRIPTION OF
"LHAAP-12 PARCEL"
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The hereinafter described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP-12 Parcel" being 50.541 acres of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract "LHAAP-12 Parcel" being more particularly described as follows:

Surveyor's Note: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999918513, and is based on surface traverse (using electronic total station) between type "G" Corps of Engineers monuments "2-95"(N=6953300.285 feet & E=3311219.090 feet) and "3-95"(N=6952411.298 feet & E=3314136.438 feet). Said traverse indicates a surface distance of 3050.038 feet between said monuments. The computed land area is based on surface distances. As used herein, the abbreviation I.R.O.P.C. indicates 1/2" iron rebar with orange plastic cap engraved "Fidler" & "RPLS 3940".

Commencing at the monument "2-95" referenced above,

THENCE S 89deg52'35"W 132.09' to an I.R.O.P.C. set in concrete for the S.W.C. of this tract and this POINT OF BEGINNING,

THENCE N 03deg15'37"W 1740.82' along the W.B.L. of this tract to an I.R.O.P.C. set in concrete for this tract's Northwest corner,

THENCE N 62deg01'58"E 1151.47' along the N.W. B.L. of this tract to an I.R.O.P.C. set in concrete for this tract's Northmost corner,

THENCE S 15deg58'31"E 1311.66' along the N.E. B.L. of this tract to an I.R.O.P.C. set in concrete for this tract's Eastmost corner,

THENCE S 35deg09'39"W 1307.58' along the S.E. B.L. of this tract to an I.R.O.P.C. set in concrete for this tract's Southeast corner,

THENCE N 84deg21'15"W 528.56' along the S.B.L. of this tract to this POINT OF BEGINNING, containing 50.541 acres, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

FIELD NOTES DESCRIPTION OF
"LHAAP-12 LAND USE CONTROL AREA"
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The hereinafter described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP-12 Land Use Control Area" being 45.939 acres of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said "LHAAP-12 Land Use Control Area" being more particularly described as follows:

Surveyor's Note: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999918513, and is based on surface traverse (using electronic total station) between type "G" Corps of Engineers monuments "2-95"(N=6953300.285 feet & E=3311219.090 feet) and "3-95"(N=6952411.298 feet & E=3314136.438 feet). Said traverse indicates a surface distance of 3050.038 feet between said monuments. The computed land area is based on surface distances. As used herein, the abbreviation I.R.O.P.C. indicates 1/2" iron rebar with orange plastic cap engraved "Fidler" & "RPLS 3940".

Commencing at the monument "2-95" referenced above,

THENCE S 89deg52'35"W 132.09' to an I.R.O.P.C. set in concrete for the S.W.C. of this tract and this POINT OF BEGINNING,

THENCE N 03deg15'37"W 1740.82' along the W.B.L. of this tract to an I.R.O.P.C. set in concrete for this tract's Northwest corner,

THENCE N 62deg01'58"E 868.58' along the N.W. B.L. of this tract to an I.R.O.P.C. set in concrete for this tract's Northmost corner,

THENCE S 27deg07'40"E 1298.06' along the N.E. B.L. of this tract to an I.R.O.P.C. set in concrete for this tract's Eastmost corner,

THENCE S 35deg09'39"W 1274.64' along the S.E. B.L. of this tract to an I.R.O.P.C. set in concrete for this tract's Southeast corner,

THENCE N 84deg21'15"W 528.56' along the S.B.L. of this tract to this POINT OF BEGINNING, containing 45.939 acres, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

FIELD NOTES DESCRIPTION OF
"LHAAP-12 LANDFILL AREA"
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The hereinafter described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP-12 Landfill Area" being 9.429 acres of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said "LHAAP-12 Landfill Area" being more particularly described as follows:

Surveyor's Note: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999918513, and is based on surface traverse (using electronic total station) between type "G" Corps of Engineers monuments "2-95"(N=6953300.285 feet & E=3311219.090 feet) and "3-95"(N=6952411.298 feet & E=3314136.438 feet). Said traverse indicates a surface distance of 3050.038 feet between said monuments. The computed land area is based on surface distances. As used herein, the abbreviation I.R.O.P.C. indicates 1/2" iron rebar with orange plastic cap engraved "Fidler" & "RPLS 3940".

Commencing at the monument "2-95" referenced above,

THENCE N 58deg35'33"E 31.72' to a 12" diameter wooden fence corner post found for a Southwest corner of this tract and this POINT OF BEGINNING,

THENCE generally along a barbed wire fence the following eleven courses,

N 23deg52'43"W 96.81' to a 10" diameter wooden fence corner post found for the Westmost corner of this tract,

N 37deg07'57"E 537.87' to a 10" diameter wooden fence corner post,

N 15deg28'17"W 618.92' to a 12" diameter wooden fence corner post,

N 26deg16'28"E 90.81' to a 12" diameter wooden fence corner post,

N 54deg00'30"E 50.67' to a 12" diameter wooden fence corner post found for the Northmost corner of this tract,

SHEET 4b OF 4

S 81deg02'29"E 96.24' to a 12" diameter wooden fence corner post,

S 34deg25'01"E 596.16' to a 12" diameter wooden fence corner post found for the Eastmost corner of this tract,

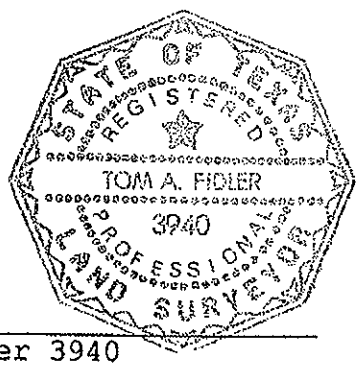
S 12deg11'35"W 370.18' to a 10" diameter wooden fence corner post,

S 36deg09'00"W 434.64' to a 12" diameter wooden fence corner post,

S 87deg15'04"W 286.47' to a 12" diameter wooden fence corner post,

N 57deg18'20"W 15.33' to this POINT OF BEGINNING, containing 9.429 acres, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

Doc Bk Vol Pg
7009064 OR 3640 10

FIGURE 1

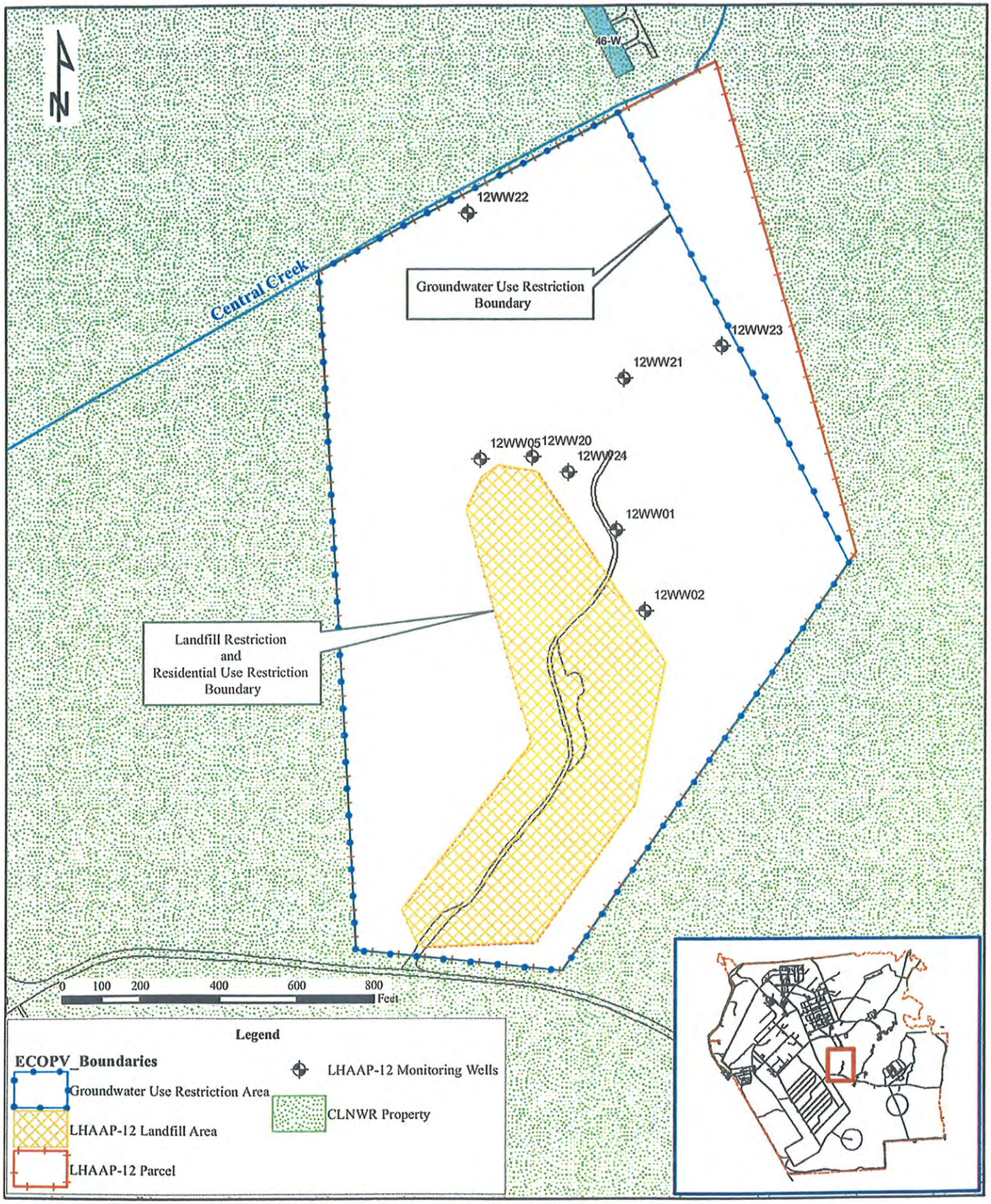


FIGURE 1

Land Use Control Boundaries

00943086

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7009064	OR	3640	12

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 volume and page of the named records of:

Harrison County

as stamped hereon by me.

Jun 13,2007

HONORABLE PATSY COX, COUNTY CLERK
Harrison County

LHAAP-12, 12-4

LAND USE CONTROL COMPLIANCE INSPECTION FORM

September 14, 2015

LHAAP-12, Landfill 12 Parcel
Annual Land Use Control Compliance Certification

Land use controls (LUC) at LHAAP-12 in the Landfill 12 Parcel:

• Land use restriction – Prohibition of any activities that would affect the integrity of the cap (i.e. no digging or disturbing the existing cover or contents of the landfill) and of residential use or residential development of the property

• Groundwater use restriction – Prohibition of any activities that would cause exposure to contaminated groundwater (i.e. no withdrawal or use of groundwater for other than environmental monitoring and testing)

Compliance with land use controls:

• No use of groundwater or installation of new groundwater wells (except that required for environmental monitoring and testing), or tampering with existing wells at LHAAP-12

• No reuse activity at LHAAP-12 that would adversely affect the integrity of the landfill cap (i.e no digging or disturbing the existing cover or contents of the landfill) and cap protective components (fencing and signage), and no residential use or residential development of the property

Inspection: In accordance with the LHAAP-12 Remedial Design Addendum dated 21 June 2007, an inspection of LHAAP-12 was conducted by _____ on_____ to visually confirm compliance with the LUCs.

I, the undersigned, do document that the inspection was performed 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: _____

Completed annual compliance form, to be kept on file at the Administrative Office of the Caddo Lake National Wildlife Refuge by the Refuge staff and available to EPA, TCEQ and Army upon request. The certification shall be conducted no later than March 1 of each year for the previous calendar year.

LHAAP – 16, 16-1
DRAFT LUC INSPECTION AND MAINTENANCE LOG
(RAO Inspection and Maintenance Checklist)
(Well Inspection Form)

November 28, 2017

RAO Inspection and Maintenance Checklist

General Information	
Project Name	RAO 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?					

DRAFT

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?					

DRAFT

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?					

DRAFT

WELL INSPECTION FORM

Job Name: _____ Well ID: _____

Job No.: _____ Completed Date: _____

Client: _____ Measured Depth: _____

Site Location: _____ Inspector: _____

☐ **ABOVE GROUND**

Protective casing? ☐ Yes ☐ No

Material _____

Condition: ☐ Good ☐ Broken ☐ Cracked

Lid Condition: ☐ Good ☐ Broken ☐ Cracked

Hinge Condition: ☐ Good ☐ Less than 50% rusted ☐ More than 50% rusted

☐ **FLUSH MOUNTED**

Well cover present? ☐ Yes ☐ No

Condition: ☐ Good ☐ Broken ☐ Cracked

Condition of Sump: ☐ Clean ☐ Dry ☐ Standing Water

CONCRETE PAD:

Visible? ☐ Yes ☐ No

Dimensions _____ Thickness _____

Sloped away from casing? ☐ Yes ☐ No

Check any of the following features that apply:

☐ Many Cracks ☐ Gap Around Casing ☐ Few Cracks ☐ Ponded Water ☐ No Pad Present

CONCRETE PAD:

Inner Diameter (inches) _____

Condition: ☐ Good ☐ Broken ☐ Cracked ☐ Other (describe) _____

Cap present? ☐ Yes ☐ No

Well lock present? ☐ Yes ☐ No

Lock functioning properly? ☐ Yes ☐ No

Bump post? ☐ Yes ☐ No

Well ID visible? ☐ Yes ☐ No

WELL INTEGRITY:

Bailer present? ☐ Yes ☐ No

Visual obstruction? ☐ Yes ☐ No

Is well open to completed depth? ☐ Yes ☐ No

Is silt present in well? ☐ Yes ☐ No

Is silt greater than 25% of well screen length? ☐ Yes ☐ No

COMMENTS:

LHAAP-16, 16-2
LUCs FROM DRAFT-FINAL REMEDIAL DESIGN

November 28, 2017

DRAFT FINAL
REMEDIAL DESIGN
LHAAP-16 LANDFILL
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Prepared For:





U.S. Army Corps of Engineers
Tulsa District

Prepared By:

AECOM

AECOM Technical Services

January 2017

DRAFT FINAL
REMEDIAL DESIGN LHAAP-16 LANDFILL
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Prepared For:

U.S. Army Corps of Engineers

Tulsa District

Prepared By:

AECOM Technical Services

Contract No. W912DY-09-D-0059

Task Order No. DS01

January 2017

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Acronyms and Abbreviations

µg/L	microgram per liter
ABC+	Anaerobic Biochem Plus
API	American Petroleum Institute
ARAR	applicable or relevant and appropriate requirements
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm/sec	centimeters per second
COC	contaminant of concern
DCA	Dichloroethane
DCE	Dichloroethene
DO	dissolved oxygen
DPT	direct push technology
ECP	Environmental Condition of Property
EDS-ER	Electron Donor Solution - Extended Release
ESD	Explanation of Significant Difference
ESTCP	Environmental Security Technology Certification Program
EVO	emulsified vegetable oil
FFA	Federal Facilities Agreement
FS	Feasibility Study
HDPE	high-density polyethyelene
HFCS	high-fructose corn syrup
HSA	hollow stem auger
IRA	Interim Remedial Action
ISB	in-situ bioremediation
IWWP	Installation-Wide Work Plan
lbs	pounds
LHAAP	Longhorn Army Ammunition Plant
LTM	long-term monitoring
LUC	land use control
mg/L	milligrams per liter

MNA	monitored natural attenuation
MOA	Memorandum of Agreement
msl	mean sea level
mV	millivolt
NPL	National Priorities List
O&M	operation and maintenance
ORP	Oxidation-Reduction Potential
RACR	Remedial Action Completion Report
RAO	Remedial Action Objectives
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
ROI	Radius of Influence
SARA	Superfund Amendment and Reauthorization Act
TAC	Texas Administrative Code
TCA	Trichloroethane
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
U.S.	United States
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
VOC	volatile organic compound
VC	Vinyl chloride
ZVI	zero valent iron

5 LAND USE CONTROL REMEDIAL DESIGN

This section describes the LUC RD for LHAAP-16. In accordance with the Final ROD (U.S. Army, 2016), the LUC RD will be finalized as the land use component of the Remedial Design.

Per the Final ROD (U.S. Army, 2016), LUCs' performance objectives are to:

- Prohibit access to the contaminated groundwater except for environmental monitoring and testing only;
- Preserve the integrity of the landfill cap, and to restrict intrusive activities (e.g., digging) that would degrade or alter the cap;
- Restrict land use to nonresidential;
- Maintain the integrity of any current or future remedial or monitoring systems; and

The implementation, maintenance, and inspection requirements associated with each of the performance objectives that comprise this LUC RD are described below. The actions taken to implement the LUC objectives during the RA phase, as well as ongoing maintenance, monitoring and reporting requirements will be presented in the Remedial Action Completion Report (RACR), as the final LUC RD. Upon regulatory review and concurrence with the final LUC RD, it will be distributed as part of the Comprehensive LUC Management Plan.

For portions of the Site subject to land use controls that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of land use controls, and coordinate with federal, state, and local governments and owners and occupants of properties subject to land use controls. The Army remains responsible for ensuring that the remedy remains protective of human health and the environment.

5.1 LUC Implementation

The actions required to implement the LUCs for LHAAP-16 are described below. The first of these, the initial notice of LUCs, has been completed. A figure depicting the preliminary LUC boundaries is presented in **Figure 5-1**. The following actions will be undertaken to implement the LUCs for LHAAP-16:

- Provide initial notice of the LUCs before remedial action is implemented.
    - Develop the initial notice of the groundwater and soil (surface and subsurface) contamination and any land use restrictions referenced in the ROD. The notice will consist of a brief description of the contaminants in groundwater and soil, a written description of the LUCS and a figure depicting the preliminary LUC boundaries presented in **Figure 5-1**.
    - Transmit the notice to federal, state and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and land use controls within 90 days of ROD signature, which is on or before December 12, 2016. The notices will be sent to federal, state and local officials including: U.S. Senator Ted Cruz, U.S. Senator John Cornyn, U.S. Congressman Louie Gohmert, State Senator Kevin Eltiffe, State Representative Chris Paddie, Harrison County

Judge Hugh Taylor, Harrison County Commissioner Precinct 1 William D. Hatfield, City of Uncertain Mayor Sam Canup, and Karnack Water Supply Corporation Board Members. Notice will also be sent to the Caddo Lake National Wildlife Refuge Manager.

- Finalize the Boundaries for the LUCs as a part of the remedial action.
    - Revise the boundaries if necessary. The LUC boundary presented in this RD is subject to change, based on COC results from the two proposed wells to be installed on the east side of Harrison Bayou. The final boundaries of the groundwater LUCs (prevent the use of groundwater contaminated above cleanup levels as a potable water source and prohibit access to the contaminated groundwater except for environmental monitoring and testing only); the landfill LUCs (preserve the integrity of the landfill cap, and to restrict intrusive activities (e.g., digging) that would degrade or alter the cap); the remedial or monitoring system LUCs (maintain the integrity of any current or future remedial or monitoring systems); and, the nonresidential land use LUC (restrict land use to nonresidential) will be reviewed during remedial action activities after an evaluation of new data has been completed and revised if necessary.
    - Survey the LUC Boundaries. The boundaries will be finalized after concurrence by USEPA and TCEQ, and the LUC boundaries will be surveyed by a State-licensed surveyor. A legal description of the surveyed areas will be appended to the survey plat.
- Record the LUCs in Harrison County. The LUC plat, legal description and LUC restriction language will be recorded in the Harrison County Courthouse in accordance with TAC Title 30, §335.566.
- Notify the Texas Department of Licensing and Regulation of the groundwater LUCs. The Texas Department of Licensing and Regulation will be notified of the groundwater restrictions, which include the prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval from the Army, the USEPA, and the TCEQ. The survey plat, legal boundary and description of the groundwater restriction LUCs, in conjunction with a locator map, will be provided in hard and electronic copy.

5.2 Maintenance and Monitoring Requirements

The LUCs will be maintained in place as follows:

- The landfill LUCs will remain in place as long as the landfill waste remains at the site or until the levels of Contaminants of Concern (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 1-1**) allow for unlimited use and unrestricted exposure;
- The LUCs restricting the use of groundwater to environmental monitoring and testing only and the LUC restricting land use to nonresidential will remain in place until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site

at cleanup levels as listed in **Table 1-1**) in surface and subsurface soil and groundwater allow for unlimited use and unrestricted exposure;

- The LUC to maintain the integrity of any current or future remedial or monitoring systems will remain in place until groundwater cleanup levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 1-1**) are met; and,
- The LUC prohibiting groundwater use (except for environmental monitoring and testing) as a potable source will remain in place until the levels of COCs (i.e., all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Table 1-1**) in soil and groundwater allow for unlimited use and unrestricted exposure.

Landfill and Remedial or Monitoring System LUCs include physical components that require repair and maintenance. These are described in **Section 3.0.** The Inspection and Maintenance Checklist is provided in **Appendix A.**

The administrative maintenance required to ensure the five LUCs remain in place and effective until the cleanup levels of the COCs are at levels that allow unrestricted use and unlimited exposure are:

- Annual field inspections of the site to confirm that no violations of the LUCs have occurred. Documentation of the inspection will be included in the Inspection and Maintenance Checklist (see **Appendix A).**
- Annual certifications that no LUC-restricted activities have been authorized and that site conditions and use are consistent with the LUCs. The Certification Form is presented in **Appendix E).**
- Periodic transmittal of a LUC Notice to federal, state, and local authorities and to owners and occupants of LHAAP-16. The notice will include the groundwater and soil (surface and subsurface) contamination and any 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 RD appendix of the RACR will be added to the Comprehensive LUC Management Plan and the plan will be provided to the owner or occupant of LHAAP-16.

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.

5.3 Reporting of LUC Inspection and Monitoring

Beginning with finalization of this RD and approval of the Inspection and Maintenance forms and the Annual Certification Form, the U.S. Army will undertake inspections and certify continued compliance with the LUC objectives. The U.S. Army, or the transferee after transfer, will retain the LUC Inspection and Certification documents in the project files for incorporation into the five-year review reports, and these documents will be made available to USEPA and TCEQ upon request. In addition, should any violations be found during the certification, the U.S. Army will provide to USEPA and TCEQ, along with the document, a separate written explanation indicating the specific violations found and what efforts or measures have or will be

taken to correct those violations. The need to continue inspections and certifications will be revisited at five year reviews.

5.3.1 Notice of Planned Property Conveyances

Upon transfer of Army-owned property, the Army will provide written notice to the transferee of the LHAAP-16 groundwater and soil (surface and subsurface) contamination and any land use restrictions. Within 15 days of transfer, the U.S. Army will provide written notice to USEPA and TCEQ of the division of implementation, maintenance, and enforcement responsibilities unless the information has already been provided in the LUC RD. The notice will describe the mechanism by which the LUC will continue to be implemented, maintained, inspected, reported, and enforced. Upon transfer, such responsibilities may shift to the transferee via appropriate provisions placed in the Environmental Condition of Property (ECP) or other environmental document for transfer. Although the US Army may transfer responsibility for various implementation actions, the U.S. Army will also retain ultimate responsibility for the remedy integrity. This means that the U.S. Army is responsible for addressing substantive violations of the LUC performance objectives that would undermine the U.S. Army's CERCLA remedy. The US Army also will be responsible for incorporating RD information and outlining the transferee's LUC obligations into property transfer documentation. In the event property is transferred out of Federal control, the land use controls relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas.

5.3.2 Opportunity to Review Text of Intended Land Use Controls

The US Army will provide a copy of the groundwater and land use restriction notification to TCEQ for review and approval prior to its recordation in Harrison County. USEPA will also receive a copy for review. The US Army will produce an ECP or other environmental document for transfer of LHAAP-16, but before executing transfer, the US Army will provide USEPA and TCEQ with a copy of the ECP or other environmental document for transfer so that they may have reasonable opportunity, before transfer, to review all LUC-related provisions.

5.3.3 Notification Should Action(s) which Interfere with land Use Control Effectiveness be Discovered Subsequent to Conveyance

Should the US Army discover after conveyance of the site any activity on the property inconsistent with the LUC performance objectives, the US Army shall notify USEPA and TCEQ within 72 hours of such discovery. Consistent with Section 5.2.5 below, the US Army will then work with USEPA, TCEQ and the transferee to correct the problem(s) discovered. This reporting requirement does not preclude the US Army from taking immediate action pursuant to its CERCLA authorities to prevent any perceived risk(s) to human health or the environment.

5.3.4 Land Use Control Enforcement

Should the LUC remedy reflected in this RD fail, the US Army will coordinate with USEPA and TCEQ to ensure that appropriate actions are taken to reestablish its protectiveness. These actions are taken to reestablish its protectiveness. These actions may range from informal resolutions with the USFWS or its lessee, to the institution of judicial action against non-federal third

parties. Alternatively, should the circumstances warrant such, the US Army could choose to exercise its response authorities under CERCLA. Should the US Army become aware that any future owner or user of the property has violated any LUC requirement over which a local agency may have independent jurisdiction, the US Army may notify those agencies of such violation(s) and work cooperatively with them to re-achieve owner/user compliance with the LUC.

5.3.5 Modification or Termination of Land Use Controls

The LUCs shall remain in effect until such time as the US Army and USEPA agree that the concentrations of COCs in groundwater have met cleanup levels in groundwater and that surface and subsurface soil concentrations allow unrestricted use. When this occurs, the LUC will be terminated as needed. The decision to terminate the LUC will be documented consistent with the NCP process for post-ROD changes, potentially including an explanation of significant differences or a remedial action complete report. If the property has been transferred and a determination by the US Army and USEPA has been made to terminate the LUC, the US Army shall provide to the owner of the property an appropriate release for recordation pertaining to the site and will also timely advise other local stakeholders of the action.

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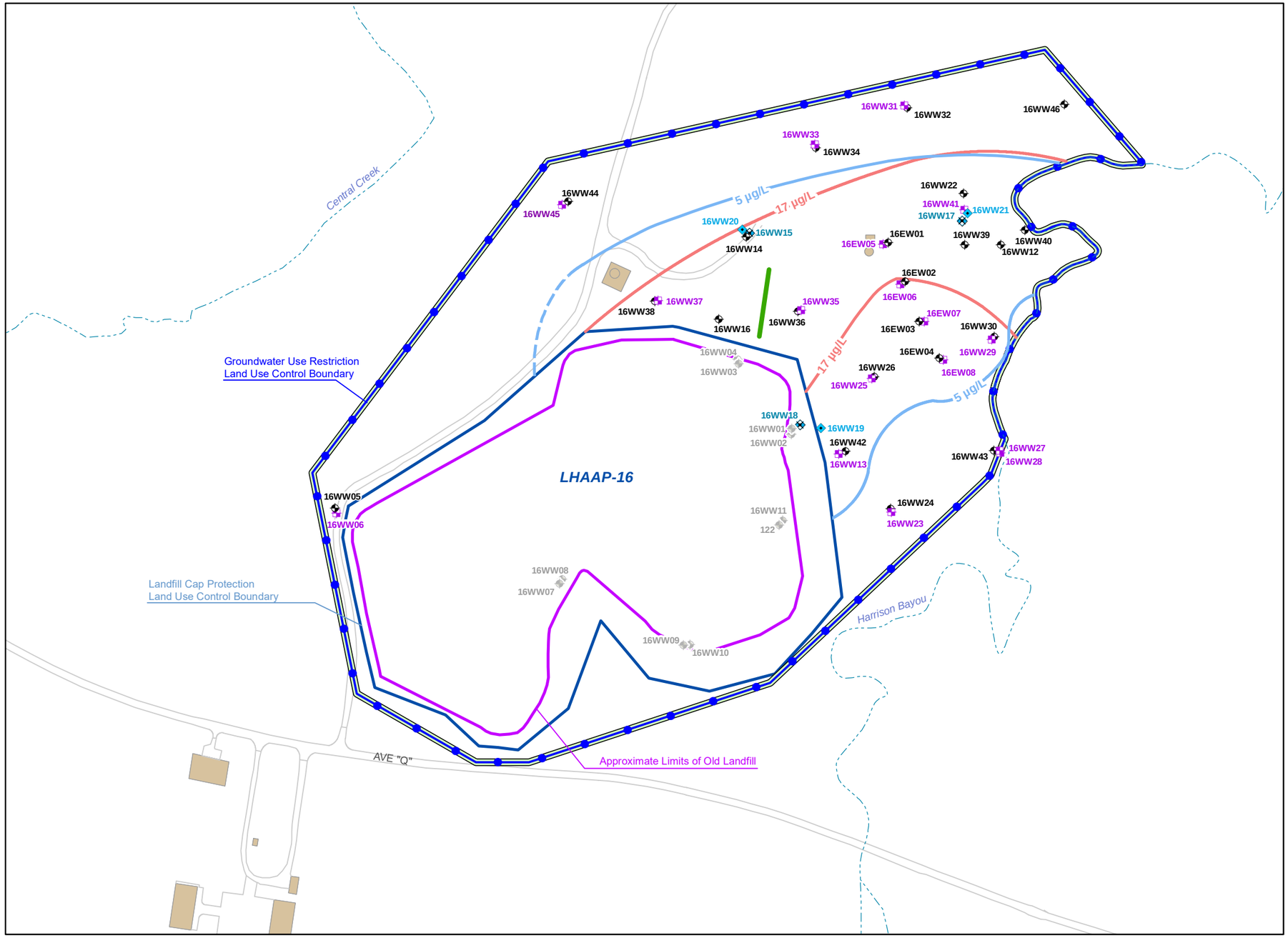

Legend

- Existing Shallow Monitoring Well
- Existing Intermediate Monitoring Well
- Existing Upper Deep Monitoring Well
- Existing Lower Deep Monitoring Well
- Abandoned or Plugged Well
- Extent of Perchlorate Contamination > 17 ug/L in Intermediate and Shallow Zones (May 2013)
- Extent of TCE Contamination > 5 ug/L in Intermediate and Shallow Zones (Dashed Where Inferred) (May 2013)
- Location of Semi-Passive Biobarrier Demonstration (February 2004 through June 2006 [ESTCP 2009]).
- Road
- Stream
- Remedial and Monitoring System Boundary
- Groundwater Use Restriction Land Use Control Boundary
- LHAAP-16 Landfill Fence

Path: L:\AGE\GIS\AUS GIS\GIS_Projects\Longhorn_AAP\01_Reports\LHAAP-16\RAWP\Fig 5-1 LHAAP-16 Land Use Control Boundaries.mxd

AECOM

Figure 5-1
Land Use Contol Boundaries
LHAAP-16 Remedial Design

Longhorn Army Ammunition Plant
Karnack, Texas

60256135

January 2017

LHAAP – 16, 16-3
NOTICE OF LAND USE CONTROL AND NONRESIDENTIAL LAND USE FOR LHAAP-16 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT) (PENDING)

Date October 4, 2019

LHAAP – 16, 16-4
LAND USE CONTROL COMPLIANCE INSPECTION FORM

November 28, 2017

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.

LHAAP – 17, 17-1
DRAFT LUC INSPECTION AND MAINTENANCE LOG
(RAO Inspection and Maintenance Checklist)
(Well Inspection Form)

Date October 4, 2019

RAO Inspection and Maintenance Checklist

General Information	
Project Name	RAO Inspection and Maintenance, LHAAP-17 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 ----------

A. Groundwater Monitoring Wells						
A.1	Are the installed groundwater monitoring wells in poor condition?					
A.2	Is the well cleared of vegetation and accessible?					
A.3	Any other relevant observations?					
A.4	Are there any significant cracks present?					
A.5	Are there any damaged areas?					

WELL INSPECTION FORM

Job Name: _____ Well ID: _____

Job No.: _____ Completed Date: _____

Client: _____ Measured Depth: _____

Site Location: _____ Inspector: _____

☐ **ABOVE GROUND**

Protective casing? ☐ Yes ☐ No

Material _____

Condition: ☐ Good ☐ Broken ☐ Cracked

Lid Condition: ☐ Good ☐ Broken ☐ Cracked

Hinge Condition: ☐ Good ☐ Less than 50% rusted ☐ More than 50% rusted

☐ **FLUSH MOUNTED**

Well cover present? ☐ Yes ☐ No

Condition: ☐ Good ☐ Broken ☐ Cracked

Condition of Sump: ☐ Clean ☐ Dry ☐ Standing Water

CONCRETE PAD:

Visible? ☐ Yes ☐ No

Dimensions _____ Thickness _____

Sloped away from casing? ☐ Yes ☐ No

Check any of the following features that apply:

☐ Many Cracks ☐ Gap Around Casing ☐ Few Cracks ☐ Ponded Water ☐ No Pad Present

CONCRETE PAD:

Inner Diameter (inches) _____

Condition: ☐ Good ☐ Broken ☐ Cracked ☐ Other (describe) _____

Cap present? ☐ Yes ☐ No

Well lock present? ☐ Yes ☐ No

Lock functioning properly? ☐ Yes ☐ No

Bump post? ☐ Yes ☐ No

Well ID visible? ☐ Yes ☐ No

WELL INTEGRITY:

Bailer present? ☐ Yes ☐ No

Visual obstruction? ☐ Yes ☐ No

Is well open to completed depth? ☐ Yes ☐ No

Is silt present in well? ☐ Yes ☐ No

Is silt greater than 25% of well screen length? ☐ Yes ☐ No

COMMENTS:

LHAAP – 17, 17-2
LUCs FROM DRAFT FINAL REMEDIAL DESIGN

Date October 4, 2019

Draft Final
Remedial Design and Remedial Action Work Plan, LHAAP-17 Burning Ground No. 2 / Flashing Area, Group 2

Longhorn Army Ammunition Plant
Karnack, Texas

Prepared for U.S. Army Corps of Engineers, Tulsa District
Contracting Division
2488 East 81st Street
Tulsa, Oklahoma 74137-4290

Prepared by

bhate ENVIRONMENT & INFRASTRUCTURE

1608 13th Avenue south, Suite 300
Birmingham, Alabama 35205
1-800-806-4001 • www.bhate.com

Prepared by

APTIM

Aptim Federal Services, LLC
2500 CityWest, Suite 1700
Houston, Texas 77042

Contract No. W9128F-13-D-0012
Task Order No. W9128BV17F0150
Project No. 501032
Rev 0
March 2019

Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Draft Final • Rev 0 • March 2019

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Acronyms and Abbreviations

µg/L	micrograms per liter
AECOM	AECOM Engineering Company
APTIM	Aptim Federal Services, LLC
Bgs	below ground surface
Bhate	Bhate Environmental, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COC	chemical of concern
COPEC	chemical of potential ecological concern
CY	cubic yards
DCE	dichloroethene
DNT	dinitrotoluene
ESD	Explanation of Significant Differences
FFA	Federal Facility Agreement
gpm	gallons per minute
GPS	global positioning system
GWTP	groundwater treatment plant
HDPE	high density polyethylene pipe
IWWP	Installation-Wide Work Plan
LHAAP	Longhorn Army Ammunition Plant
LOE	line of evidence
LTM	long-term monitoring
LUC	land use control
mg/kg	milligrams per kilogram
MNA	monitored natural attenuation
MOA	Memorandum of Agreement
NCP	National Contingency Plan
NPL	National Priorities List
O&M	operation and maintenance
PDI	Pre-Design Investigation
RA	remedial action
RACR	Response Action Completion Report
RA-O	Remedial Action-Operation
RAOs	remedial action objectives
RAWP	Remedial Action Work Plan
RD	remedial design
ROD	Record of Decision
Shaw	Shaw Environmental, Inc.
TAC	Texas Administrative Code
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin

Acronyms and Abbreviations (continued)

TCE	trichloroethene
TCEQ	Texas Commission on Environmental Quality
TNT	2,4,6-trinitrotoluene
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service

Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Draft Final • Rev 0 • March 2019

6.0 LAND USE CONTROL PLAN

The U.S. Army or its representative will be responsible for LUC implementation and certification, reporting and enforcement. The U.S. Army will address the LUC problems within its control that are likely to impact remedy integrity and will address problems as soon as practicable. Per the Final ROD (Shaw 2016), the LUCs' performance objectives are to:

- Prohibit the use of groundwater contaminated as a potable water source;
- Restrict land use to nonresidential; and
- Maintain the integrity of any current or future remedial or monitoring systems.

The implementation, maintenance, and inspection requirements associated with each of the performance objectives that comprise this LUC RD are described below. The proposed actions to be taken to implement the LUC objectives during the RA phase are described in **Section 8.0**. The implementation activities, as well as ongoing maintenance, monitoring, and reporting requirements will be presented in the Remedial Action Completion Report (RACR), as the final LUC RD. Upon regulatory review and concurrence with the final LUC RD, it will be included as part of the Comprehensive LUC Management Plan.

For portions of the Site subject to land use controls that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of land use controls, and coordinate with federal, state, and local governments and owners and occupants of properties subject to land use controls. The Army retains responsibility for ensuring that the remedy remains protective of human health and the environment.

6.1 LUC Implementation

The actions required to implement the LUCs for LHAAP-17 are described below. The first of these, the initial notice of LUCs was completed on December 8, 2016. The December 8, 2016 notice letters that were sent to relevant officials (U.S. Army 2016) included a preliminary LUC boundary. The proposed LUC boundary for the groundwater use restriction is shown in red on **Figure 6-1**. The LUC boundary for the non-residential site use will be the "Site Boundary" shown in blue on **Figure 6-1**. The following actions will be undertaken to implement the LUCs for LHAAP-17:

- Finalize the boundary for the LUCs as a part of the remedial action.
  - Revise the boundary, if necessary, based on groundwater sampling results. The final boundary of the groundwater LUCs (prevent the use of groundwater contaminated above cleanup levels as a potable water source and prohibit access to the contaminated groundwater except for environmental monitoring and testing

only); the remedial or monitoring system LUCs (maintain the integrity of any current or future remedial or monitoring systems); and the nonresidential land use LUC (restrict land use to nonresidential) will be reviewed during RA activities after an evaluation of the monitoring data has been completed and revised if necessary.

  - Survey the groundwater use and land use restriction LUC boundaries. The boundaries will be finalized after concurrence by USEPA and TCEQ, and will be surveyed by a State-licensed surveyor. A legal description of the surveyed areas will be appended to the survey plat.

- Record the LUCs in Harrison County. The LUC plat, legal description, and LUC restriction language will be recorded in the Harrison County Courthouse in accordance with TAC Title 30, §335.566.
- Notify the Texas Department of Licensing and Regulation of the groundwater LUCs. The Texas Department of Licensing and Regulation will be notified of the groundwater restrictions, which include the prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval from the Army, the USEPA, and the TCEQ. The survey plat, legal boundary, and description of the groundwater restriction LUCs, in conjunction with a locator map, will be provided in hard and electronic copy.
- Provide notice after finalizing LUC boundary as part of the RA. The notice will consist of a brief description of the contaminants in groundwater and soil, a written description of the LUCs and a figure depicting the revised LUC boundaries. The notices will be sent to federal, state, and local officials including: U.S. Senators, U.S. Congressman, State Senator, State Representative, Harrison County Judge, Harrison County Commissioner Precinct 1, City of Uncertain Mayor, and Karnack Water Supply Corporation Board Members. Notice will also be sent to the Caddo Lake National Wildlife Refuge Manager.
- Periodically transmit the notice to federal, state, and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and LUCs. The transmittal will coincide with each Five Year Review and will be documented in the report.

6.2 Maintenance and Monitoring Requirements

The LUCs will be maintained in place as follows:

- The LUCs restricting the use of groundwater to environmental monitoring and testing only and the LUC restricting land use to nonresidential will remain in place until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Tables 1-2 and 1-3**) in surface and subsurface soil and groundwater allow for unlimited use and unrestricted exposure;

- The LUC to maintain the integrity of any current or future remedial or monitoring systems will remain in place until groundwater cleanup levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in **Table 1-2**) are met; and,

- The LUC prohibiting groundwater use (except for environmental monitoring and testing) as a potable source will remain in place until the levels of COCs (i.e., all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in **Tables 1-2 and 1-3**) in soil and groundwater allow for unlimited use and unrestricted exposure.

Remedial or Monitoring System LUCs include physical components that require repair and maintenance. These are described in **Section 10.0.** The RAO and Extraction System Inspection and Maintenance Checklists is provided in **Appendix D.**

The administrative maintenance required to ensure the LUCs remain in place and effective until the cleanup levels of the COCs are at levels that allow unrestricted use and unlimited exposure are:

- Annual field inspections of the site to confirm that no violations of the LUCs have occurred. Documentation of the inspection will be included in the Inspection and Maintenance Checklist (see **Appendix D).**

- Annual certifications that no LUC-restricted activities have been authorized and that site conditions and use are consistent with the LUCs. The Certification Form is presented in **Appendix E).**

- Periodic transmittal of a LUC Notice to federal, state, and local authorities and to owners and occupants of LHAAP-17. The notice will include the groundwater and soil (surface and subsurface) contamination and any 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.

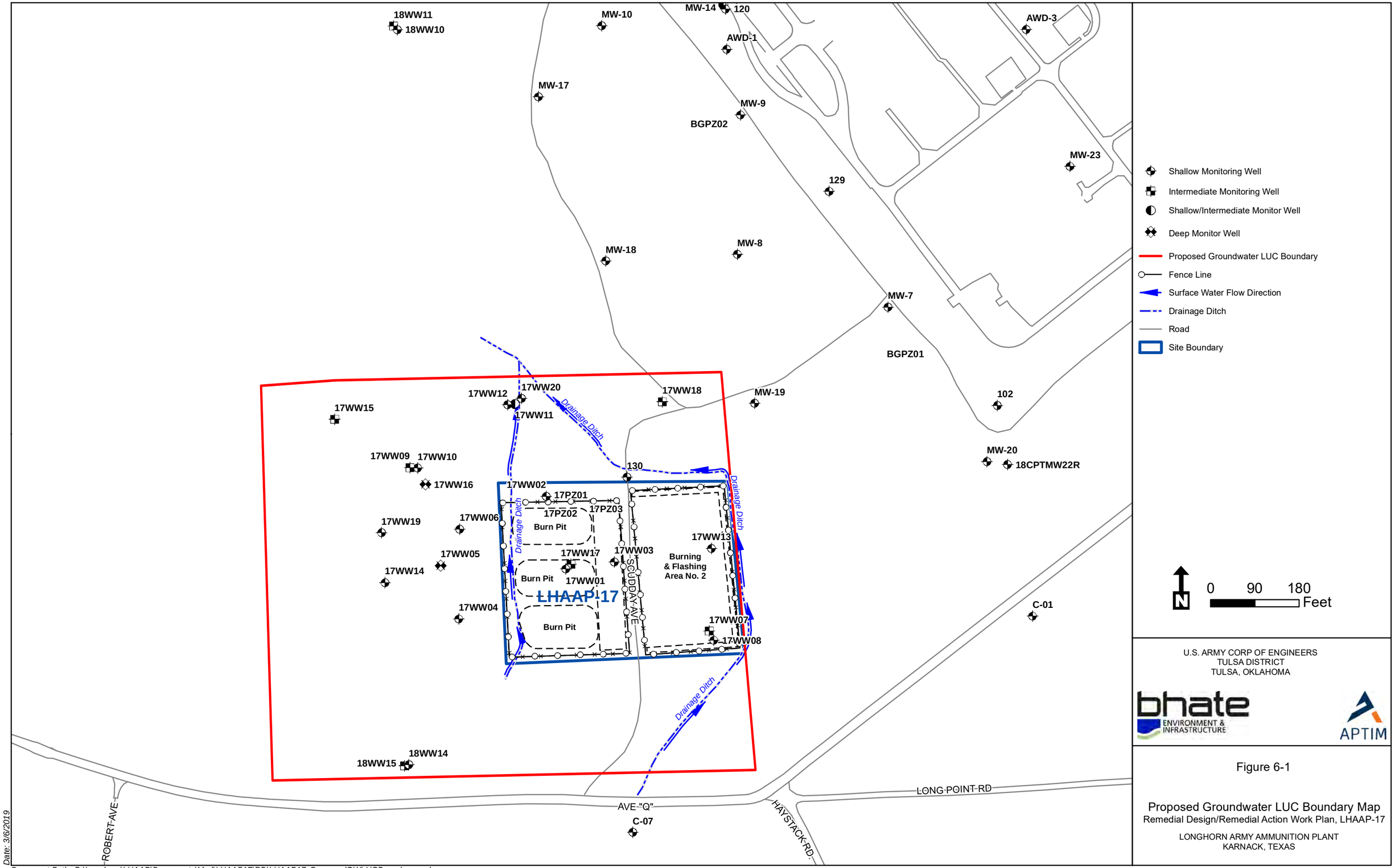
- The final LUC RD appendix of the RACR will be added to the Comprehensive LUC Management Plan and the plan will be provided to the owner or occupant of LHAAP-17.

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.

6.3 LUC Inspection and Monitoring

Upon finalization of this LUC RA, the amended LUC boundary map and legal description recordation will be inserted into the Comprehensive LUC Management Plan for LHAAP. The Comprehensive LUC Management Plan figure and table will be updated to reflect the inclusion of LHAAP-17.

Beginning with finalization of this RD/RAWP and approval of the Inspection and Maintenance form and the Annual Certification Form, the U.S. Army will undertake inspections and certify continued compliance with the LUC objectives. The U.S. Army, or the transferee after transfer, will retain the LUC Inspection and Certification documents in the project files for incorporation into the Five Year Review reports, and these documents will be made available to USEPA and TCEQ upon request. In addition, should any violations be found during the certification, the U.S. Army will provide to USEPA and TCEQ, along with the document, a separate written explanation indicating the specific violations found and what efforts or measures have or will be taken to correct those violations. The need to continue inspections and certifications will be revisited at Five Year Reviews.



U.S. ARMY CORP OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

bhate ENVIRONMENT & INFRASTRUCTURE

APTIM

Figure 6-1

Proposed Groundwater LUC Boundary Map
Remedial Design/Remedial Action Work Plan, LHAAP-17

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Date: 3/6/2019

Document Path: G:\Longhorn\LHAAP\Documents\Mxd\LHAAP17\RD\LHAAP17_ProposedGWLUCBoundary.mxd

LHAAP – 17, 17-3
NOTICE OF LAND USE CONTROLS AND NONRESIDENTIAL LAND USE AT LHAAP-17 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT) (PENDING)

Date October 4, 2019

LHAAP – 17, 17-4
LAND USE CONTROL COMPLIANCE INSPECTION FORM

Date October 4, 2019

Annual Land Use Control Compliance Certification Form

In accordance with the Remedial Design dated_____for LHAAP-17 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;
- 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 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.

LHAAP-19

NOTICE OF NONRESIDENTIAL LAND USE AT LHAAP-19 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2013-000013785

*****DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT*****

MISCELLANEOUS

5 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 11/14/2013 04:23 PM **Document Number:** 2013-000013785 **Receipt No:** 1313735 **Amount:** $ 28.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

AARON WILLIAMS
1645 SOUTH 100 FIRST EAST AVE

TULSA, OK 74128

STATE OF TEXAS
HARRISON COUNTY

INDUSTRIAL SOLID WASTE
CERTIFICATION OF REMEDIATION

KNOW ALL MEN BY THESE PRESENT THAT:

Pursuant to the Rules of the Texas Commission on Environmental Quality 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 a remediation of the land described herein. The site, LHAAP-19, is a C&D Landfill located within the former Longhorn Army Ammunition Plant (LHAAP) in the northeast corner of Harrison County, Texas approximately 14 miles northeast of Marshall, Texas, and approximately 40 miles west of Shreveport, Louisiana. LHAAP was placed on the National Priorities (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-19 is not itself considered an NPL site. The TCEQ, the lead regulatory agency concurs that the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 3.

The C&D landfill, designated LHAAP-19, covers a 7.91 acre tract of land. The maximum depth of the landfill is believed to be less than 15 feet below ground surface. The C&D landfill was sporadically active from 1985 until recent closure activities were conducted. The C&D landfill was permitted by rule to receive non-friable asbestos and other demolition debris. During periods of activity, the monthly disposal rate ranged from 35 to 400 cubic yards of waste. The C&D landfill (formerly referred to as LHAAP-26) was evaluated in 1988. From the landfill evaluation dated 1988, and the buildings description dated 2004, it is concluded that all of the materials deposited in this landfill were what is normally classified as Construction and Demolition Debris (C&D) consisting of wood and metal studs, corrugated metal walls and roofs, concrete rubble, steel re-bar, dry-wall, transite (non-friable asbestos) siding, cardboard, Class 2 paper, packing, plastics, foil, wood packaging, wood debris, bricks, cement and other inert constituents. Records provided by the site manager indicate that hazardous materials such as friable asbestos were disposed of in other permitted landfills. Based on this information and certification of process knowledge by the owner, this landfill is classified as Non-Hazardous Class 2. The final closure assessment report and its supporting documentation demonstrate that the threat to human health or the environment is at or below those required for Risk Reduction Standard Number 2. However, due to the fact that waste was left in place, a cap was constructed to cover the footprint of the landfill and closure of the landfill meets Risk Reduction Standard Number 3.

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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The Texas Commission on Environmental Quality requires certain persons to provide certification and/or recordation in the real property records to notify the public of the conditions of the land and/or the

occurrence of remediation. This certification is not a representation or warranty by the Texas Commission on Environmental Quality of the suitability of this land for any purpose.

II

Being a 7.91 acre tract of land situated in Harrison County, Texas, being out of and a part of a 8,493 acres tract of land known as the former Longhorn Army Ammunition Plant, situated between Highway 43 at Karnack, Texas, and the southwestern shore of Caddo Lake, and being more particularly described by metes and bounds as follows:

(All coordinates shown here on are NAD 83, Texas State Plane North Central Zone 4202, based on GPS Static Processing verified with OPUS).

Beginning at the northwest corner of the herein described tract with coordinates of North: 6951971.54, East: 3316288.74, from which an iron pin set for a GPS Base Point with coordinates of North 6951987.74, East 3316281.35 bears N 24-31-50 E a distance of 17.81 feet;

Thence N 78-23-54 E, 504.61 feet to a point for an angle point with coordinates of North: 6952073.02, East: 3316783.04

Thence S 52-47-27 E, 137.20 feet to a point for an angle point with coordinates of North: 6951990.05, East: 3316892.31;

Thence S 44-12-24 E, 108.04 feet to a point for an angle point with coordinates of North: 6951912.60, East: 3316967.64;

Thence S 01-33-58 W, 110.10 feet to a point for an angle point with coordinates of North: 6951802.55, East: 3316964.63;

Thence S 11-28-04 W, 121.11 feet to a point for an angle point with coordinates of North: 6951683.85, East: 3316940.56;

Thence S 17-11-28 W, 349.04 feet to a point for the southeast corner of the herein described tract with coordinates of North: 6951350.41, East: 3316837.39;

Thence N 89-11-23 W, 294.12 feet to a point for the southwest corner of the herein described tract with coordinates of North: 6951354.57, East: 3316543.30;

Thence N 22-57-01 W, 332.88 feet to an angle point with coordinates of North: 6951661.10, East: 3316413.50;

Thence N 21-53-42 W , 334.57 feet to the place of beginning and containing 7.91 acres of land according to a survey made on the ground on November 12, 2009 by Ace Surveying, Inc.

The United States Department of the Army has undertaken careful environmental study of the LHAAP-19 site and the TCEQ concluded that no further investigation or remedial action is required for LHAAP-19.

Limited monitoring will take place in the form of inspections of the landfill cap and any maintenance required to maintain the cap integrity for a period of five years. The Army shall correct, as needed, erosion of cover material, lack of vegetative growth, and subsidence or ponding of water. If any of these problems occur after the end of the five-year post-closure period or persist for longer than the first five years of post-closure care, the owner or operator shall be responsible for their correction until all problems have been adequately resolved. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multifamily residences;

child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

Institutional controls placed on the property to ensure appropriate future use include: (1) Use must remain non-residential as described above; and (2) No activity shall be conducted or permitted that would damage the integrity of the landfill cover (i.e. unauthorized digging or disturbing the existing cover or contents of the landfill). These restrictions will be placed in the deed transferring any part of the property out of federal ownership.

III

The owner of the site is the Department of the Army and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-BDO (T. Lederle)
600 Army Pentagon
Washington, D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 14th day of November 2013.

STATE OF TEXAS
COUNTY OF Gregg

BEFORE ME, on this the 14th day of Nov, 2013, 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.

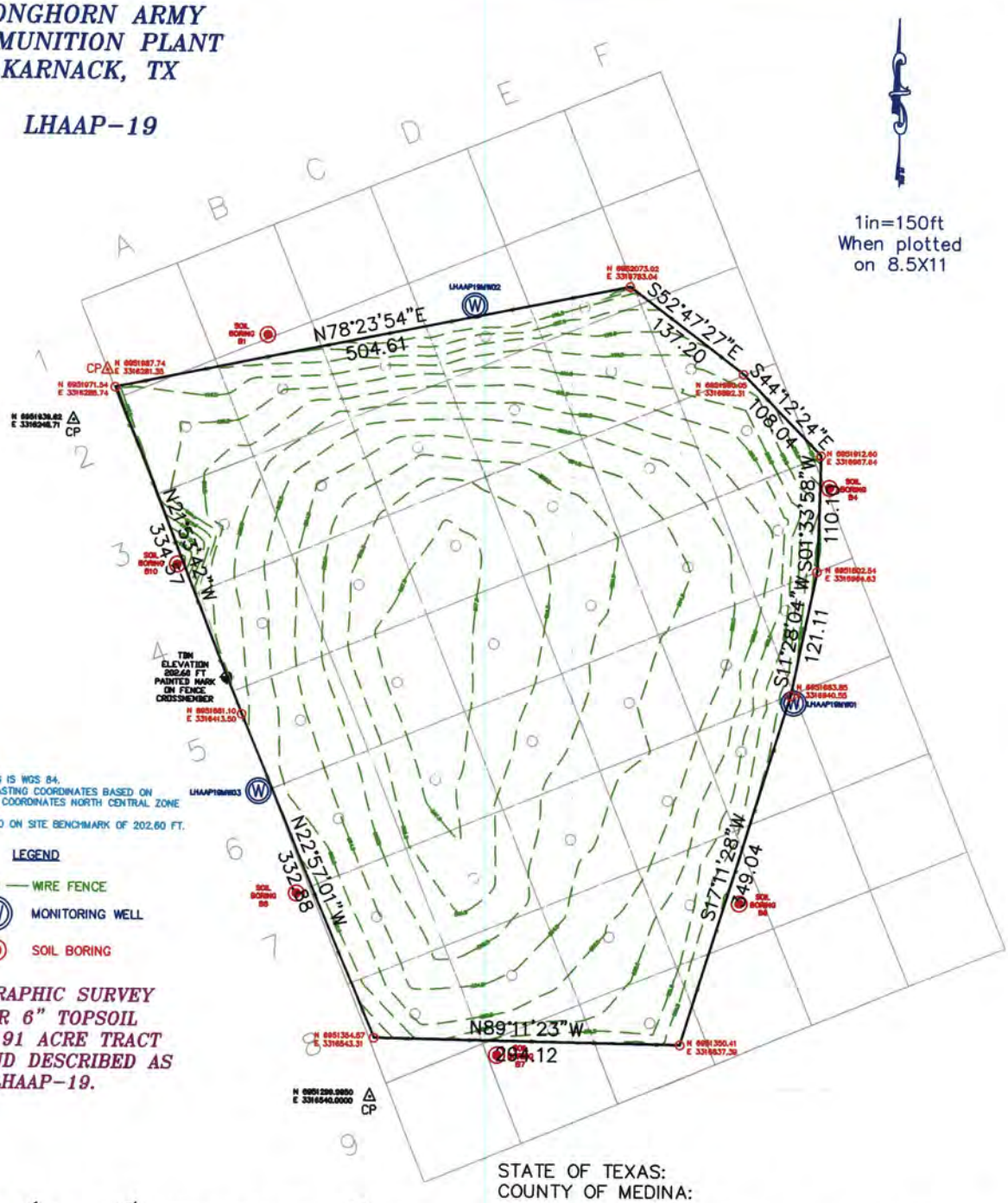
GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the 14th day of Nov, 2013.

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

BRENDA McBRIDE
Notary Public State of Texas
COMM. EXP. 5-4-2014

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TX

LHAAP-19



NOTES:
1) BASIS OF BEARING IS WGS 84.
2) NORTHING AND EASTING COORDINATES BASED ON TEXAS STATE PLANE COORDINATES NORTH CENTRAL ZONE #4202, NAD83.
3) ELEVATIONS BASED ON SITE BENCHMARK OF 202.60 FT.

LEGEND

— x — WIRE FENCE

(W) MONITORING WELL

SOIL BORING

TOPOGRAPHIC SURVEY AFTER 6" TOPSOIL OF A 7.91 ACRE TRACT OF LAND DESCRIBED AS LHAAP-19.

Ace Surveying, Inc.
P. O. BOX 597
DEVINE, TEXAS 78016
830-334-7264
830-665-5796 FAX
acesurveying@sbcglobal.net

THIS DRAWING IS THE PROPERTY OF ACE LAND SERVICES AND SHALL NOT BE USED FOR ANY PURPOSE WITHOUT THE WRITTEN CONSENT OF AN AUTHORIZED AGENT OF ACE LAND SERVICES. ACE LAND SERVICES ACCEPTS NO RESPONSIBILITY FOR THE USE OF THIS DRAWING FOR ANY PURPOSE AFTER SIX MONTHS FROM THE DATE SHOWN HEREON. ALL RIGHTS RESERVED. COPYRIGHT 2009, ACE SURVEYING, INC. ©

STATE OF TEXAS
REGISTERED
RHONDA K. BUTLER
5409
PROFESSIONAL
LAND SURVEYOR

STATE OF TEXAS:
COUNTY OF MEDINA:

I, RHONDA K. BUTLER, DO HEREBY CERTIFY THAT THIS PLAT WAS PREPARED FROM AN ACTUAL SURVEY MADE ON THE GROUND BY MEN WORKING UNDER MY SUPERVISION.

RHONDA K. BUTLER
REGISTERED PROFESSIONAL LAND SURVEYOR #5409

SURVEYED: NOVEMBER 12, 2009
FILE NO: ALAMO 1, KARNACK

LHAAP-35/36

NOTICE OF NONRESIDENTIAL LAND USE AT SUMPS/WASTE RACK SUMP LOCATIONS (LHAAP-35/36) FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2012-000000706

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000706 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. Sump094 (called Sump 094 on the attached Exhibit A) is part of LHAAP-35/36. Sump094 is a former sump location near Building 16-Y physically located within site boundary of LHAAP-48 of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which Sump094 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps (including Sump094) were also associated with wash racks (waste rack sumps) where containers were cleaned and stored. Further information may be found in the Notice of Registration No. 30990 files, which are available for inspection upon request at

TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The Sump094 parcel is 64 square feet, more or less, or 0.00146 acre tract 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 United States Department of the Army has undertaken careful environmental study of the Sump094 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from Sump094 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of Sump094 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of Sump094 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the ____th day of _____, 2011.

BEFORE ME, on this the 30 th day of June, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
SUMP 094
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 64.0 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-1" referenced above,

THENCE N 07deg59'31"W 569.56' to a point for the Southmost corner of this sump and this POINT OF BEGINNING,

THENCE along the boundary of this tract the following four courses :

(01) N 37deg59'57"W 8.00' to a point for the Westmost corner of this tract,
(02) N 52deg00'03"E 8.00' to a point for the Northmost corner of this tract,
(03) S 37deg59'57"E 8.00' to a point for the Eastmost corner of this tract,
(04) S 52deg00'03"W 8.00' to this POINT OF BEGINNING.

This tract contains 64.0 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943142

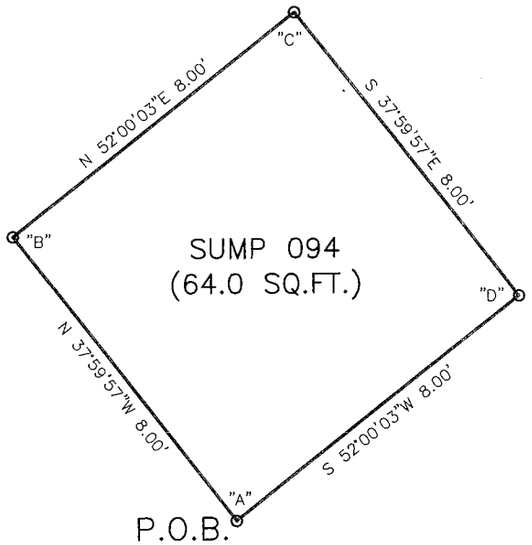
LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

NOTES:

X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
O INDICATES UNMARKED CORNER OF SUMP



COORDINATE TABLE

POINT	NORTH	EAST
A	6959071.485	3314200.311
B	6959077.789	3314195.385
C	6959082.715	3314201.689
D	6959076.411	3314206.615



SCALE 1"=3'

3 0 3 6 9
GRAPHIC SCALE - FEET

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 14, 2011.

N 07°59'31"W 569.56'

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEET

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

SUMP 094
(64.0 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	H.PTS H.LEG
03/14/2011	1103025H.DWG	DRAWN BY JTJ

2012-000000707

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000707 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. Sump095 (called Sump 095 on the attached Exhibit A) is part of LHAAP-35/36. Sump095 is a former sump location near Building 34-Y physically located within site boundary of LHAAP-48 of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which Sump095 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps (including Sump095) were also associated with wash racks (waste rack sumps) where containers were cleaned and stored. Further information may be found in the Notice of Registration No. 30990 files, which are available for inspection upon request at

TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The Sump095 parcel is 69.6 square feet, more or less, or 0.00159 acre tract 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 United States Department of the Army has undertaken careful environmental study of the Sump095 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from Sump095 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of Sump095 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of Sump095 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM- ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30th day of June, 2011.

BEFORE ME, on this the 30 th day of June, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
SUMP 095
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 69.6 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-1" referenced above,

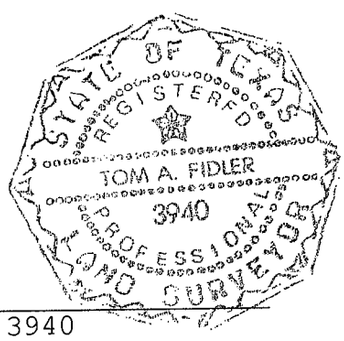
THENCE N 43deg48'28"E 725.22' to a point for the Southmost corner of this sump and this POINT OF BEGINNING,

THENCE along the boundary of this tract the following eight courses :

(01)	N 37deg59'57"W	12.00'	to a point for tract corner,
(02)	S 52deg00'03"W	3.10'	to a point for tract corner,
(03)	N 37deg59'57"W	6.00'	to a point for the Westmost corner of this tract,
(04)	N 52deg00'03"E	8.00'	to a point for the Northmost corner of this tract,
(05)	S 37deg59'57"E	6.00'	to a point for tract corner,
(06)	S 52deg00'03"W	3.10'	to a point for tract corner,
(07)	S 37deg59'57"E	12.00'	to a point for the Eastmost corner of this tract,
(08)	S 52deg00'03"W	1.80'	to this POINT OF BEGINNING.

This tract contains 69.6 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



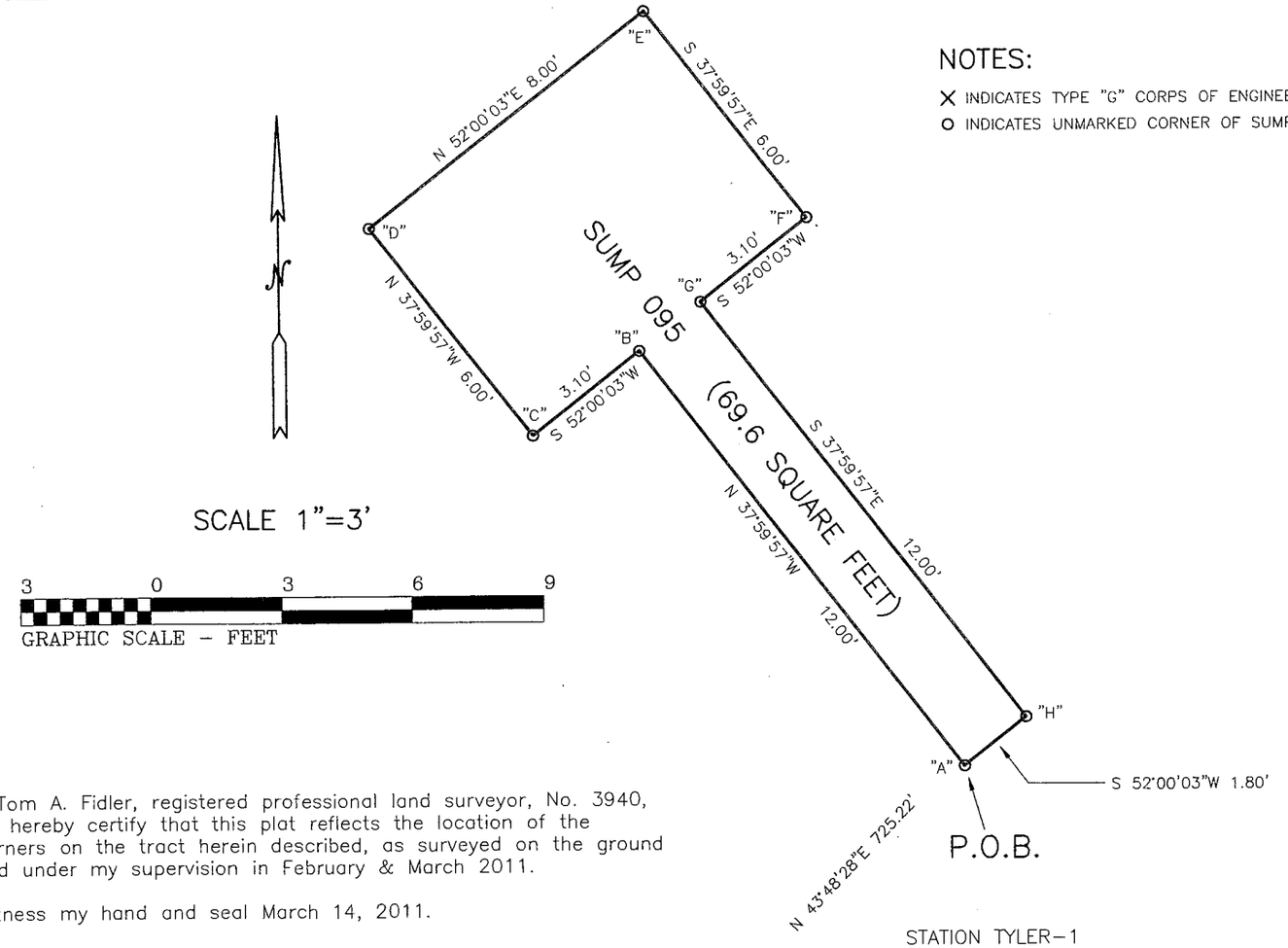
Tom A. Fidler, R.P.L.S. Number 3940

00943148

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@coblelynx.com

NOTES:

X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
O INDICATES UNMARKED CORNER OF SUMP



NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

COORDINATE TABLE

POINT	NORTH	EAST
A	6959030.826	3314781.526
B	6959040.282	3314774.138
C	6959038.373	3314771.695
D	6959043.101	3314768.001
E	6959048.027	3314774.305
F	6959043.299	3314777.999
G	6959041.390	3314775.556
H	6959031.934	3314782.944

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 14, 2011.

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEET

SUMP 095
(69.6 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	F.PTS F.LEG
03/14/2011	1103025F.DWG	DRAWN BY JTJ

2012-000000708

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000708 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. Sump096 (called Sump 096 on the attached Exhibit A) is part of LHAAP-35/36. Sump096 is a former sump location near Building 34-Y physically located within site boundary of LHAAP-48 of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which Sump096 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps (including Sump096) were also associated with wash racks (waste rack sumps) where containers were cleaned and stored. Further information may be found in the Notice of Registration No. 30990 files, which are available for inspection upon request at

TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The Sump096 parcel is 64 square feet, more or less, or 0.00146 acre tract 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 United States Department of the Army has undertaken careful environmental study of the Sump096 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from Sump096 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of Sump096 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of Sump096 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

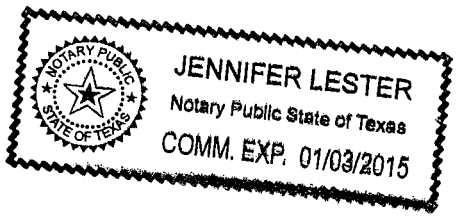
Assistant Chief of Staff for Installation Management
ATTN: DAIM- ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30th day of June, 2011.

BEFORE ME, on this the 30th day of June, 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 30 day of June, 2011.



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

FIELD NOTES DESCRIPTION OF
SUMP 096
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 64.0 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-1" referenced above,

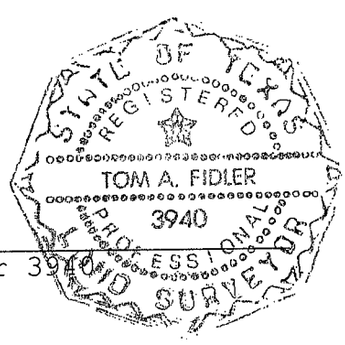
THENCE N 36deg34'53"E 696.04' to a point for the Southmost corner of this sump and this POINT OF BEGINNING,

THENCE along the boundary of this tract the following four courses :

(01) N 37deg59'57"W 8.00' to a point for the Westmost corner of this tract,
(02) N 52deg00'03"E 8.00' to a point for the Northmost corner of this tract,
(03) S 37deg59'57"E 8.00' to a point for the Eastmost corner of this tract,
(04) S 52deg00'03"W 8.00' to this POINT OF BEGINNING.

This tract contains 64.0 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



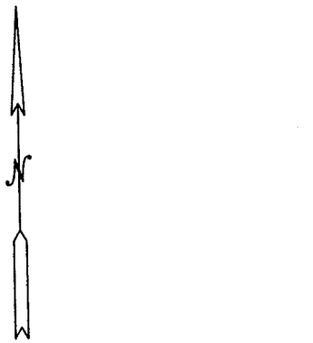
Tom A. Fidler, R.P.L.S. Number 3940

00943154

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

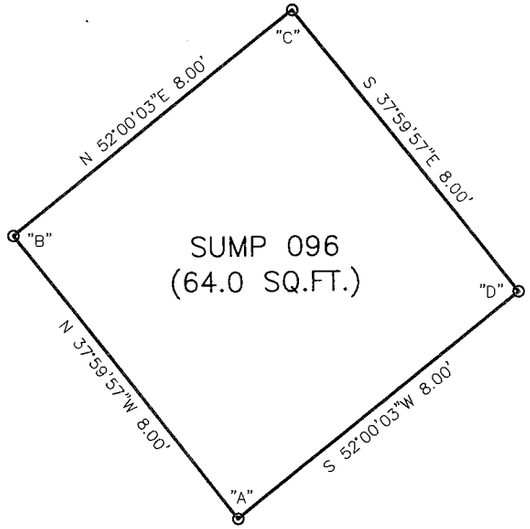
NOTES:

X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
O INDICATES UNMARKED CORNER OF SUMP



SCALE 1"=3'

3 0 3 6 9
GRAPHIC SCALE - FEET



P.O.B.

N 36°34'53"E 696.04'

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

COORDINATE TABLE

POINT	NORTH	EAST
A	6959066.385	3314694.311
B	6959072.689	3314689.385
C	6959077.615	3314695.689
D	6959071.311	3314700.615

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEET

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 14, 2011.

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor No. 3940

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

SUMP 096
(64.0 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	G.PTS G.LEG
03/14/2011	1103025G.DWG	DRAWN BY JTJ

2012-000000709

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000709 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. Sump097 (called Sump 097 on the attached Exhibit A) is part of LHAAP-35/36. Sump097 is a former sump location near Building 38-Y physically located within site boundary of LHAAP-48 of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which Sump097 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps (including Sump097) were also associated with wash racks (waste rack sumps) where containers were cleaned and stored. Further information may be found in the Notice of Registration No. 30990 files, which are available for inspection upon request at

TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The Sump097 parcel is 76.6 square feet, more or less, or 0.00175 acre tract 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 United States Department of the Army has undertaken careful environmental study of the Sump097 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from Sump097 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of Sump097 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of Sump097 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30 th day of June, 2011.

BEFORE ME, on this the 30 th day of June, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
SUMP 097
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 76.6 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-1" referenced above,

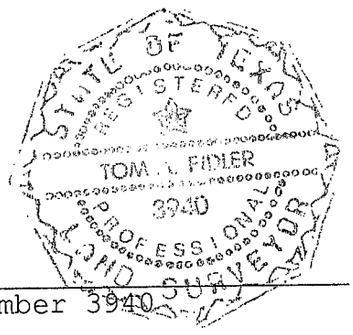
THENCE N 33deg53'28"E 842.86' to this POINT OF BEGINNING, said point being at the Southmost corner of the external face of the concrete which defines this sump,

THENCE along the external face of the concrete which defines this sump the following four courses, each course ending at a corner of the external face of said concrete :

(01)	N 58deg18'32"W	6.20',	being this sump's Westmost corner,
(02)	N 37deg53'34"E	12.45',	being this sump's Northmost corner,
(03)	S 58deg06'49"E	6.18',	being this sump's Eastmost corner,
(04)	S 37deg47'39"W	12.43',	being the aforementioned POINT OF BEGINNING.

This tract contains 76.6 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943160

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

NOTE

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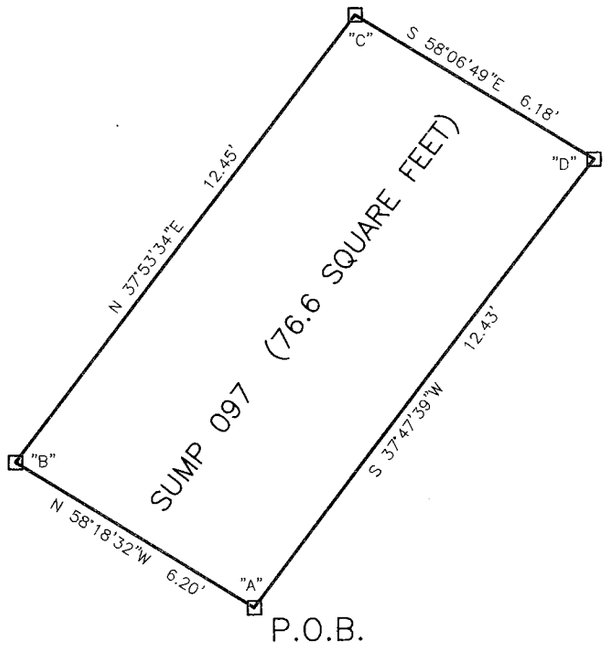
NOTES:

- X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- □ INDICATES CORNER OF EXTERNAL FACE OF CONCRETE
- O INDICATES UNMARKED POINT

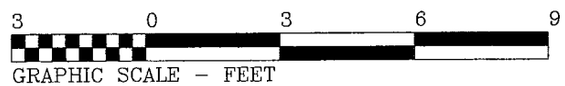


COORDINATE TABLE

POINT	NORTH	EAST
A	6959207.120	3314749.495
B	6959210.377	3314744.219
C	6959220.206	3314751.868
D	6959216.943	3314757.113



SCALE 1"=3'



I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 4, 2011.



Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

N 33°53'28"E 842.86'

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEET

SUMP 097
(76.6 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	Z.PTS Z.LEG
MAR. 4, 2011	0908074Z.DWG	DRAWN BY JTJ

2012-000000710

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000710 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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

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LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps (including Sump098) were also associated with wash racks (waste rack sumps) where containers were cleaned and stored. Further information may be found in the Notice of Registration No. 30990 files, which are available for inspection upon request at

TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The Sump098 parcel is 39.4 square feet, more or less, or 0.0009 acre tract 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 United States Department of the Army has undertaken careful environmental study of the Sump098 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from Sump098 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of Sump098 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of Sump098 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30th day of June, 2011.

BEFORE ME, on this the 30th day of June, 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 30 day of June, 2011.



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

FIELD NOTES DESCRIPTION OF
SUMP 098
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 39.4 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-1" referenced above,

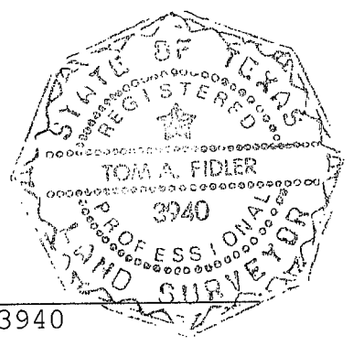
THENCE N 28deg58'18"E 815.98' to this POINT OF BEGINNING, said point being at the Southmost corner of the external face of the concrete which defines this sump,

THENCE along the external face of the concrete which defines this sump the following four courses, each course ending at a corner of the external face of said concrete :

(01)	N 51deg59'37"W	9.74',	being this sump's Westmost corner,
(02)	N 43deg01'55"E	4.05',	being this sump's Northmost corner,
(03)	S 52deg06'01"E	9.75',	being this sump's Eastmost corner,
(04)	S 43deg15'56"W	4.07',	being the aforementioned POINT OF BEGINNING.

This tract contains 39.4 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



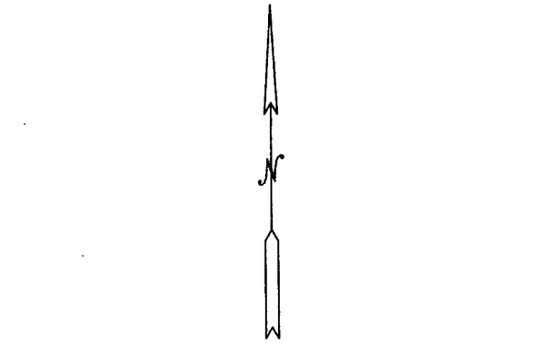
Tom A. Fidler, R.P.L.S. Number 3940

00943166

NOTES:

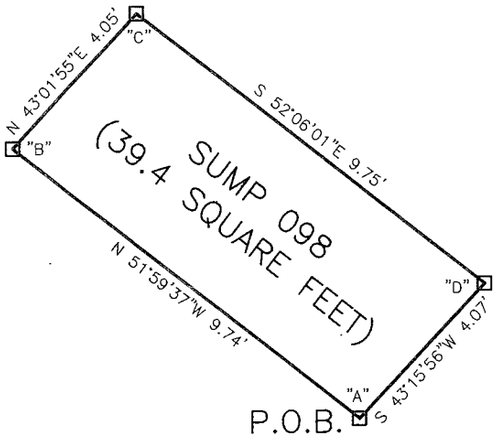
X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
□ INDICATES CORNER OF EXTERNAL FACE OF CONCRETE
O INDICATES UNMARKED POINT

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com



SCALE 1"=3'

3 0 3 6 9
GRAPHIC SCALE – FEET



NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER–1 & TYLER–2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

COORDINATE TABLE

POINT	NORTH	EAST
A	6959221.331	3314674.744
B	6959227.327	3314667.072
C	6959230.288	3314669.837
D	6959224.296	3314677.534

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 4, 2011.

N 28°58'18"E 815.98'

STATION TYLER–1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEET

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

STATION TYLER–2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

SUMP 098
(39.4 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	Y.PTS Y.LEG
MAR. 4, 2011	0908074Y.DWG	DRAWN BY JTJ

2012-000000711

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000711 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. Sump099 (called Sump 099 on the attached Exhibit A) is part of LHAAP-35/36. Sump099 is a former sump location near Building 38-Y physically located within site boundary of LHAAP-48 of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which Sump099 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps (including Sump099) were also associated with wash racks (waste rack sumps) where containers were cleaned and stored. Further information may be found in the Notice of Registration No. 30990 files, which are available for inspection upon request at

TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The Sump099 parcel is 48 square feet, more or less, or 0.0011 acre tract 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 United States Department of the Army has undertaken careful environmental study of the Sump099 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from Sump099 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of Sump099 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of Sump099 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30 th day of June, 2011.

BEFORE ME, on this the 30th day of June, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
SUMP 099
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 48.0 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-1" referenced above,

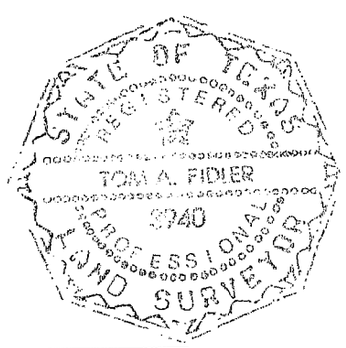
THENCE N 27deg36'35"E 879.49' to a point for the Southmost corner of this sump and this POINT OF BEGINNING,

THENCE along the boundary of this tract the following four courses :

(01) N 37deg59'57"W 8.00' to a point for the Westmost corner of this tract,
(02) N 52deg00'03"E 6.00' to a point for the Northmost corner of this tract,
(03) S 37deg59'57"E 8.00' to a point for the Eastmost corner of this tract,
(04) S 52deg00'03"W 6.00' to this POINT OF BEGINNING.

This tract contains 48.0 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943172

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

NOTE

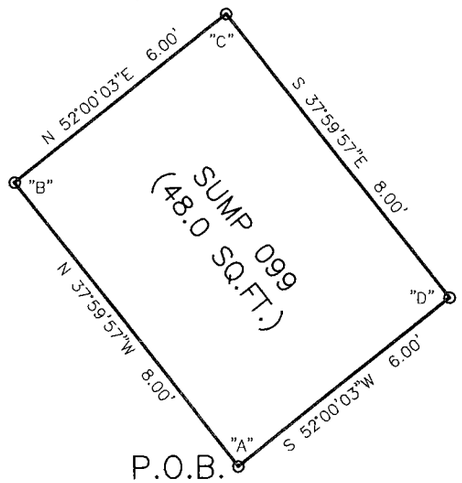
ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

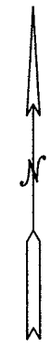
NOTES

X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
O INDICATES UNMARKED CORNER OF SUMP

COORDINATE TABLE

POINT	NORTH	EAST
A	6959286.801	3314687.099
B	6959293.105	3314682.173
C	6959296.799	3314686.901
D	6959290.495	3314691.827



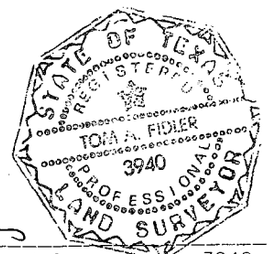


SCALE 1"=3'

3 0 3 6 9
GRAPHIC SCALE - FEET

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 14, 2011.



Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

N 27°36'35"E 879.49'

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEET

SUMP 099
(48.0 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	J.PTS J.LEG
03/14/2011	1103025J.DWG	DRAWN BY JTJ

2012-000000712

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000712 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. Sump100 (called Sump 100 on the attached Exhibit A) is part of LHAAP-35/36. Sump100 is a former sump location near Building 45-Y physically located within site boundary of LHAAP-48 of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which Sump100 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps (including Sump100) were also associated with wash racks (waste rack sumps) where containers were cleaned and stored. Further information may be found in the Notice of Registration No. 30990 files, which are available for inspection upon request at

TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The Sump100 parcel is 80 square feet, more or less, or 0.00183 acre tract 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 United States Department of the Army has undertaken careful environmental study of the Sump100 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from Sump100 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of Sump100 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of Sump100 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30th day of June, 2011.

BEFORE ME, on this the 30th day of JUNE, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
SUMP 100
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 80.0 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-1" referenced above,

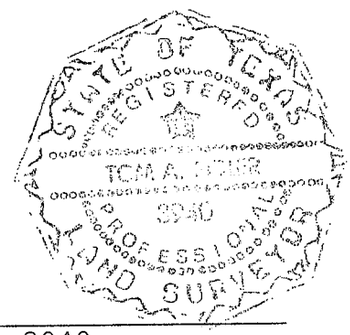
THENCE N 23deg52'16"E 995.90' to a point for the Southmost corner of this sump and this POINT OF BEGINNING,

THENCE along the boundary of this tract the following four courses :

(01) N 37deg59'57"W 8.00' to a point for the Westmost corner of this tract,
(02) N 52deg00'03"E 10.00' to a point for the Northmost corner of this tract,
(03) S 37deg59'57"E 8.00' to a point for the Eastmost corner of this tract,
(04) S 52deg00'03"W 10.00' to this POINT OF BEGINNING.

This tract contains 80.0 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



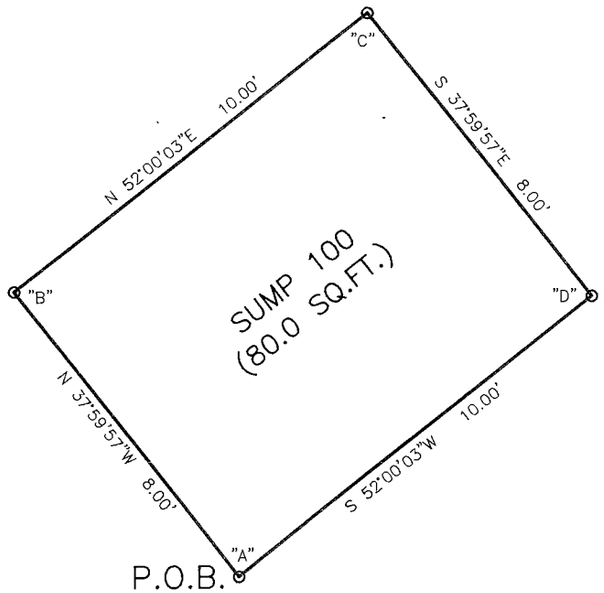
Tom A. Fidler, R.P.L.S. Number 3940

00943178

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.



NOTES

X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
O INDICATES UNMARKED CORNER OF SUMP



COORDINATE TABLE

POINT	NORTH	EAST
A	6959418.170	3314682.523
B	6959424.474	3314677.597
C	6959430.630	3314685.477
D	6959424.326	3314690.403

SCALE 1"=3'

3 0 3 6 9
GRAPHIC SCALE – FEET

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 14, 2011.

N 23°52'16"E 995.90'

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEET

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

SUMP 100
(80.0 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	K.PTS K.LEG
03/14/2011	1103025K.DWG	DRAWN BY JTJ

2012-000000713

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000713 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

KNOW ALL MEN BY THESE PRESENTS THAT:

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I

The U.S. Army, Department of Defense, has performed a remediation of the land described herein. Sump101 (called Sump 101 on the attached Exhibit A) is part of LHAAP-35/36. Sump101 is a former sump location near Building 45-Y physically located within site boundary of LHAAP-48 of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which Sump101 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps (including Sump101) were also associated with wash racks (waste rack sumps) where containers were cleaned and stored. Further information may be found in the Notice of Registration No. 30990 files, which are available for inspection upon request at

TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The Sump101 parcel is 67 square feet, more or less, or 0.00153 acre tract 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 United States Department of the Army has undertaken careful environmental study of the Sump101 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from Sump101 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of Sump101 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of Sump101 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30 th day of June, 2011.

BEFORE ME, on this the 30 th day of JUNE, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
SUMP 101
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 67.0 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-1" referenced above,

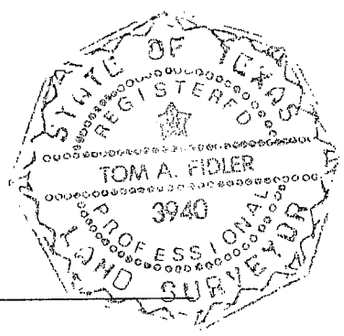
THENCE N 27deg18'47"E 1027.58' to this POINT OF BEGINNING, said point being at the Southmost corner of the external face of the concrete which defines this sump,

THENCE along the external face of the concrete which defines this sump the following four courses, each course ending at a corner of the external face of said concrete :

(01)	N 38deg59'52"W	11.24',	being this sump's Westmost corner,
(02)	N 57deg48'20"E	5.99',	being this sump's Northmost corner,
(03)	S 39deg05'42"E	11.26',	being this sump's Eastmost corner,
(04)	S 57deg59'19"W	6.01',	being the aforementioned POINT OF BEGINNING.

This tract contains 67.0 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



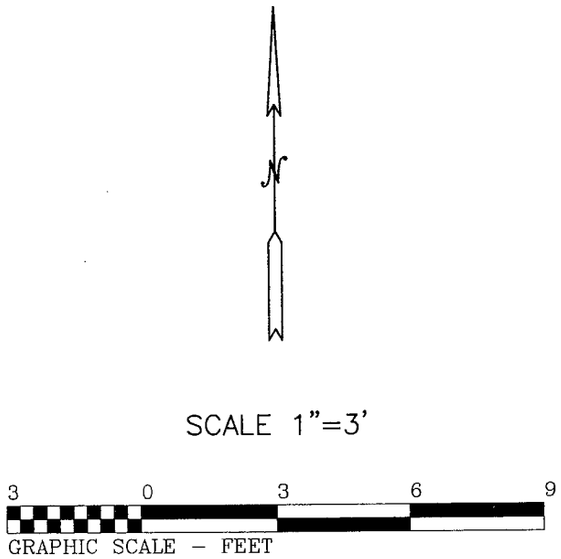
Tom A. Fidler, R.P.L.S. Number 3940

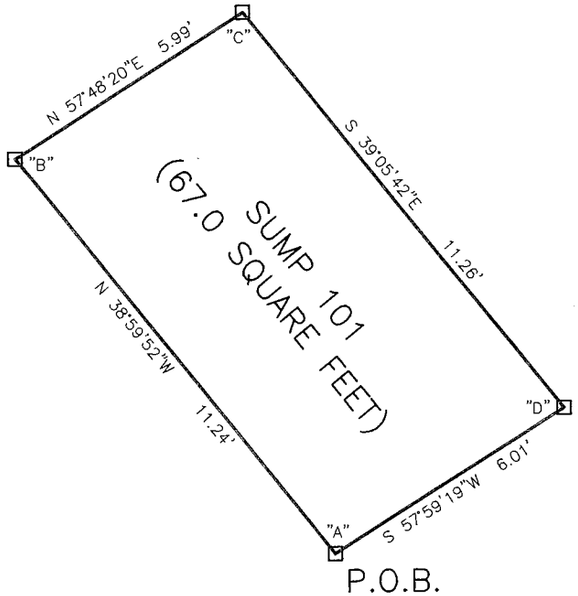
00943184

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

NOTES:

- X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- □ INDICATES CORNER OF EXTERNAL FACE OF CONCRETE
- O INDICATES UNMARKED POINT





NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

COORDINATE TABLE

POINT	NORTH	EAST
A	6959420.476	3314751.003
B	6959429.211	3314743.930
C	6959432.404	3314749.001
D	6959423.663	3314756.102

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 4, 2011.

N 27°18'47"E 1027.58'

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEETS

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING
ELECTRONIC TOTAL STATION
INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

SUMP 101
(67.0 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	A.PTS A.LEG
MAR. 4, 2011	1103025A.DWG	DRAWN BY JTJ

2012-000000714

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000714 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. Sump102 (called Sump 102 on the attached Exhibit A) is part of LHAAP-35/36. Sump102 is a former sump location near Building 16-T physically located within site boundary of LHAAP-35C(53) of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which Sump102 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps (including Sump102) were also associated with wash racks (waste rack sumps) where containers were cleaned and stored. Further information may be found in the

Notice of Registration No. 30990 files, which are available for inspection upon request at TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The Sump102 parcel is 154.4 square feet, more or less, or 0.00354 acre tract 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 United States Department of the Army has undertaken careful environmental study of the Sump102 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from Sump102 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of Sump102 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of Sump102 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30th day of June, 2011.

BEFORE ME, on this the 30 th day of June, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
SUMP 102
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 154.4 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-2" referenced above,

THENCE S 17deg29'41"E 550.28' to a point for the Northmost corner of this sump and this POINT OF BEGINNING,

THENCE along the boundary of this tract the following ten courses :

(01)	S 15deg52'38"E	7.67'	to a point for the Eastmost corner of this tract,
(02)	S 74deg07'22"W	6.94'	to a point for tract corner,
(03)	N 15deg52'38"W	5.54'	to a point for tract corner,
(04)	S 74deg07'22"W	12.94'	to a point for tract corner,
(05)	S 36deg37'46"W	24.51'	to a point for tract corner,
(06)	S 53deg22'14"E	7.10'	to a point for tract corner,
(07)	S 36deg37'46"W	2.10'	to a point for the Southmost corner of this tract,
(08)	N 53deg22'14"W	9.25'	to a point for the Westmost corner of this tract,
(09)	N 36deg37'46"E	27.31'	to a point for tract corner,
(10)	N 74deg07'22"E	20.63'	to this POINT OF BEGINNING.

This tract contains 154.4 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943190

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

NOTES:

× INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
O INDICATES UNMARKED CORNER OF SUMP

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

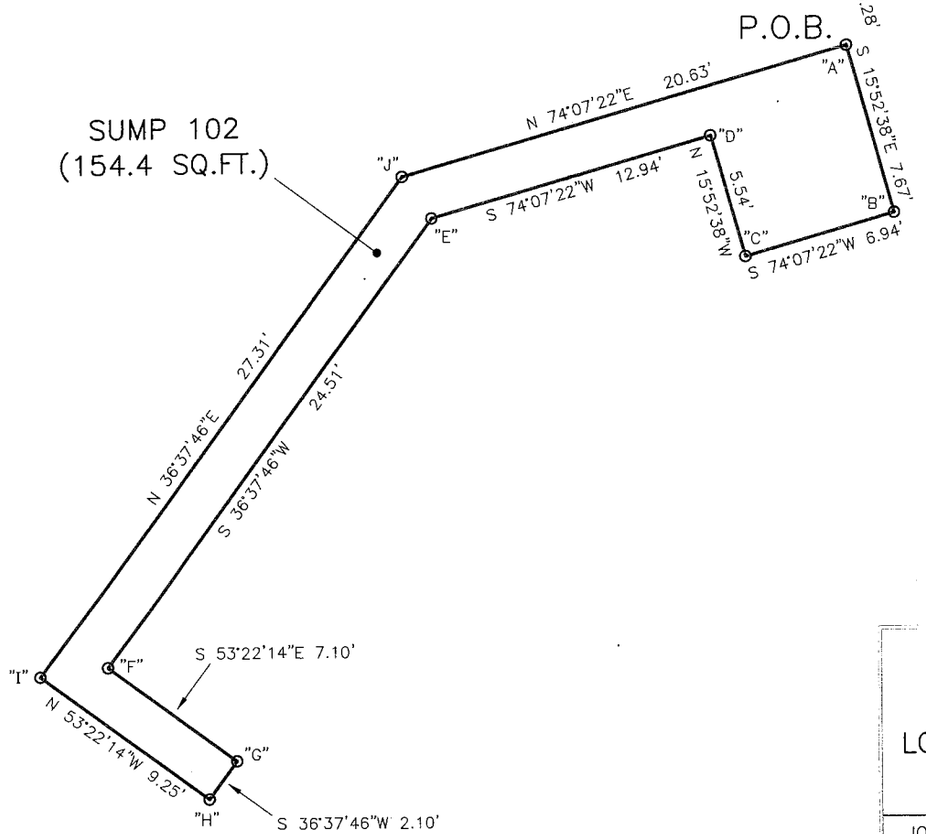
STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

SCALE 1"=6'

6 0 6 12 18
GRAPHIC SCALE - FEET



COORDINATE TABLE

POINT	NORTH	EAST
A	6957307.354	3315333.565
B	6957299.975	3315335.664
C	6957298.077	3315328.991
D	6957303.409	3315327.474
E	6957299.870	3315315.030
F	6957280.203	3315300.409
G	6957275.965	3315306.110
H	6957274.278	3315304.856
I	6957279.797	3315297.433
J	6957301.711	3315313.725

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 11, 2011.

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEET

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

SUMP 102
(154.4 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #1101007	0407088.CRD	B.PTS B.LEG
MAR. 11, 2011	1103025B.DWG	DRAWN BY JTJ

2012-000000715

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000715 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. Sump103 (called Sump 103 on the attached Exhibit A) is part of LHAAP-35/36. Sump103 is a former sump location near Building 16-T physically located within site boundary of LHAAP-35C(53) of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which Sump103 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps (including Sump103) were also associated with wash racks (waste rack sumps) where containers were cleaned and stored. Further information may be found in the

Notice of Registration No. 30990 files, which are available for inspection upon request at TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The Sump103 parcel is 209.1 square feet, more or less, or 0.0048 acre tract 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 United States Department of the Army has undertaken careful environmental study of the Sump103 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from Sump103 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of Sump103 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of Sump103 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30th day of June, 2011.

BEFORE ME, on this the 30th day of June, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
SUMP 103
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 209.1 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-2" referenced above,

THENCE S 20deg31'34"E 601.43' to a point for the Northmost corner of this sump and this POINT OF BEGINNING,

THENCE along the boundary of this tract the following ten courses :

(01)	S 16deg10'14"E	10.01'	to a point for the Eastmost corner of this tract,
(02)	S 73deg49'46"W	9.99'	to a point for tract corner,
(03)	N 16deg10'14"W	2.67'	to a point for tract corner,
(04)	S 36deg37'46"W	27.57'	to a point for the Southmost corner of this tract,
(05)	N 53deg22'14"W	29.02'	to a point for the Westmost corner of this tract,
(06)	N 36deg37'46"E	2.10'	to a point for tract corner,
(07)	S 53deg22'14"E	27.18'	to a point for tract corner,
(08)	N 36deg37'46"E	26.86'	to a point for tract corner,
(09)	N 16deg10'14"W	5.03'	to a point for tract corner,
(10)	N 73deg49'46"E	9.99'	to this POINT OF BEGINNING.

This tract contains 209.1 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943196

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@coblelynx.com

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 11, 2011.

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

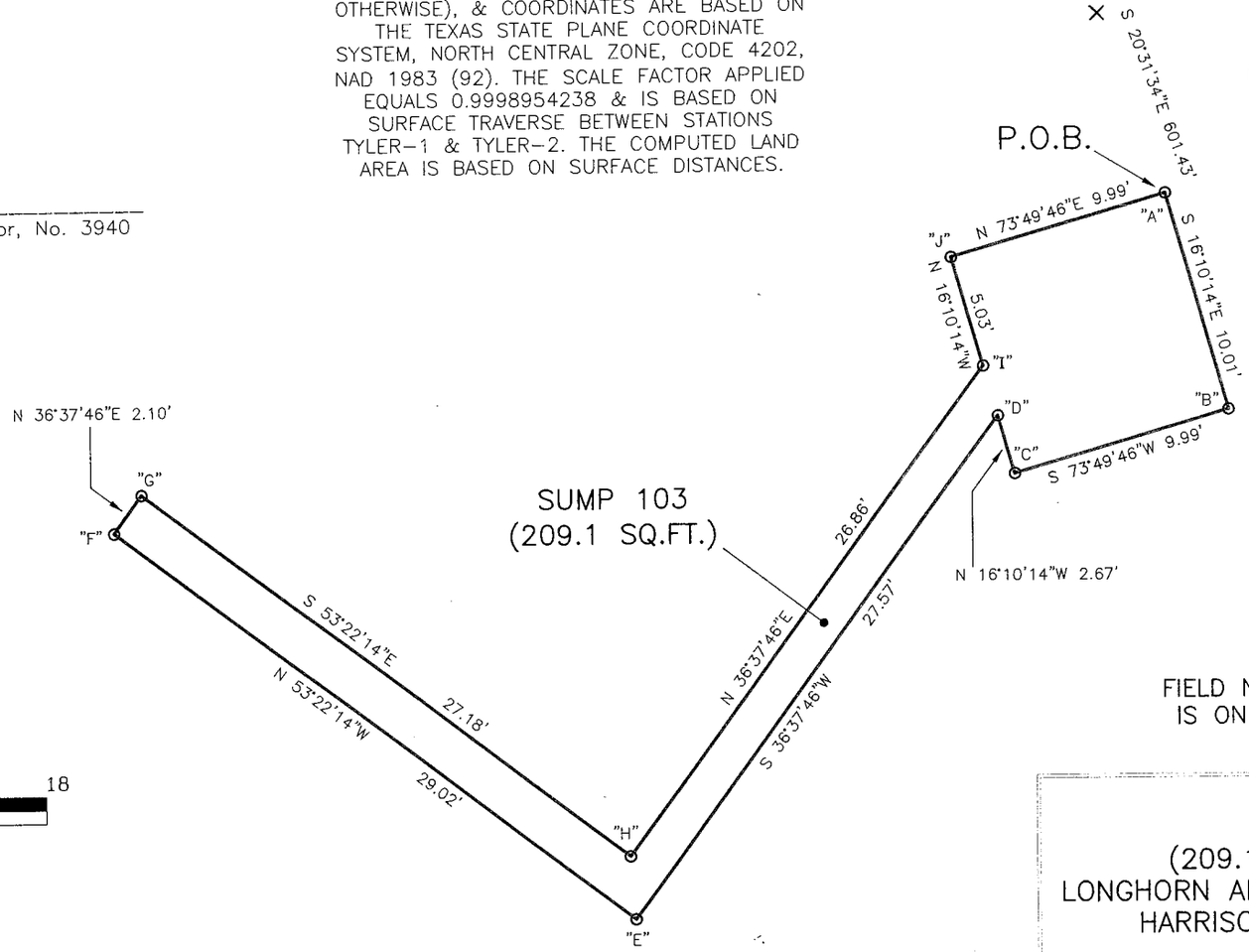
STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

COORDINATE TABLE

POINT	NORTH	EAST
A	6957268.937	3315379.021
B	6957259.319	3315381.810
C	6957256.536	3315372.213
D	6957259.104	3315371.468
E	6957236.982	3315355.021
F	6957254.297	3315331.731
G	6957255.984	3315332.985
H	6957239.765	3315354.800
I	6957261.320	3315370.825
J	6957266.154	3315369.424



SCALE 1"=6'

6 0 6 12 18
GRAPHIC SCALE - FEET

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEET

NOTES:

X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
O INDICATES UNMARKED CORNER OF SUMP

SUMP 103
(209.1 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #1101007	0407088.CRD	C.PTS C.LEG
MAR. 11, 2011	1103025C.DWG	DRAWN BY JTJ

2012-000000716

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000716 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. Sump104 (called Sump 104 on the attached Exhibit A) is part of LHAAP-35/36. Sump104 is a former sump location near Building 16-T physically located within site boundary of LHAAP-35C(53) of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which Sump104 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps (including Sump104) were also associated with wash racks (waste rack sumps) where containers were cleaned and stored. Further information may be found in the

Notice of Registration No. 30990 files, which are available for inspection upon request at TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The Sump104 parcel is 149.2 square feet, more or less, or 0.00342 acre tract 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 United States Department of the Army has undertaken careful environmental study of the Sump104 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from Sump104 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of Sump104 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of Sump104 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30th day of June, 2011.

BEFORE ME, on this the 30th day of JUNE, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
SUMP 104
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 149.2 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-2" referenced above,

THENCE S 09deg38'40"E 580.62' to a point for the Northmost corner of this sump and this POINT OF BEGINNING,

THENCE along the boundary of this tract the following eight courses :

(01)	S 53deg22'14"E	23.26'	to a point for the Eastmost corner of this tract,
(02)	S 36deg37'46"W	2.24'	to a point for tract corner,
(03)	N 53deg22'14"W	20.93'	to a point for tract corner,
(04)	S 36deg37'46"W	24.04'	to a point for the Southmost corner of this tract,
(05)	N 53deg22'14"W	7.69'	to a point for the Westmost corner of this tract,
(06)	N 36deg37'46"E	7.70'	to a point for tract corner,
(07)	S 53deg22'14"E	5.37'	to a point for tract corner,
(08)	N 36deg37'46"E	18.58'	to this POINT OF BEGINNING.

This tract contains 149.2 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943202

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 11, 2011.

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

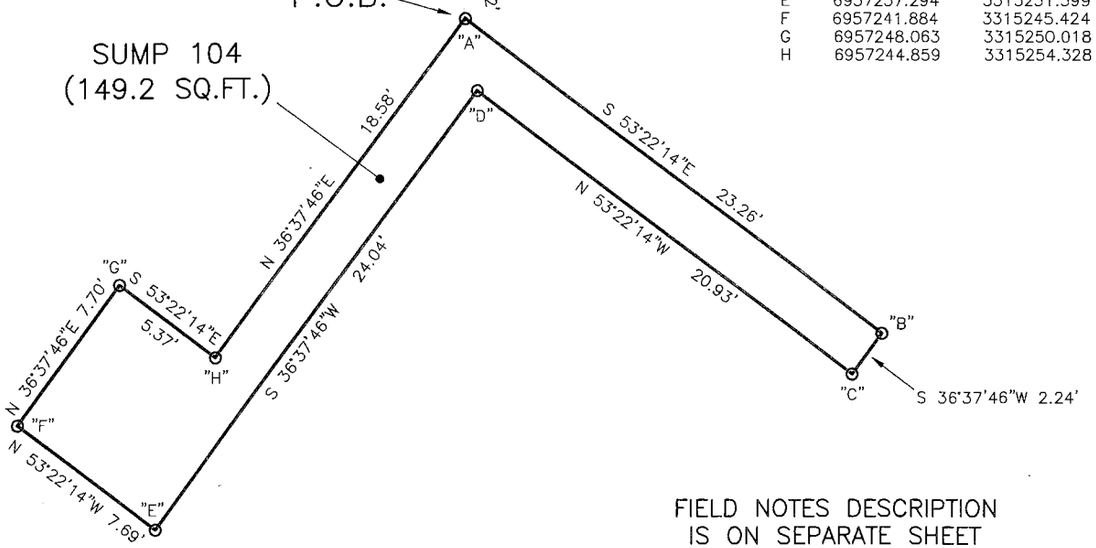
LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

S 09°38'40"E 580.62'



COORDINATE TABLE

POINT	NORTH	EAST
A	6957259.767	3315265.412
B	6957245.891	3315284.077
C	6957244.097	3315282.743
D	6957256.587	3315265.943
E	6957237.294	3315251.599
F	6957241.884	3315245.424
G	6957248.063	3315250.018
H	6957244.859	3315254.328

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEET

SCALE 1"=6'

6 0 6 12 18
GRAPHIC SCALE - FEET

NOTES:

X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
O INDICATES UNMARKED CORNER OF SUMP

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

SUMP 104
(149.2 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #1101007	0407088.CRD	D.PTS D.LEG
MAR. 11, 2011	1103025D.DWG	DRAWN BY JTJ

2012-000000717

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MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000717 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. Sump105 (called Sump 105 on the attached Exhibit A) is part of LHAAP-35/36. Sump105 is a former sump location near Building 16-T physically located within site boundary of LHAAP-35C(53) of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which Sump105 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps (including Sump105) were also associated with wash racks (waste rack sumps) where containers were cleaned and stored. Further information may be found in the Notice of Registration No. 30990 files, which are available for inspection upon request at

TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The Sump105 parcel is 201.7 square feet, more or less, or 0.00463 acre tract 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 United States Department of the Army has undertaken careful environmental study of the Sump105 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from Sump105 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of Sump105 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of Sump105 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30 th day of June, 2011.

BEFORE ME, on this the 30 th day of June, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
SUMP 105
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 201.7 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-2" referenced above,

THENCE S 13deg17'42"E 623.38' to a point for the Northmost corner of this sump and this POINT OF BEGINNING,

THENCE along the boundary of this tract the following eight courses :

(01)	S 53deg22'14"E	26.51'	to a point for the Eastmost corner of this tract,
(02)	S 36deg37'46"W	15.65'	to a point for tract corner,
(03)	S 53deg22'14"E	8.85'	to a point for tract corner,
(04)	S 36deg37'46"W	10.63'	to a point for the Southmost corner of this tract,
(05)	N 53deg22'14"W	10.86'	to a point for tract corner,
(06)	N 36deg37'46"E	24.04'	to a point for tract corner,
(07)	N 53deg22'14"W	24.50'	to a point for the Westmost corner of this tract,
(08)	N 36deg37'46"E	2.24'	to this POINT OF BEGINNING.

This tract contains 201.7 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943208

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING
ELECTRONIC TOTAL STATION
INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

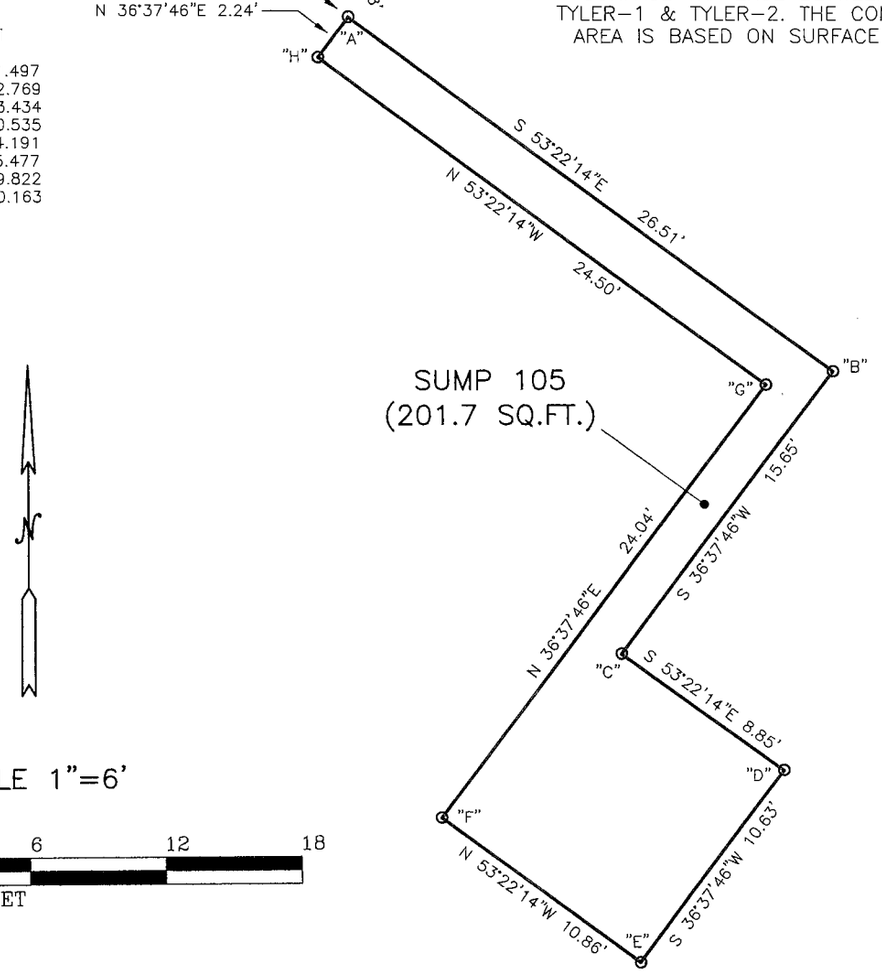
S 13°17'42"E 623.38'

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

COORDINATE TABLE

POINT	NORTH	EAST
A	6957225.505	3315311.497
B	6957209.690	3315332.769
C	6957197.135	3315323.434
D	6957191.856	3315330.535
E	6957183.323	3315324.191
F	6957189.801	3315315.477
G	6957209.095	3315329.822
H	6957223.711	3315310.163



SCALE 1"=6'

6 0 6 12 18
GRAPHIC SCALE - FEET

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 11, 2011.

NOTES:

X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
O INDICATES UNMARKED CORNER OF SUMP

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEET

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

SUMP 105
(201.7 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #1101007	0407088.CRD	E.PTS E.LEG
MAR. 11, 2011	1103025E.DWG	DRAWN BY JTJ

2012-000000718

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000718 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. Sump123 (called Sump 123 on the attached Exhibit A) is part of LHAAP-35/36. Sump123 is a former sump location near Building 18-Y physically located within site boundary of LHAAP-48 of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which Sump123 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps (including Sump123) were also associated with wash racks (waste rack sumps) where containers were cleaned and stored. Further information may be found in the Notice of Registration No. 30990 files, which are available for inspection upon request at

TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The Sump123 parcel is 60 square feet, more or less, or 0.00137 acre tract 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 United States Department of the Army has undertaken careful environmental study of the Sump123 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from Sump123 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of Sump123 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of Sump123 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30th day of June, 2011.

BEFORE ME, on this the 30th day of June, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
SUMP 123
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 60.0 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-1" referenced above,

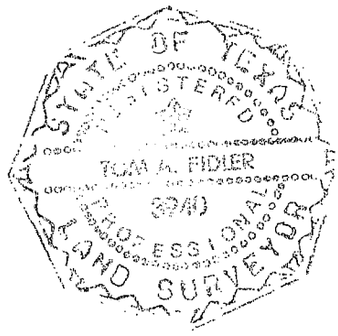
THENCE N 07deg59'31"W 569.56' to a point for the Southmost corner of this sump and this POINT OF BEGINNING,

THENCE along the boundary of this tract the following four courses :

(01) N 37deg59'57"W 6.00' to a point for the Westmost corner of this tract,
(02) N 52deg00'03"E 10.00' to a point for the Northmost corner of this tract,
(03) S 37deg59'57"E 6.00' to a point for the Eastmost corner of this tract,
(04) S 52deg00'03"W 10.00' to this POINT OF BEGINNING.

This tract contains 60.0 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

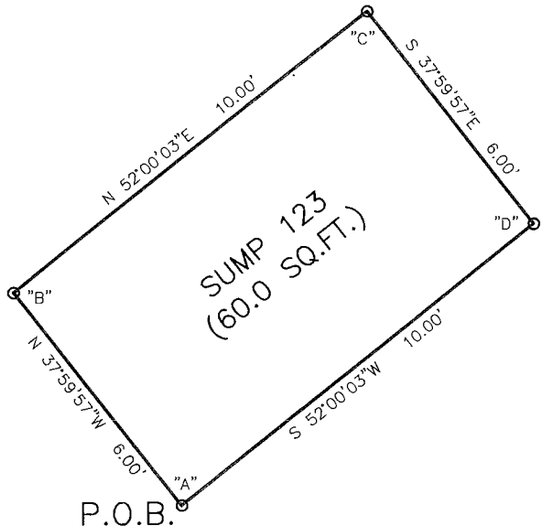
00943214

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

NOTES

X INDICATES TYPE "C" CORPS OF ENGINEERS MONUMENT (FOUND)
O INDICATES UNMARKED CORNER OF SUMP



COORDINATE TABLE

POINT	NORTH	EAST
A	6959122.758	3314187.907
B	6959127.486	3314184.213
C	6959133.642	3314192.093
D	6959128.914	3314195.787



SCALE 1"=3'

3 0 3 6 9
GRAPHIC SCALE - FEET

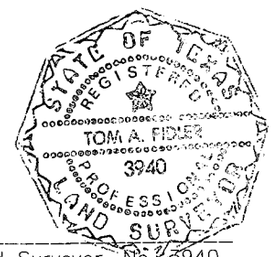
I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 14, 2011.

N 08°25'00"W 622.08'

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEET



Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

SUMP 123
(60.0 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	I.PTS I.LEG
03/14/2011	1103025I.DWG	DRAWN BY JTJ

2012-000000719

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000719 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. WRSump001 (called W.R. Sump 001 on the attached Exhibit A) is part of LHAAP-35/36. WRSump001 is a former waste rack sump location near Building 34-Y physically located within site boundary of LHAAP-48 of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36 of which WRSump001 is a part is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2, no further action.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps were also associated with wash racks (waste rack sumps including WRSump001) where containers were cleaned and stored. Further information may be found in the

Notice of Registration No. 30990 files, which are available for inspection upon request at TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The WRSump001 parcel is 57.1 square feet, more or less, or 0.00131 acre tract 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 United States Department of the Army has undertaken careful environmental study of the WRSump001 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from WRSump001 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of WRSump001 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of WRSump001 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30th day of June, 2011.

BEFORE ME, on this the 30th day of June, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
W.R. SUMP 001
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 57.1 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-1" referenced above,

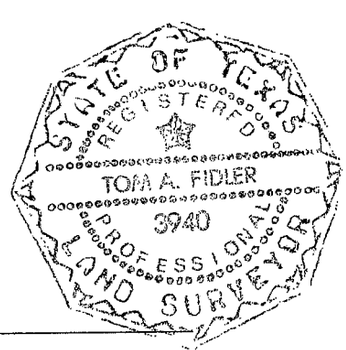
THENCE N 42deg37'08"E 700.32' to this POINT OF BEGINNING, said point being at the Southmost corner of the external face of the concrete wall which defines this sump,

THENCE along the external face of the concrete wall which defines this sump the following twelve courses, each course ending at a corner of the external face of said concrete wall :

(01)	N 36deg36'16"W	4.50',	
(02)	N 51deg51'25"E	1.07',	
(03)	N 38deg08'35"W	2.46',	
(04)	S 63deg07'08"W	0.85',	
(05)	N 38deg08'35"W	7.98',	being this sump's Westmost corner,
(06)	N 51deg51'25"E	3.70',	being this sump's Northmost corner,
(07)	S 39deg59'44"E	8.17',	
(08)	S 52deg07'09"W	1.00',	
(09)	S 39deg59'44"E	2.34',	
(10)	N 50deg00'16"E	1.14',	
(11)	S 39deg59'44"E	4.67',	being this sump's Eastmost corner,
(12)	S 52deg10'33"W	4.68',	being the aforementioned POINT OF BEGINNING.

This tract contains 57.1 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



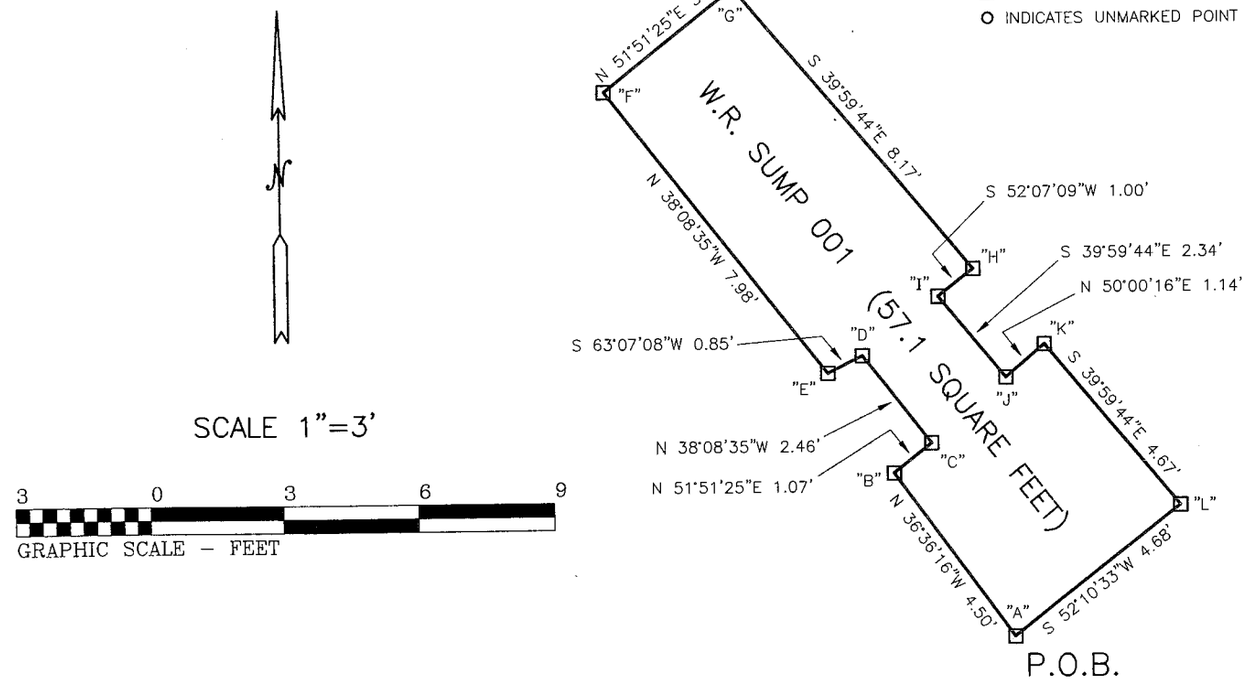
Tom A. Fidler, R.P.L.S. Number 3940

00943220

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

NOTES:

- X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- □ INDICATES CORNER OF EXTERNAL FACE OF CONCRETE WALL
- O INDICATES UNMARKED POINT



NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

COORDINATE TABLE

POINT	NORTH	EAST
A	6959022.804	3314753.696
B	6959026.415	3314751.014
C	6959027.074	3314751.854
D	6959029.012	3314750.332
E	6959028.627	3314749.573
F	6959034.899	3314744.647
G	6959037.183	3314747.555
H	6959030.925	3314752.805
I	6959030.313	3314752.018
J	6959028.519	3314753.523
K	6959029.252	3314754.396
L	6959025.676	3314757.396
M	6959022.804	3314753.696

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 1, 2011.

N 42°37'08"E 700.32'

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

W.R. SUMP 001
(57.1 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	W.PTS W.LEG
MAR. 1, 2011	0908074W.DWG	DRAWN BY JTJ

2012-000000720

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000720 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. WRSump002 (called W.R. Sump 002 on the attached Exhibit A) is part of LHAAP-35/36. WRSump002 is a former waste rack sump location near Building 38-Y physically located within site boundary of LHAAP-48 of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which WRSump002 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2, no further action.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps were also associated with wash racks (waste rack sumps including WRSump002) where containers were cleaned and stored. Further information may be found in the

Notice of Registration No. 30990 files, which are available for inspection upon request at TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The WRSump002 parcel is 61.1 square feet, more or less, or 0.00140 acre tract 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 United States Department of the Army has undertaken careful environmental study of the WRSump002 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from WRSump002 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of WRSump002 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of WRSump002 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30th day of June, 2011.

BEFORE ME, on this the 30th day of June, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
W.R. SUMP 002
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 61.1 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-1" referenced above,

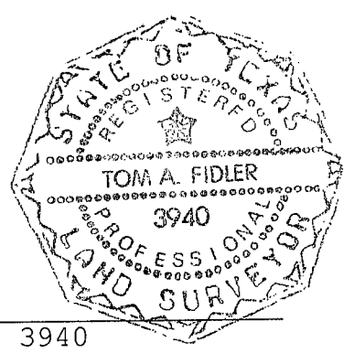
THENCE N 27deg03'19"E 797.78' to this POINT OF BEGINNING, said point being at the Southmost corner of the external face of the concrete wall which defines this sump,

THENCE along the external face of the concrete wall which defines this sump the following twelve courses, each course ending at a corner of the external face of said concrete wall :

(01)	N 50deg15'02"W	4.01',	being this sump's Westmost corner,
(02)	N 38deg19'51"E	7.83',	
(03)	S 58deg29'13"E	0.84',	
(04)	N 41deg11'11"E	3.09',	
(05)	N 51deg30'19"W	1.32',	
(06)	N 40deg19'40"E	4.55',	being this sump's Northmost corner,
(07)	S 54deg31'45"E	4.65',	being this sump's Eastmost corner,
(08)	S 38deg16'58"W	4.65',	
(09)	N 53deg12'50"W	1.23',	
(10)	S 39deg42'05"W	3.32',	
(11)	S 51deg04'42"E	0.79',	
(12)	S 38deg16'58"W	7.89',	being the aforementioned POINT OF BEGINNING.

This tract contains 61.1 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



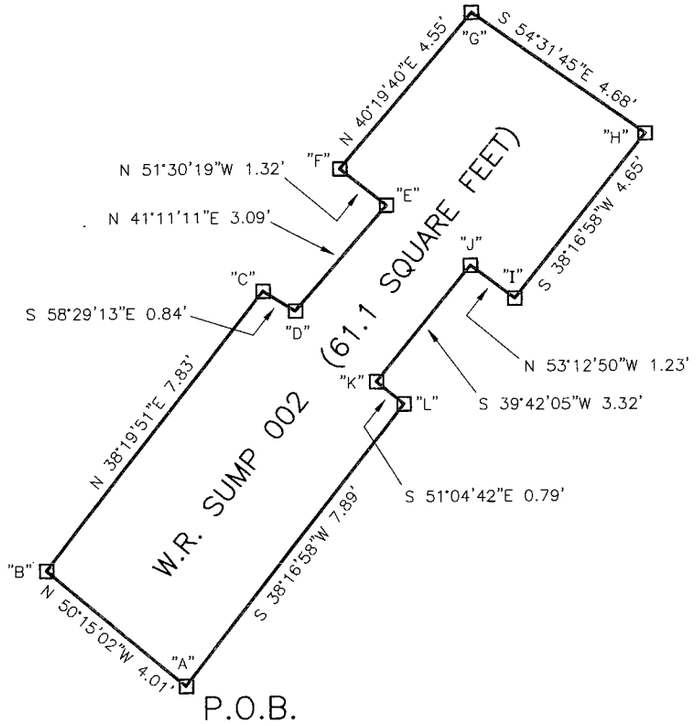
Tom A. Fidler, R.P.L.S. Number 3940

00943226

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.



COORDINATE TABLE

POINT	NORTH	EAST
A	6959217.937	3314642.369
B	6959220.500	3314639.287
C	6959226.642	3314644.143
D	6959226.201	3314644.863
E	6959228.524	3314646.896
F	6959229.343	3314645.866
G	6959232.815	3314648.814
H	6959230.097	3314652.628
I	6959226.443	3314649.744
J	6959227.177	3314648.763
K	6959224.624	3314646.643
L	6959224.129	3314647.256
M	6959217.937	3314642.369

NOTES:

- X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- □ INDICATES CORNER OF EXTERNAL FACE OF CONCRETE WALL
- O INDICATES UNMARKED POINT

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground ond under my supervision in February & March 2011.

Witness my hand and seal March 1, 2011.



Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

N 27°03'19"E 797.78'

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

SCALE 1"=3'

3 0 3 6 9
GRAPHIC SCALE - FEET

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEETS

W.R. SUMP 002
(61.1 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	X.PTS X.LEG
MAR. 1, 2011	0908074X.DWG	DRAWN BY JTJ

2012-000000721

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000721 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. WRSump003 (called W.R. Sump 003 on the attached Exhibit A) is part of LHAAP-35/36. WRSump003 is a former waste rack sump location near Building 16-Y physically located within site boundary of LHAAP-48 of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-35/36, of which WRSump003 is a part, is not considered an NPL site. Environmental activities at LHAAP-35/36 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ, the lead regulatory agency, no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2, no further action.

LHAAP-35/36 is a collection of 125 process sumps and 20 waste rack sumps found in multiple locations across the installation and predominantly associated with process areas. All of the production buildings had sumps that collected wash down water. Sumps were also associated with wash racks (waste rack sumps including WRSump003) where containers were cleaned and stored. Further information may be found in the

Notice of Registration No. 30990 files, which are available for inspection upon request at TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The WRSump003 parcel is 69.5 square feet, more or less, or 0.00159 acre tract 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 United States Department of the Army has undertaken careful environmental study of the WRSump003 site and USEPA and TCEQ concluded that no further investigation or action is required. Contaminants in soil samples from WRSump003 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of WRSump003 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of WRSump003 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 30 th day of June, 2011.

BEFORE ME, on this the 30 th day of June, 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 30 day of June, 2011.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 01/03/2015

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

FIELD NOTES DESCRIPTION OF
W.R. SUMP 003
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 69.5 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "TYLER-1" referenced above,

THENCE N 00deg06'48"W 643.61' to this POINT OF BEGINNING, said point being at the Southmost corner of the external face of the concrete wall which defines this sump,

THENCE along the external face of the concrete wall which defines this sump the following twelve courses, each course ending at a corner of the external face of said concrete wall :

(01)	N 37deg49'35"W 4.09',	being this sump's	Westmost corner,
(02)	N 48deg49'52"E 10.08',		
(03)	S 40deg22'17"E 0.96',		
(04)	N 51deg37'59"E 1.64',		
(05)	N 32deg53'50"W 1.27',		
(06)	N 49deg58'25"E 4.65',	being this sump's	Northmost corner,
(07)	S 41deg50'19"E 4.65',	being this sump's	Eastmost corner,
(08)	S 43deg56'08"W 4.79',		
(09)	N 44deg10'19"W 1.61',		
(10)	S 52deg56'11"W 1.74',		
(11)	S 39deg31'31"E 1.01',		
(12)	S 49deg33'58"W 10.21',	being the aforementioned POINT OF BEGINNING.	

This tract contains 69.5 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

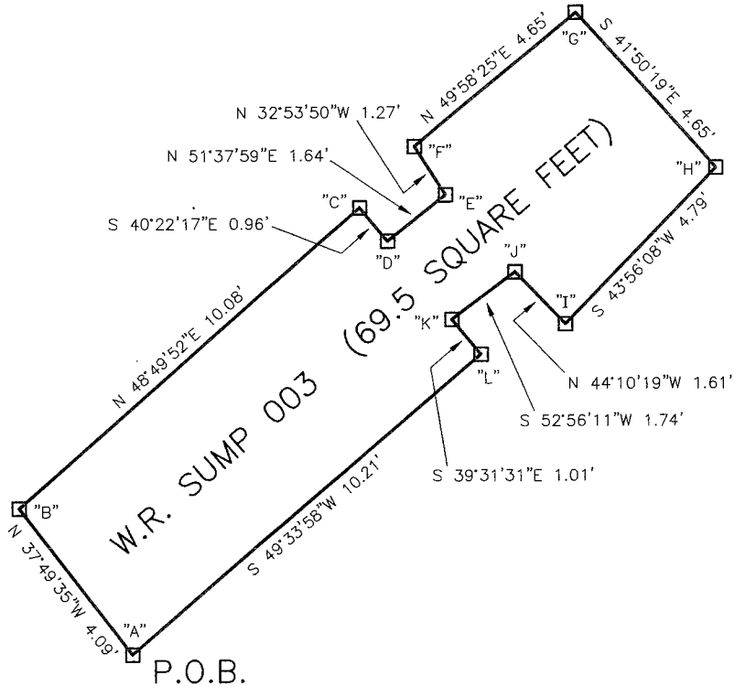
Tom A. Fidler, R.P.L.S. Number 3940

00943232

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.



NOTES:

- X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- □ INDICATES CORNER OF EXTERNAL FACE OF CONCRETE WALL
- O INDICATES UNMARKED POINT

COORDINATE TABLE

POINT	NORTH	EAST
A	6959151.071	3314278.227
B	6959154.302	3314275.719
C	6959160.937	3314283.306
D	6959160.202	3314283.931
E	6959161.221	3314285.218
F	6959162.288	3314284.528
G	6959165.278	3314288.088
H	6959161.816	3314291.188
I	6959158.365	3314287.863
J	6959159.516	3314286.744
K	6959158.468	3314285.356
L	6959157.691	3314285.996

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in February & March 2011.

Witness my hand and seal March 1, 2011.

N 00°06'48"W 643.61'

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

SCALE 1"=3'

3 0 3 6 9
GRAPHIC SCALE - FEET

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEETS

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

W.R. SUMP 003
(69.5 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	V.PTS V.LEG
MAR. 1, 2011	0908074V.DWG	DRAWN BY JTJ

LHAAP-37, 37-1

LUCs FROM FINAL REMEDIAL DESIGN

September 14, 2015

FINAL
REMEDIAL DESIGN
LHAAP-35B (37), CHEMICAL LABORATORY AND LHAAP-67, ABOVEGROUND STORAGE TANK FARM
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS



Prepared by

U.S. Army Corps of Engineers
Tulsa District
1645 South 101st East Avenue
Tulsa, Oklahoma

August 1, 2011

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4.0 Land Use Controls for the Site

The LUCs to be implemented by the Army or its representatives for LHAAP-35B(37) and LHAAP-67 to prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health include:

- Ensure no withdrawal or use of groundwater beneath the sites for anything other than environmental monitoring and testing until cleanup goals are met

Notification of the groundwater use restriction will accompany all transfer documents and will be recorded at the Harrison County Courthouse in accordance with Texas Administrative Code (TAC) Title 30, §335.566.The LUC addresses the areas of LHAAP-35B(37) and LHAAP-67 that include groundwater plumes at LHAAP-35B(37) and LHAAP-67 with levels of contamination that require implementation of a remedy (see **Section 2.0**). The U.S. Army is responsible for implementing, maintaining, monitoring, reporting on, and enforcing the LUC.

U.S. Army and regulators will consult to determine appropriate enforcement actions should there be a failure of an LUC objective at this site after it has transferred. U.S. Army shall obtain USEPA and TCEQ concurrence prior to termination or significant modification of the LUC, or implementation of a change in land use inconsistent with the LUC objectives and use assumptions of the remedy. Although not a remedy, the land use assumption for LHAAP-35B(37) and LHAAP-67 forms the basis for the remedy. The reasonably anticipated future use of the site as part of a national wildlife refuge is consistent with an industrial risk exposure scenario. Notification of the land use assumption of this site will be made in transfer documentation, will be recorded in the Harrison County Courthouse in accordance with TAC Title 30, §335.566 and compliance with the use assumption will be documented in the Five-Year Review reports.

6.2 Land Use Control Implementation Actions

The Army or its representatives will be responsible for LUC implementation and certification, reporting and enforcement. The Army shall address LUC problems within its control that are likely to impact remedy integrity and shall address problems as soon as practicable.

As a condition of property transfer, the Army may require the transferee to assume responsibility for various implementation actions, as indicated below. Although the Army may transfer responsibility for various implementation actions, the Army shall retain its responsibility for remedy integrity. This means that the Army is responsible for addressing substantive violations of performance objectives that would undermine the Army's CERCLA remedy. The Army also will be responsible for: 1) incorporating RD information and outlining the transferee's LUC obligations into property transfer documentation; 2) recording groundwater use restriction and survey plat at the Harrison County Courthouse; and 3) notifying Texas Department of Licensing and Regulation of the groundwater restriction which includes the prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval from the Army, the USEPA, and the TCEQ. The following LUC implementation actions shall be undertaken by the Army in order to ensure that the aforementioned LUC performance objectives for LHAAP-35B(37) and LHAAP-67 are met and maintained:

6.2.1 Comprehensive Land Use Control Management Plan

Within 30 days of receiving USEPA and TCEQ approval of this RD, the Army will incorporate this document into the Comprehensive LUC Management Plan. The Comprehensive LUC Management Plan consists of LHAAP RD documents and a survey plat showing the locations where LUCs being implemented at LHAAP are applied. The purpose of this Comprehensive LUC Management Plan is to ensure all site specific LUCs are compiled into one comprehensive location for both pre-transfer use by the installation and for post-transfer use by the transferee. This document is also accessible to regulators, the local government and the public. The Comprehensive LUC Management Plan is located in the Marshall Public Library to accompany LHAAP's Administrative Record. As LUC RD documents for additional environmental sites are approved by USEPA and TCEQ, the Army shall likewise add those documents and survey plats to the Comprehensive LUC Management Plan as well as update the previous copy of the plan placed in the Marshall Public Library.

6.2.2 Site Certifications and Reporting

Beginning with finalization of this RD, the Army will undertake annual certifications to confirm continued compliance with the LUC objectives. The Army will retain the annual LUC Compliance Certification documents in the project files for incorporation into the Five-Year Review Reports, and these documents will be made available to USEPA and TCEQ upon request. The certification form will be consistent with the form attached as **Appendix B**. In addition, should any violations be found during the annual certification, the Army will provide to USEPA and TCEQ along with the document, a separate written explanation indicating the specific violations found and what efforts or measures have or will be taken to correct those violations**.** Upon transfer, such responsibilities may shift to the transferee via

appropriate provisions placed in the Environmental Condition of Property (ECP) or other environmental transfer document. The need to continue annual certifications will be revisited at Five-Year Reviews.

6.2.3 Notice of Planned Property Conveyances

The Army shall provide notice to USEPA and TCEQ of plans to convey LHAAP-35B(37) and LHAAP-67 acreage. The notice shall describe the mechanism by which LUCs will continue to be implemented, maintained, inspected, reported, and enforced.

6.2.4 Opportunity to Review Text of Intended Land Use Controls

Army will provide a copy of the groundwater use restriction notification to TCEQ for review and approval prior to its recordation in Harrison County. In addition, the Army will produce an ECP or other environmental document for transfer of LHAAP-35B(37) and LHAAP-67, but before executing transfer, the Army will provide USEPA and TCEQ with a draft copy of the ECP or other environmental document for transfer so that they may have reasonable opportunity, before document execution, to review all LUC-related provisions.

6.2.5 Notification Should Action(s) Which Interfere with Land Use Control Effectiveness Be Discovered Subsequent to Conveyance

Should the Army discover after conveyance of the site any activity on the property inconsistent with the LUC performance objectives, the Army shall notify USEPA and TCEQ within 72 hours of such discovery. Consistent with **Section 6.2.6** below, the Army will then work with USEPA, TCEQ and the transferee to correct the problem(s) discovered. This reporting requirement does not preclude the Army from taking immediate action pursuant to its CERCLA authorities to prevent any perceived risk(s) to human health or the environment.

6.2.6 Land Use Control Enforcement

Should the LUC remedy reflected in this LUC RD fail, the Army will coordinate with USEPA and TCEQ to ensure that appropriate actions are taken to reestablish its protectiveness. These actions may range from informal resolutions with the owner or violator, to the institution of judicial action under the auspices of Texas property law or CERCLA. Alternatively, should the circumstances warrant such, the Army could choose to exercise its response authorities under CERCLA, and then seek cost recovery after the fact from the person(s) or entity(ies) who violated a given LUC. Should the Army become aware that any future owner or user of the property has violated any LUC requirement over which a local agency may have independent jurisdiction, the Army will notify these agencies of such violation(s) and work cooperatively with them to re-achieve owner/user compliance with the LUCs.

6.2.7 Modification or Termination of Land Use Controls

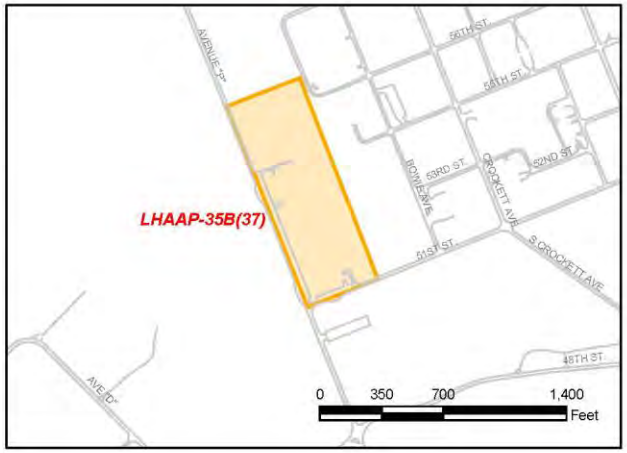
The Army shall not, without USEPA and TCEQ concurrence, make a significant modification to, or terminate a LUC, or make a land use change inconsistent with the LUC objectives and use assumptions of the selected remedy. Likewise, the Army shall seek prior USEPA and TCEQ concurrence before commencing actions that may impact remedy integrity. In the case of an emergency action, the Army shall obtain prior USEPA and TCEQ concurrence as appropriate to the exigencies of the situation.

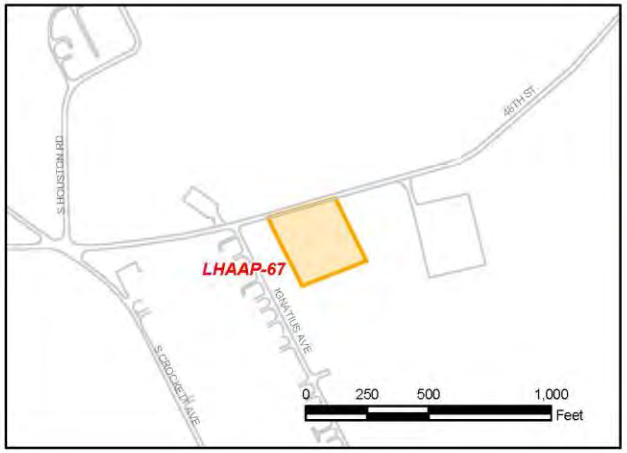
The LUCs shall remain in effect until such time as the Army, TCEQ and USEPA agree that the concentrations of COCs have met cleanup levels. When this occurs, the LUCs will be terminated as needed. The decision to terminate LUCs will be documented consistent with the NCP process for post-ROD changes, potentially including an explanation of significant differences or a remedial action completion report. If the property has been transferred and a determination by the Army, TCEQ and USEPA has been made to terminate one or more of the LUCs, the Army shall provide to the owner of the property an appropriate release for recordation pertaining to the site and will also timely advise other local stakeholders of the action.

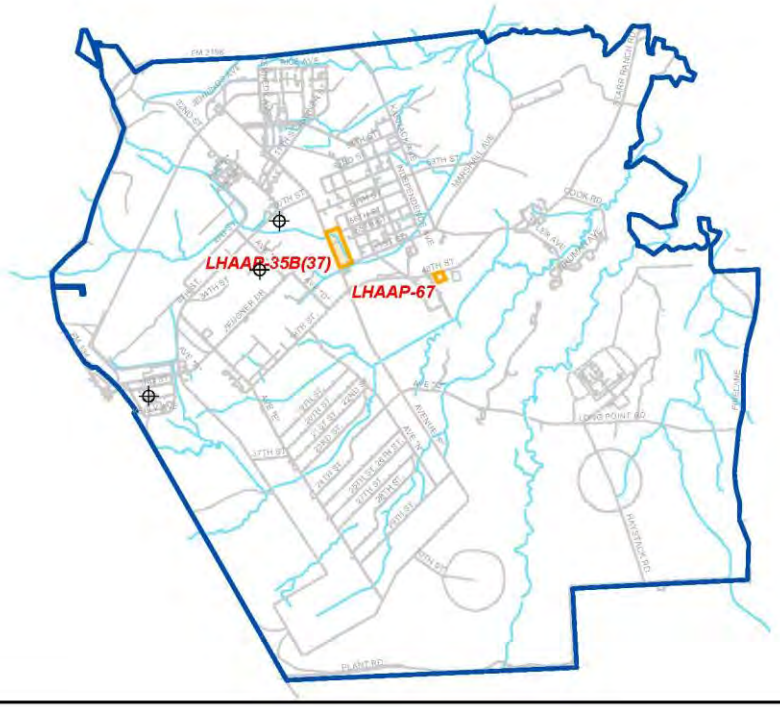
6.3 Monitored Natural Attenuation Implementation Actions

Implementation actions include installation of additional monitoring wells, plugging and abandonment of monitoring wells not designated for long-term monitoring, implementation of a groundwater monitoring plan, monitoring, and reporting. The project schedule and cost summary for implementation actions are provided in **Appendix H**. Groundwater monitoring will be conducted to monitor the effectiveness of MNA in reducing contaminant concentrations over time. Monitoring will also be conducted to evaluate plume migration and ensure that chlorinated solvents-contaminated groundwater does not impact nearby surface water at unacceptable levels. Surface water sampling will be conducted to confirm contaminated groundwater is not migrating to surface water. The Groundwater Monitoring Plan, attached as **Appendix A**, describes the wells, their locations, analytical parameters, the frequency of the monitoring, surface water sampling, and presents a list of the monitored constituents and their respective MCLs. Groundwater monitoring and surface water sampling conducted at LHAAP-35B(37) and LHAAP-67 will follow the Health and Safety Plan (**Appendix E**), the Contractor Quality Control Plan (**Appendix F**), the Chemical Data Acquisition Plan (**Appendix G**), Field Activities (**Appendix C**) and Field Procedures (**Appendix D**) as contained in the appendices of the Remedial Design LHAAP-35B(37) and LHAAP-67.

Annual reports will be prepared for any year in which sampling occurs to document the monitoring program. The first year's annual report will include a review of the first four quarters of data, which include natural attenuation parameters and provide an evaluation for the evidence of MNA as a remedial method and a review of the first year's surface water sample data. The TCEQ provides guidance for MNA as a remedial action in *Monitored Natural Attenuation Demonstrations* (Texas Natural Resource Conservation Commission [TNRCC], RG-366/TRRP-33, October 2001). Although LHAAP is being addressed under the Risk Reduction Standards rather than Texas Risk Reduction Program (TRRP), this guidance is comparable to USEPA guidance and may be used as a guideline for the evaluation of the groundwater data. TRRP guidance specifies recommended lines of evidence to document the occurrence of natural attenuation at a site. For the first annual report, primary and secondary lines of evidence will be evaluated to document that attenuation is occurring at LHAAP-35B(37) and LHAAP-67. The primary line







LEGEND

- Approximate LHAAP Boundary
- Road
- Stream
- Site
- LHAAP Water Supply Well

LEGEND

- Road
- Stream
- Site
- Approximate LHAAP Boundary
- LHAAP Water Supply Well

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	FILE PATH
Houston, TX	B. Lu 10/12/07	N. Olson 10/31/07	P. Srivastav 10/31/07	T:\GIS\Longhorn\MXD\ST35B67\ROD\SiteLocs.mxd

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 2-2
SITE LOCATION MAP
REMEDIAL DESIGN
LHAAP-35B(37) AND LHAAP-67, GROUP 4
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

LHAAP-37, 37-2

NOTICE OF LAND USE CONTROLS AND NONRESIDENTIAL LAND USE AT LHAAP-35B (37) FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

00943242

2015-000002401

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

NOTICE

8 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 03/16/2015 11:17 AM **Document Number:** 2015-000002401 **Receipt No:** 1502837 **Amount:** $ 50.00 **By:** Denise Kio, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

AECOM
112 E. PECAN ST,STE 400
FED-EX ENVELOPE
SAN ANTONIO, TX 78205

STATE OF TEXAS HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF LAND USE CONTROL AT LHAAP-35B (37)

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 in a former industrial area, located on the Former Longhorn Army Ammunition Plant (LHAAP) and is designated as LHAAP-35B (37) (Chemical Laboratory). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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-35B (37) were performed in accordance with the FFA requirements.

The LHAAP-35B (37) was built during the construction of Plant 3 (1953-1955) and was originally used to support the production activities at LHAAP. A Record of Decision (ROD) for LHAAP-35B (37) was signed by the USEPA in 2010 establishing the final remedy which consists of land use control (LUC) in conjunction with monitored natural attenuation (MNA). The site was not remediated to levels suitable for unrestricted use. The LUC at LHAAP-35B (37) is required to prevent human exposure to contaminated groundwater. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-35B (37) parcel is a 12.2-acre tract, 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. Within the LHAAP-35B (37) parcel is designated a LUC boundary which is a 16.578-acre tract, more or less, as described in Exhibit A. The LUC boundary is 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 purposes of this certification, residential use includes, but is not limited to, single family or multifamily residences; child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12. The United States Department of the Army has undertaken careful environmental study of the LHAAP-35B (37) site and concluded that the LUC set forth below is required to ensure protection of human health and the environment.

(1) Groundwater Restriction. The groundwater use restriction boundary consists of the 16.578-acre tract, more or less. Groundwater underlying this land is contaminated with trichloroethene (TCE), tetrachloroethene (PCE), and 1,1-dichloroethene (1,1-DCE) and shall not be accessed or used for any purpose without the prior written approval of the U.S. Army, the USEPA, and the TCEQ. A LUC restricting the use of groundwater has been established for the protection of human health. The U.S. Army will notify the Texas Department of Licensing and Regulation of the groundwater restriction which includes prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval by the U.S. Army, the USEPA, and the TCEQ. A restriction against the residential use of groundwater will remain in effect until the levels of the COCs in groundwater and soil allow unrestricted use and unlimited exposure (UUUE).

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

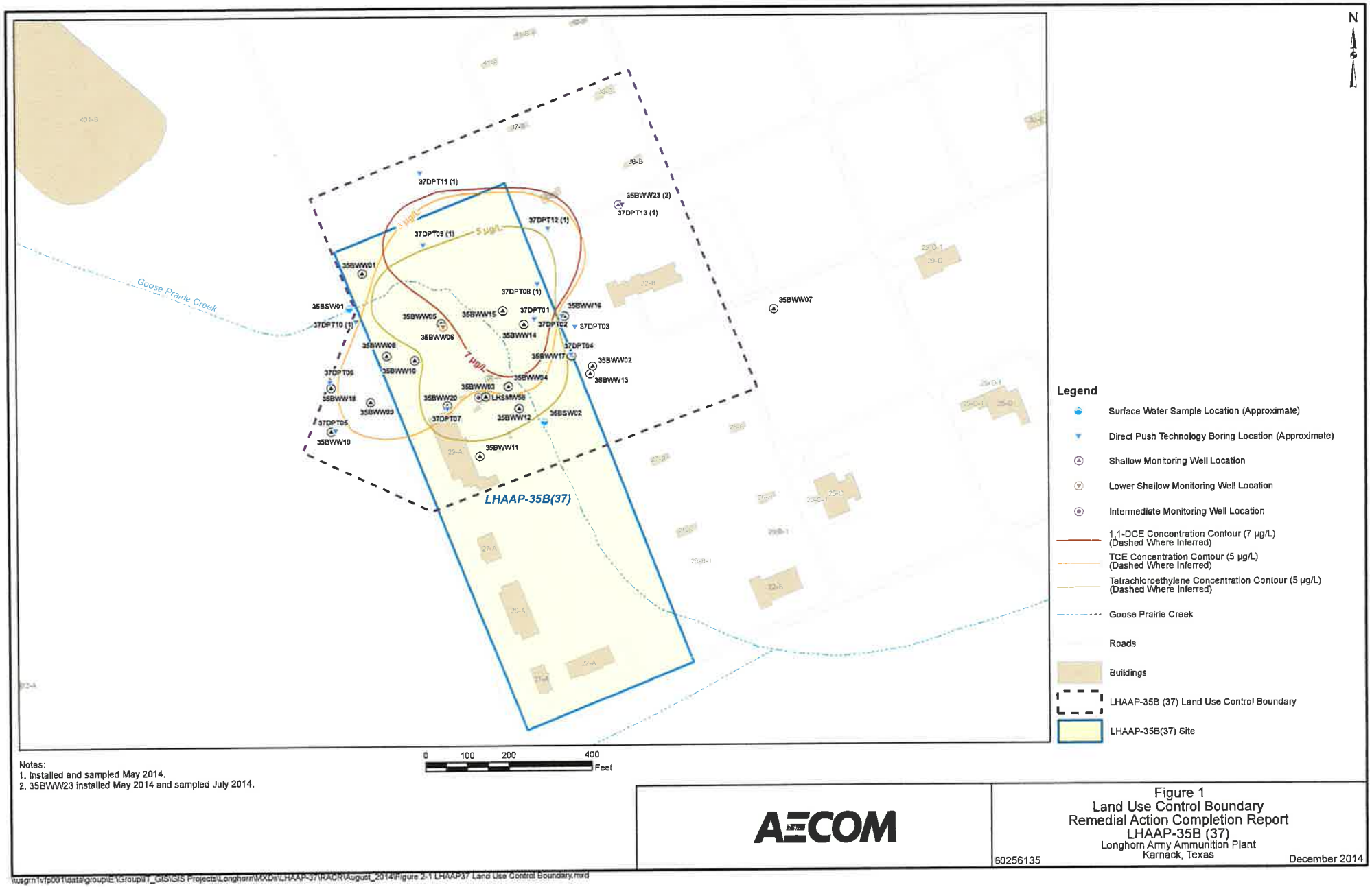
EXECUTED this the 19 th day of February, 2015.

BEFORE ME, on this the 19 th day of February 2015 personally appeared Rose M. Zeiler, of 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 19th day of February, 2015.

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

GENIE WARNER
Notary Public State of Texas
COMM. EXP. 8/1/2018



Notes:
1. Installed and sampled May 2014.
2. 35BWW23 installed May 2014 and sampled July 2014.

AECOM

Figure 1
Land Use Control Boundary
Remedial Action Completion Report
LHAAP-35B (37)
Longhorn Army Ammunition Plant
Karnack, Texas

60256135 December 2014

\\usgrn1vfp001\data\group\E:\Group\IT_GIS\GIS Projects\Longhorn\MXDs\LHAAP-37\RACR\August_2014\Figure 2-1 LHAAP37 Land Use Control Boundary.mxd

EXHIBIT A
SURVEY PLAT

FIELD NOTES DESCRIPTION OF
"LHAAP-35B(37)" LAND USE CONTROL AREA
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, "LHAAP-35B(37)" Land Use Control Area being 16.578 acres of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), "LHAAP-35B(37)" Land Use Control Area being more particularly described as follows :

Surveyor's Note: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.99986172702, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "C-21" (N=6956579.781 feet E=3308499.969 feet) and "X-11" (N=6960733.698 feet E=3304750.367 feet). Said traverse indicates a surface distance of 5596.714 feet between said monuments. The computed land area is based on State Plane distances. As used herein, the abbreviation I.R.O.P.C. indicates 1/2" iron rebar with orange plastic cap engraved "Fidler" and "RPLS 3940" .

Commencing at monument "C-21" referenced above,

THENCE N 22deg47'20"W 1290.84' to a concrete nail set (near the centerline of the asphalt pavement of "Avenue P") for the Southmost corner of this tract and this POINT OF BEGINNING,

THENCE N 67deg25'22"W 354.97' along a S.B.L. of this tract to an I.R.O.P.C. set for this tract's Westmost corner,

THENCE N 20deg54'22"E 363.80' along a W.B.L. of this tract to a concrete nail set (near the centerline of the asphalt pavement of "Avenue P") for this tract's Westerly reentrant corner,

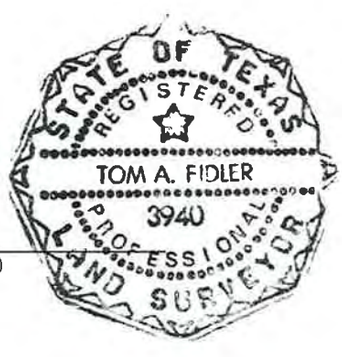
THENCE N 22deg33'04"W 285.83' along a W.B.L. of this tract to a concrete nail set (near the centerline of the asphalt pavement of "Avenue P") for this tract's N.W.C., said nail being S 52deg54'59"E 3687.90' from the aforementioned "X-11" monument,

THENCE N 68deg33'30"E 817.56' along the N.B.L. of this tract to a concrete nail set (near the centerline of the asphalt pavement of "Bowie Avenue") for this tract's Northmost corner,

THENCE S 21deg48'41"E 817.92' along the E.B.L. of this tract to a concrete nail set (near the centerline of the asphalt pavement of "Bowie Avenue") for this tract's Eastmost corner,

THENCE S 69deg44'08"W 807.28' along a S.B.L. of this tract to this POINT OF BEGINNING, containing 16.578 acres, more or less.

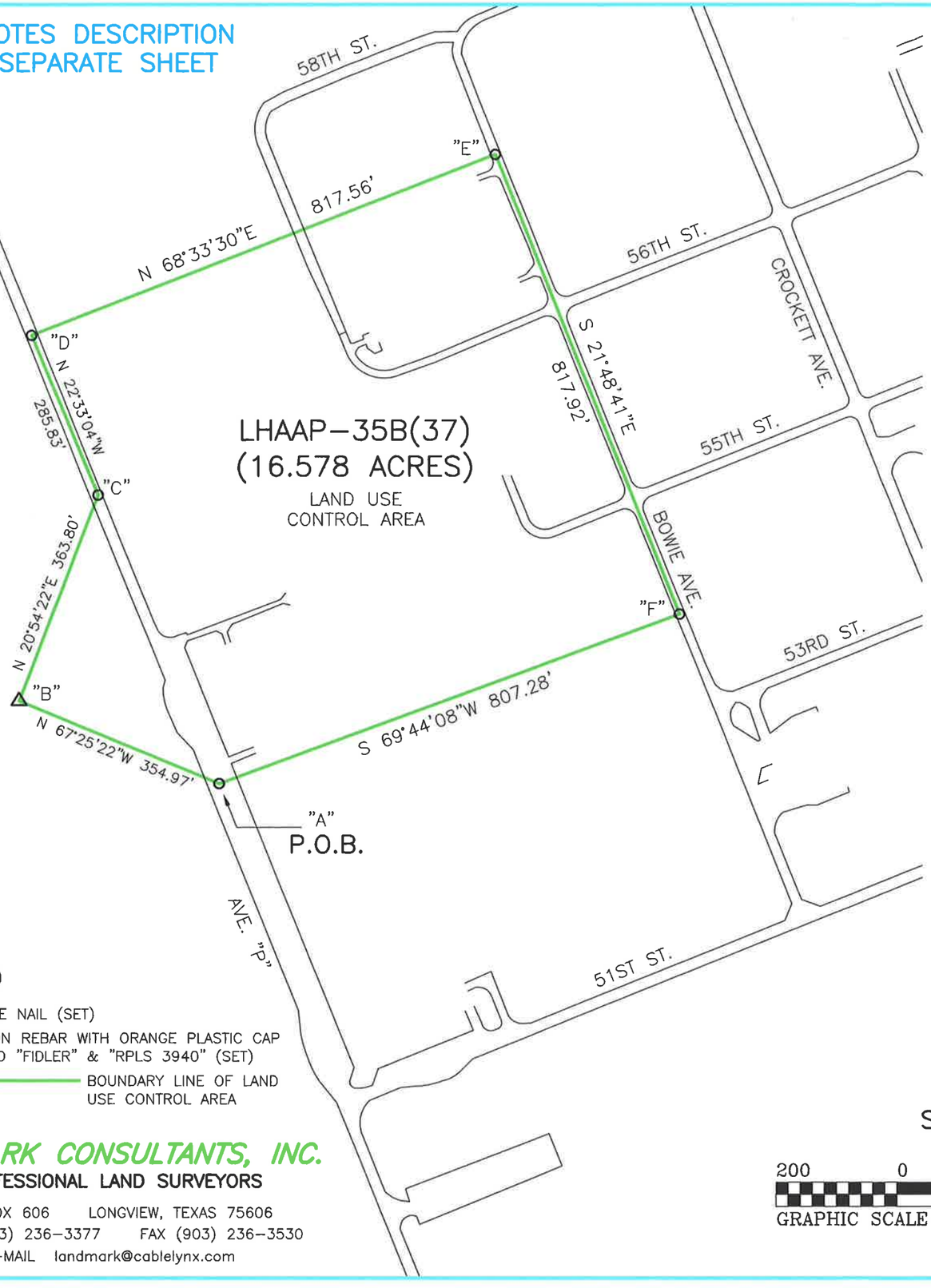
I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943249

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEET



I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in January, 2015.

Witness my hand and seal this the 21st day of January, 2015.

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), AND COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.99986172702 & IS BASED ON CALCULATED DISTANCE BETWEEN PUBLISHED STATE PLANE COORDINATES OF STATIONS C-21 & X-11 DIVIDED BY SURFACE TRAVERSE CALCULATED DISTANCE BETWEEN SAME TWO STATIONS. THE COMPUTED LAND AREA IS BASED ON STATE PLANE DISTANCES.

COORDINATE TABLE

POINT	NORTH	EAST
A	6957769.855	3307999.979
B	6957906.138	3307672.216
C	6958245.983	3307802.032
D	6958509.961	3307692.413
E	6958808.823	3308453.390
F	6958049.461	3308757.289

LEGEND

- ○ CONCRETE NAIL (SET)
- △ 1/2" IRON REBAR WITH ORANGE PLASTIC CAP ENGRAVED "FIDLER" & "RPLS 3940" (SET)
- BOUNDARY LINE OF LAND USE CONTROL AREA

SCALE 1"=200'

200 0 200 400 600

GRAPHIC SCALE - FEET

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

LHAAP-35B(37) L.U.C.A.
(16.578 ACRES)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	I.PTS I.LEG
01/21/2015	0605063I.DWG	DRAWN BY JTJ

LHAAP-37, 37-3

LAND USE CONTROL COMPLIANCE INSPECTION FORM

September 14, 2015

Sample Annual Land Use Control Compliance Certification Documentation

In accordance with the Remedial Design dated 8/1/11 for LHAAP-35B (37), a certification of site was conducted by _____ [indicate transferee] on _____.

A summary of land use control mechanisms is as follows:

- Groundwater restriction – A restriction against use of groundwater will remain in effect until the levels of the COCs in groundwater and soil allow unrestricted use and unlimited exposure (UUUE). [Indicate whether groundwater restrictions are still required at LHAAP-35B (37)]

A summary of compliance with land use and restriction covenants is as follows:

- No use of groundwater, installation of new groundwater wells, or tampering with existing wells at LHAAP-35B (37).

I, the undersigned, do document that the certification was performed as indicated above, and that the above information is true and correct to the best of my knowledge, information, and belief.

Date: _____

Name/Title: _____

Signature: _____

Annual compliance certification forms shall be completed no later than March 1 of each year for the previous calendar year.

LHAAP-46, 46-1

LUCs FROM FINAL REMEDIAL DESIGN

September 14, 2015

Final
Remedial Design
LHAAP-46, Plant 2 Area, Group 4
Longhorn Army Ammunition Plant
Karnack, Texas

Prepared for U.S. Army Corps of Engineers – Tulsa District
1645 South 101st, East Avenue
Tulsa, Oklahoma 74128

Prepared by Shaw Environmental, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

Contract No. W912QR-04-D-0027, Task Order No. DS02
Shaw Project No. 117591
Rev 0
September 2011

Shaw® a world of Solutions™

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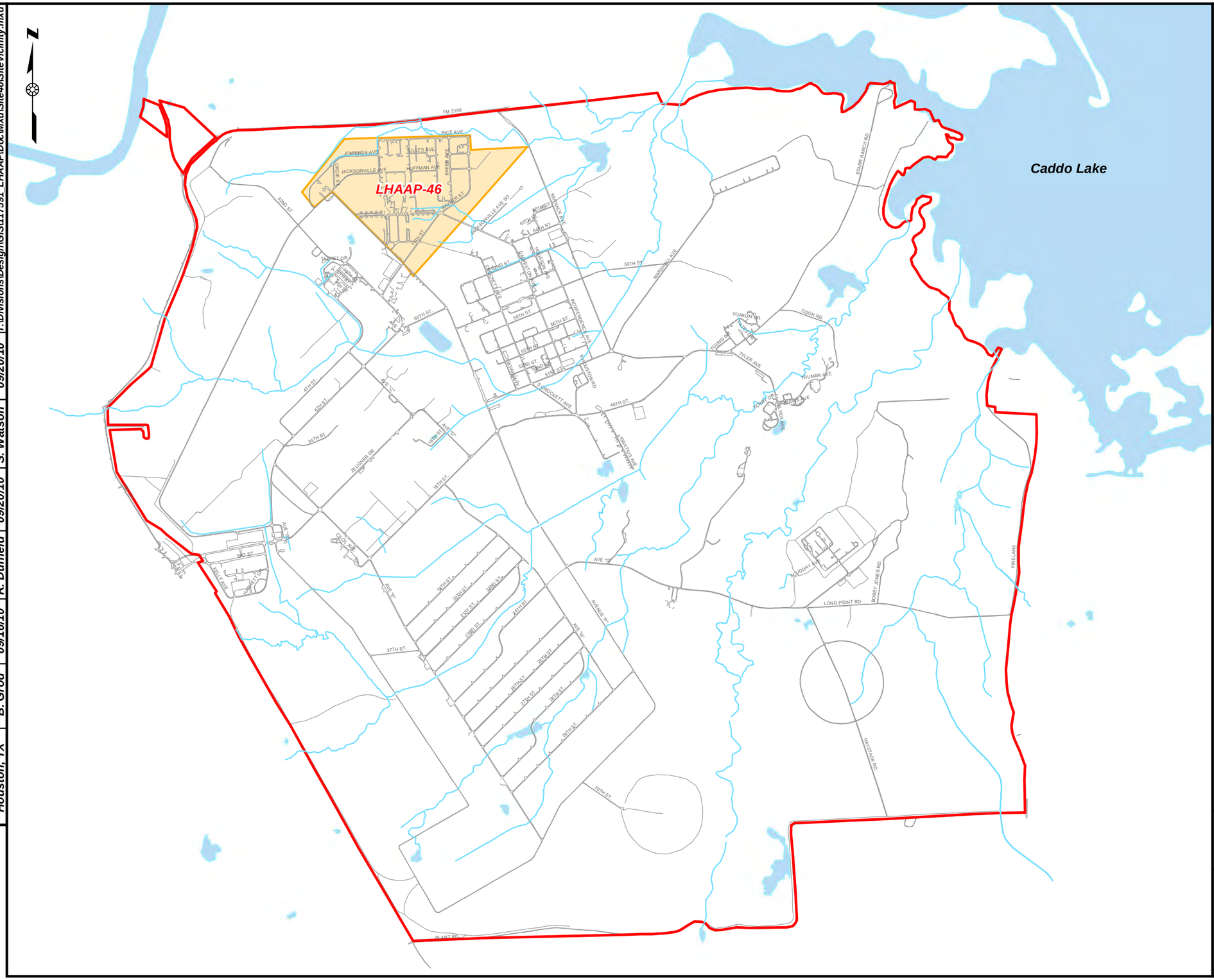

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 1-2

SITE VICINITY MAP
LHAAP-46, REMEDIAL DESIGN

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

2.0 LAND USE CONTROL

The objective of the LUC at LHAAP-46 is to prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health and ensure that there is no withdrawal or use of groundwater beneath the sites for anything other than environmental monitoring and testing until cleanup goals are met Notification of the groundwater use restriction will accompany all transfer documents and will be recorded at the Harrison County Courthouse in accordance with Texas Administrative Code (TAC) Title 30, §335.566. **Appendix A** provides sample LUC compliance certification documentation.

The LUC addresses the area of LHAAP-46 that includes two groundwater plumes at LHAAP-46 with levels of contamination that require implementation of a remedy (see **Section 1.3**). The U.S. Army is responsible for implementing, maintaining, monitoring, reporting on, and enforcing the LUC.

U.S. Army and regulators will consult to determine appropriate enforcement actions should there be a failure of an LUC objective at this site after it has transferred. U.S. Army shall obtain USEPA and Texas Commission on Environmental Quality (TCEQ) concurrence prior to termination or significant modification of the LUC, or implementation of a change in land use inconsistent with the LUC objectives and use assumptions of the remedy. Although not a remedy, the land use assumption for LHAAP-46 forms the basis for the remedy. The future use of the site as part of a national wildlife refuge is consistent with an industrial risk exposure scenario. Notification of the land use assumption of this site will be made in transfer documentation and will be recorded in the Harrison County Courthouse in accordance with TAC Title 30, §335.566. Compliance with the use assumption will be documented in the five-year review reports.

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4.0 LAND USE CONTROL DESIGN AND IMPLEMENTATION PLAN

This section describes the LUC design and implementation activities for LHAAP-46. The activities will result in a surveyed and recorded groundwater use restriction boundary and an operation and maintenance plan for the LUC.

The objective of the LUC at LHAAP-46 is to prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health and ensure that there is no withdrawal or use of groundwater beneath the sites for anything other than environmental monitoring and testing until cleanup goals are met. Notification of the groundwater use restriction will accompany all transfer documents. The U.S. Army is responsible for long-term implementation, maintenance, inspection, reporting, and enforcement of the LUC.

The LUC will address the area of LHAAP-46 that includes two groundwater plumes with levels of contamination that require implementation of a remedy (see **Section 1.3**). The Land Use Control Operation and Maintenance (LUC O&M) Plan will identify the measures required for the monitoring and enforcement of the groundwater use restriction.

Upon review and concurrence of this RD, the LUC O&M Plan will be coordinated with regulators, finalized and distributed as part of the Comprehensive LUC Management Plan.

4.1 Land Use Control Implementation

The U.S. Army will undertake the following actions to implement the groundwater restriction LUC for LHAAP-46:

- Define the Area of the Groundwater Use Restriction. The groundwater use restriction boundary will be defined based on the review of the first round of groundwater sampling data in conjunction with historic data. The extent of plume will be bounded by a buffer and may extend to natural groundwater and surface water boundaries.
- Survey the LUC Boundary. The proposed boundary will be finalized after all wells are installed and sampled. Concurrence by USEPA and TCEQ will be obtained, and the LUC boundary will be surveyed by a State-licensed surveyor. A legal description of the surveyed area will be appended to the survey plat.
- Record the LUC in Harrison County. The LUC plat, legal description and groundwater use restriction language will be recorded in the Harrison County Courthouse in accordance with TAC Title 30, §335.56.

- Notify the Texas Department of Licensing and Regulation of the LUC. The Texas Department of Licensing and Regulation will be notified of the groundwater restriction which includes the prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval from the U.S. Army, the USEPA, and the TCEQ. The survey plat, legal boundary and description of the groundwater restriction, in conjunction with a locator map, will be provided in hard and electronic copy.

- Develop the LUC O&M Plan. A LUC O&M Plan for LHAAP-46 will be developed. It will include the elements presented in **Section 4.2** below, the county recordation of the LUC survey plat, legal description and restriction language and the annual inspection/certification form.

4.2 Land Use Control Operation and Maintenance

The U.S. Army or its representatives will be responsible for the operation and maintenance of the LHAAP-46 LUC. This includes certification, reporting and enforcement activities. The U.S. Army shall address LUC problems within its control that are likely to impact remedy integrity and shall address problems as soon as practicable. To facilitate long-term operation and maintenance of the groundwater use restriction LUC remedy, U.S. Army will develop a plan that will encompass the elements described in the following subsections.

4.2.1 Site Certification and Reporting

Beginning with finalization of this RD and approval of the annual inspection form, the U.S. Army will undertake annual inspections and certify continued compliance with the LUC objectives. The U.S. Army, or the transferee after transfer, will retain the annual LUC Inspection/Certification documents in the project files for incorporation into the Five Year Review Reports, and these documents will be made available to USEPA and TCEQ upon request. In addition, should any violations be found during the annual certification, the U.S. Army will provide to USEPA and TCEQ along with the document, a separate written explanation indicating the specific violations found and what efforts or measures have or will be taken to correct those violations. The need to continue annual certifications will be revisited at five year reviews.

4.2.2 Notice of Planned Property Conveyances

The U.S. Army shall provide notice to USEPA and TCEQ of plans to convey the LHAAP-46 acreage. The notice shall describe the mechanism by which the LUC will continue to be implemented, maintained, inspected, reported, and enforced. Upon transfer, such responsibilities may shift to the transferee via appropriate provisions placed in the Environmental Condition of Property (ECP) or other environmental document for transfer. Although the U.S. Army may transfer responsibility for various implementation actions, the

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U.S. Army shall retain its responsibility for remedy integrity. This means that the U.S. Army is responsible for addressing substantive violations of the LUC performance objective that would undermine the U.S. Army's CERCLA remedy. The U.S. Army also will be responsible for incorporating RD information and outlining the transferee's LUC obligations into property transfer documentation.

4.2.3 Opportunity to Review Text of Intended Land Use Controls

U.S. Army will provide a copy of the groundwater use restriction notification to TCEQ for review and approval prior to its recordation in Harrison County. USEPA will also receive a copy for review. In addition, the U.S. Army will produce an ECP or other environmental document for transfer of LHAAP-46, but before executing transfer, the U.S. Army will provide USEPA and TCEQ with a copy of the ECP or other environmental document for transfer so that they may have reasonable opportunity, before transfer, to review all LUC-related provisions.

4.2.4 Notification Should Action(s) which Interfere with Land Use Control Effectiveness be Discovered Subsequent to Conveyance

Should the U.S. Army discover after conveyance of the site any activity on the property inconsistent with the LUC performance objective, the U.S. Army shall notify USEPA and TCEQ within 72 hours of such discovery. Consistent with **Section 4.2.5** below, the U.S. Army will then work with USEPA, TCEQ and the transferee to correct the problem(s) discovered. This reporting requirement does not preclude the U.S. Army from taking immediate action pursuant to its CERCLA authorities to prevent any perceived risk(s) to human health or the environment.

4.2.5 Land Use Control Enforcement

Should the LUC remedy reflected in this LUC RD fail, the U.S. Army will coordinate with USEPA and TCEQ to ensure that appropriate actions are taken to reestablish its protectiveness. These actions may range from informal resolutions with the U.S. Fish and Wildlife Service or its lessee, to the institution of judicial action against nonfederal third parties. Alternatively, should the circumstances warrant such, the U.S. Army could choose to exercise its response authorities under CERCLA. Should the U.S. Army become aware that any future owner or user of the property has violated any LUC requirement over which a local agency may have independent jurisdiction, the U.S. Army may notify those agencies of such violation(s) and work cooperatively with them to re-achieve owner/user compliance with the LUC.

4.2.6 Modification or Termination of Land Use Controls

The U.S. Army shall not, without USEPA and TCEQ concurrence, make a significant modification to, or terminate a LUC, or make a land use change inconsistent with the LUC objective. Likewise, the U.S. Army shall seek prior USEPA and TCEQ concurrence before commencing actions that may impact remedy integrity. In the case of an emergency action, the U.S. Army shall obtain prior USEPA and TCEQ concurrence as appropriate to the exigencies of the situation.

The LUCs shall remain in effect until such time as the U.S. Army and USEPA agree that the concentrations of COCs have met cleanup levels. When this occurs, the LUC will be terminated as needed. The decision to terminate the LUC will be documented consistent with the NCP process for post-ROD changes, potentially including an explanation of significant differences or a remedial action completion report. If the property has been transferred and a determination by the U.S. Army and USEPA has been made to terminate the LUC, the U.S. Army shall provide to the owner of the property an appropriate release for recordation pertaining to the site and will also timely advise other local stakeholders of the action.

4.2.7 Comprehensive Land Use Control Management Plan

Upon finalization of the LUC O&M Plan a copy will be inserted into the Comprehensive LUC Management Plan for Longhorn. The Comprehensive LUC Management Plan figure and table will be updated to reflect the inclusion of LHAAP-46.

The Comprehensive LUC Management Plan consists of LHAAP RD documents and a survey plat showing the locations where LUCs being implemented at LHAAP are applied. The purpose of this Comprehensive LUC Management Plan is to ensure all site-specific LUCs are compiled into one comprehensive location for both pre-transfer use by the installation and for post-transfer use by the transferee. This document will be provided to USEPA and TCEQ, and will also be accessible to the local government and the public. The Comprehensive LUC Management Plan is located in the Marshall Public Library to accompany LHAAP's Administrative Record.

The land use assumption of industrial reuse as part of a national wildlife refuge forms the basis for the remedy at LHAAP-46 and this land use assumption will be in included in the Comprehensive LUC Management Plan with supporting documentation.

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LHAAP-46, 46-2

NOTICE OF LAND USE CONTROLS AND NONRESIDENTIAL LAND USE AT LHAAP-46 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

00943262

2014-000013307

*****DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT*****

NOTICE

8 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 12/09/2014 10:42 AM **Document Number:** 2014-000013307 **Receipt No:** 1415412 **Amount:** $ 50.00 **By:** Pam Rockwell, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

AECOM
ATTN: AMANDA LAGARDE (FEDEX ENV)
112 E PECAN ST., SUITE 400
SAN ANTONIO, TX 78205

STATE OF TEXAS HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF LAND USE CONTROL AT LHAAP-46

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 in a former industrial area, located on the Former Longhorn Army Ammunition Plant (LHAAP) and is designated as LHAAP-46 (Plant 2 Area). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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-46 were performed in accordance with the FFA requirements.

The LHAAP-46 site was used for production of pyrotechnic and illumination devices until 1997. A Record of Decision (ROD) for LHAAP-46 was signed by U.S. Army and USEPA with TCEQ concurrence in 2010 establishing the final remedy which consists of land use control (LUC) in conjunction with monitored natural attenuation (MNA). The LUC will ensure protection of human health by restricting the use of groundwater to environmental monitoring and testing only. MNA will be implemented to establish confidence in attenuation trends and verify that the constituents of concern (COCs) are stable or shrinking and will not migrate to nearby surface water at levels that may present an unacceptable risk to human health or the environment. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at

the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-46 parcel is a 190 acre tract, 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. Within the LHAAP-46 parcel are designated LUC boundaries including a 63.772-acre tract, more or less, 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. The United States Department of the Army has undertaken careful environmental study of the LHAAP-46 site and concluded that the LUC set forth below is required to ensure protection of human health and the environment.

(1) Groundwater Restriction. The groundwater use restriction boundary consists of the 63.772-acre tract, more or less. Groundwater underlying this land is contaminated with trichloroethene (TCE) and other volatile organic compounds (VOCs) and shall not be accessed or used for any purpose without the prior written approval of the U.S. Army, the USEPA, and the TCEQ. A LUC restricting the use of groundwater has been established for the protection of human health. The U.S. Army will notify the Texas Department of Licensing and Regulation of the groundwater restriction which includes prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval by the U.S. Army, the USEPA, and the TCEQ. A restriction against the residential use of groundwater will remain in effect until the levels of the COCs in groundwater and soil allow unrestricted use and unlimited exposure (UUUE).

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 20 th day of November, 2014.

BEFORE ME, on this the 20 th day of November, personally appeared Rose M. Zeiler, of 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.

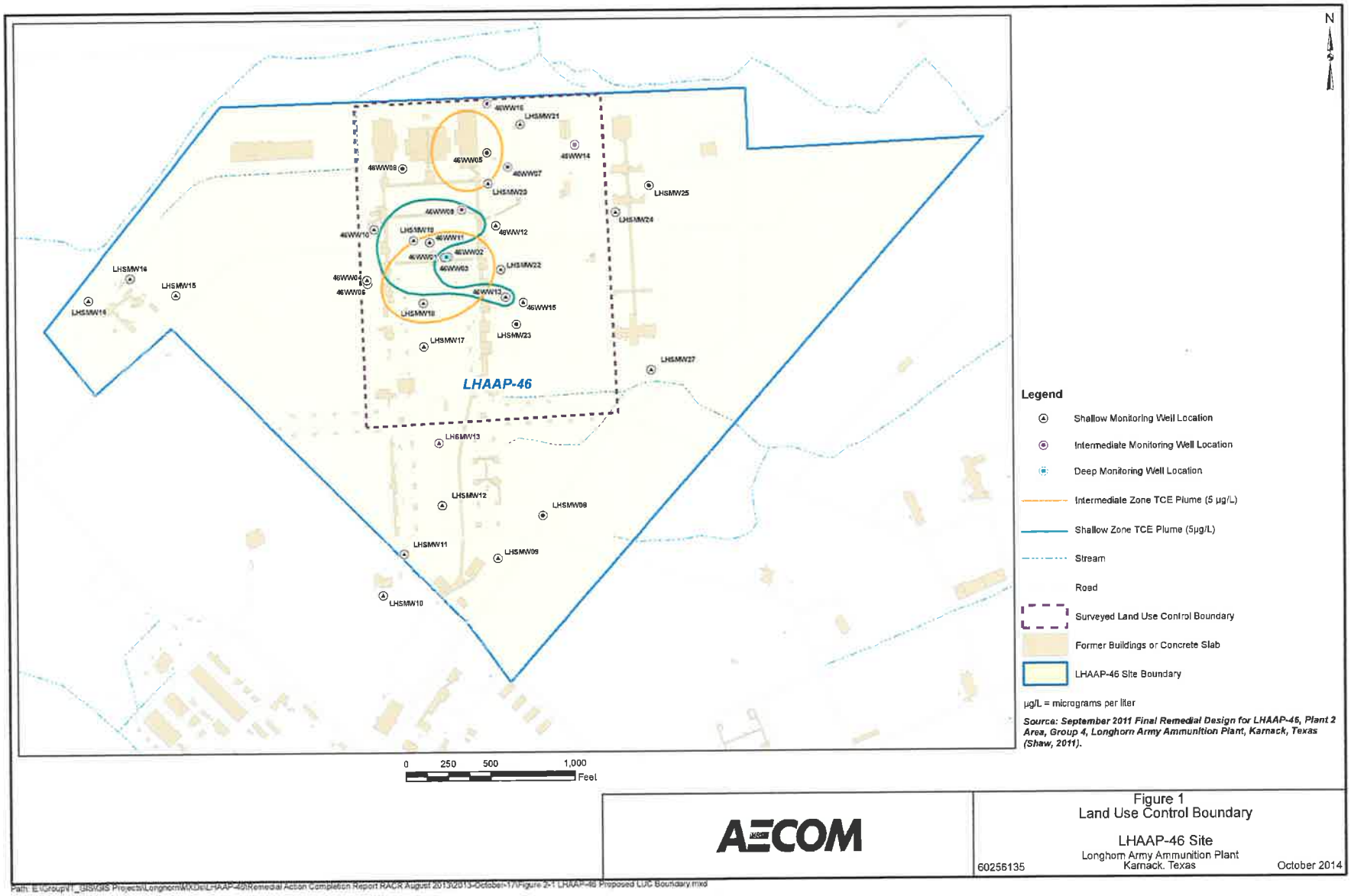
GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the 20 day of November, 2014.

ANGELA HUMPHRIES
Notary Public State of Texas
COMM. EXP. 03-17-2015

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

EXHIBIT A

COUNTY CLERK'S MEMO
PORTIONS OF THIS
DOCUMENT NOT
REPRODUCIBLE
WHEN RECORDED



AECOM

Figure 1
Land Use Control Boundary

LHAAP-46 Site
Longhorn Army Ammunition Plant
Karnack, Texas

60256135

October 2014

Path: E:\Group\1_GIS\GIS Projects\LonghornMXDs\LHAAP-46\Remedial Action Completion Report RACR August 2013\2013-October-17\Figure 2-1 LHAAP-46 Proposed LUC Boundary.mxd

FIELD NOTES DESCRIPTION OF
"LHAAP-46" LAND USE CONTROL AREA
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, "LHAAP-46" Land Use Control Area being 63.772 acres of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), "LHAAP-46" Land Use Control Area being more particularly described as follows :

Surveyor's Note: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999861858, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "X-11" (N=6960733.698 feet E=3304750.367 feet) and "HORSE" (N=6960008.269 feet E=3309591.340 feet). Said traverse indicates a surface distance of 4895.701 feet between said monuments. The computed land area is based on grid distances. As used herein, the abbreviation I.R.O.P.C. indicates 1/2" iron rebar with orange plastic cap engraved "Fidler" & "RPLS 3940" .

Commencing at monument "X-11" referenced above,

THENCE N 36deg34'22"E 1386.89' to a concrete nail set (in white paint on asphalt) for the S.W.C. of this tract and this POINT OF BEGINNING,

THENCE N 01deg52'33"W 1886.35' along the W.B.L. of this tract to an I.R.O.P.C. set (in a 6' tall chain link fence running Easterly and Westerly) for this tract's N.W.C. ,

THENCE along said fence, which defines the Northerly Boundary Lines of this tract, the following eleven courses :

(01) N 86deg41'48"E 82.30' to a fence corner post,
(02) N 39deg20'47"E 18.62' to a bent fence corner post,
(03) N 86deg29'33"E 97.31' to a fence corner post,
(04) S 38deg05'14"E 19.89' to a fence corner post,
(05) N 87deg17'05"E 337.52' to a point in said fence,
(06) N 87deg22'07"E 699.24' to a point in said fence,
(07) N 87deg22'02"E 139.25' to a fence corner post,
(08) S 59deg03'44"E 20.98' to a fence corner post,
(09) N 86deg53'55"E 29.32' to a fence corner post,
(10) N 55deg19'37"E 21.12' to a fence corner post,
(11) N 86deg05'43"E 16.55' to an I.R.O.P.C. set in said fence for this tract's N.E.C. ,

THENCE S 02deg42'36"E 1879.91' along the E.B.L. of this tract to a concrete nail set (in white paint on asphalt) for this tract's S.E.C., from which monument "HORSE" referenced above bears S 52deg51'46"E 3171.37',

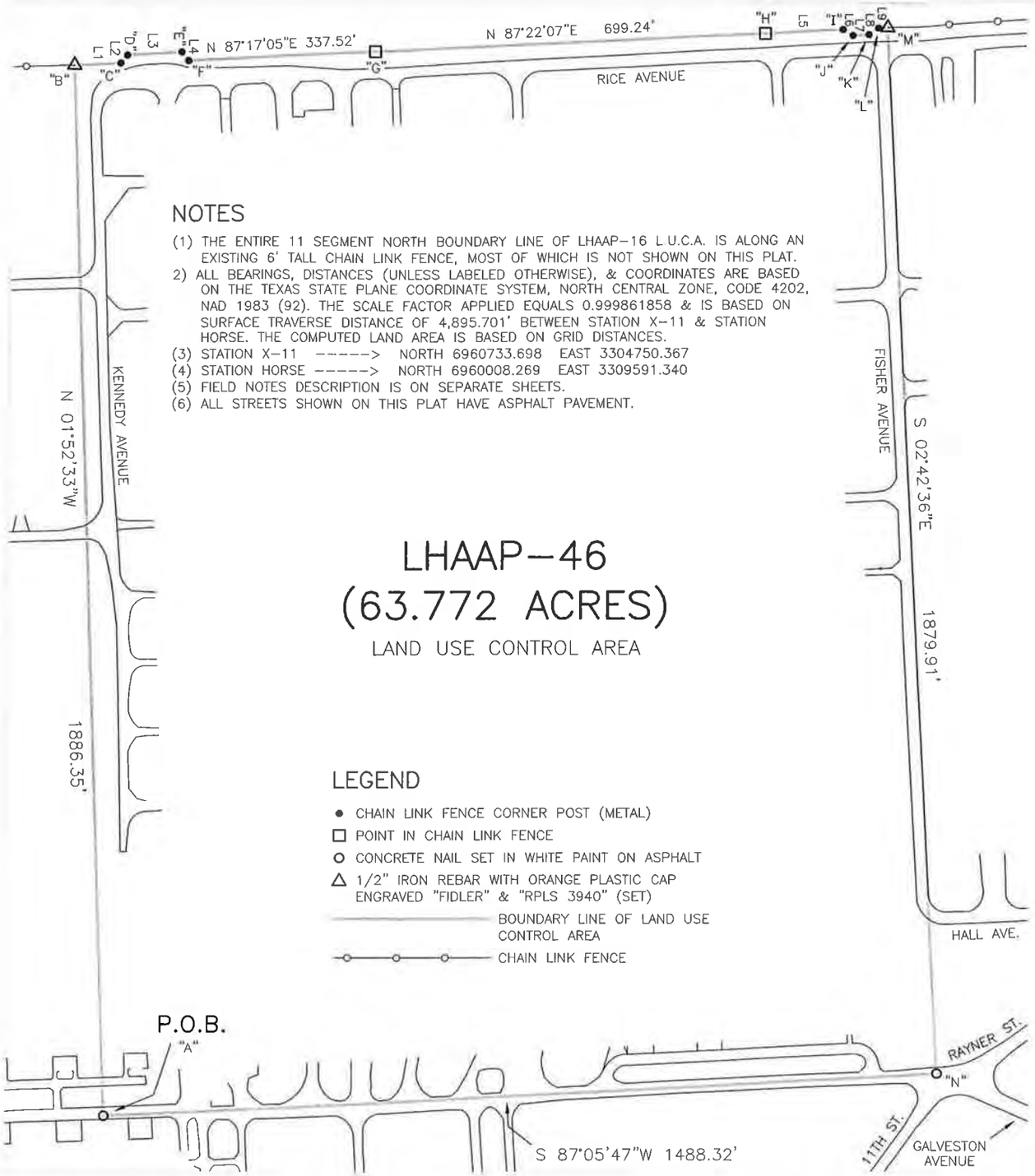
THENCE S 87deg05'47"W 1488.32' along the S.B.L. of this tract to this POINT OF BEGINNING. This tract contains 63.772 acres, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943269



NOTES

(1) THE ENTIRE 11 SEGMENT NORTH BOUNDARY LINE OF LHAAP-16 L.U.C.A. IS ALONG AN EXISTING 6' TALL CHAIN LINK FENCE, MOST OF WHICH IS NOT SHOWN ON THIS PLAT.
2) ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999861858 & IS BASED ON SURFACE TRAVERSE DISTANCE OF 4,895.701' BETWEEN STATION X-11 & STATION HORSE. THE COMPUTED LAND AREA IS BASED ON GRID DISTANCES.
(3) STATION X-11 -----> NORTH 6960733.698 EAST 3304750.367
(4) STATION HORSE -----> NORTH 6960008.269 EAST 3309591.340
(5) FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS.
(6) ALL STREETS SHOWN ON THIS PLAT HAVE ASPHALT PAVEMENT.

LHAAP-46
(63.772 ACRES)
LAND USE CONTROL AREA

LEGEND

- ● CHAIN LINK FENCE CORNER POST (METAL)
- □ POINT IN CHAIN LINK FENCE
- ○ CONCRETE NAIL SET IN WHITE PAINT ON ASPHALT
- △ 1/2" IRON REBAR WITH ORANGE PLASTIC CAP ENGRAVED "FIDLER" & "RPLS 3940" (SET)
- BOUNDARY LINE OF LAND USE CONTROL AREA
- CHAIN LINK FENCE

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in October, 2014.

Witness my hand and seal this the 20th day of October, 2014.

STATE OF TEXAS REGISTERED TOM A. FIDLER 3940 PROFESSIONAL LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

LINE TABLE

LINE	BEARING	DISTANCE
L1	N 86°41'48"E	82.30'
L2	N 39°20'47"E	18.62'
L3	N 86°29'33"E	97.31'
L4	S 38°05'14"E	19.89'
L5	N 87°22'02"E	139.25'
L6	S 59°03'44"E	20.98'
L7	N 86°53'55"E	29.32'
L8	N 55°19'37"E	21.12'
L9	N 86°05'43"E	16.55'

N

SCALE 1"=200'

200 0 200 400 600
GRAPHIC SCALE - FEET

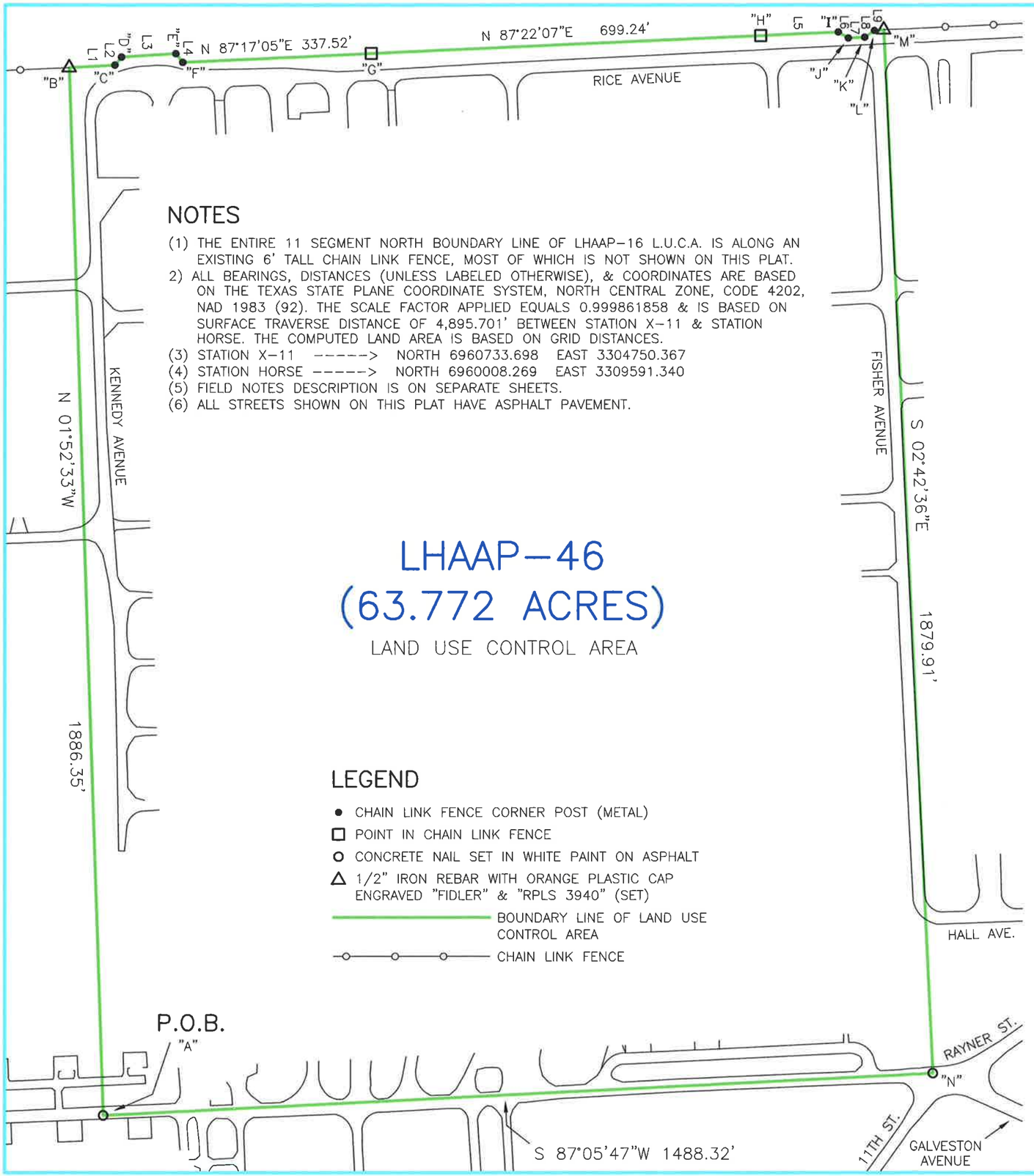
COORDINATE TABLE

POINT	NORTH	EAST
A	6961847.512	3305576.740
B	6963732.849	3305514.995
C	6963737.591	3305597.161
D	6963751.988	3305608.964
E	6963757.942	3305706.095
F	6963742.285	3305718.366
G	6963758.275	3306055.508
H	6963790.379	3306754.008
I	6963796.775	3306893.111
J	6963785.987	3306911.111
K	6963787.573	3306940.387
L	6963799.588	3306957.756
M	6963800.715	3306974.265
N	6961922.907	3307063.146

LHAAP-46 L.U.C.A.
(63.772 ACRES)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	U.PTS U.LEG
10/20/2014	1103025U.DWG	DRAWN BY JTJ

00943270



LHAAP-46
(63.772 ACRES)
LAND USE CONTROL AREA

NOTES

(1) THE ENTIRE 11 SEGMENT NORTH BOUNDARY LINE OF LHAAP-16 L.U.C.A. IS ALONG AN EXISTING 6' TALL CHAIN LINK FENCE, MOST OF WHICH IS NOT SHOWN ON THIS PLAT.
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(3) STATION X-11 -----> NORTH 6960733.698 EAST 3304750.367
(4) STATION HORSE -----> NORTH 6960008.269 EAST 3309591.340
(5) FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS.
(6) ALL STREETS SHOWN ON THIS PLAT HAVE ASPHALT PAVEMENT.

LEGEND

- ● CHAIN LINK FENCE CORNER POST (METAL)
- □ POINT IN CHAIN LINK FENCE
- ○ CONCRETE NAIL SET IN WHITE PAINT ON ASPHALT
- △ 1/2" IRON REBAR WITH ORANGE PLASTIC CAP ENGRAVED "FIDLER" & "RPLS 3940" (SET)
- BOUNDARY LINE OF LAND USE CONTROL AREA
- CHAIN LINK FENCE

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I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in October, 2014.

Witness my hand and seal this the 20th day of October, 2014.

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

LINE TABLE

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GRAPHIC SCALE - FEET

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F	6963742.285	3305718.366
G	6963758.275	3306055.508
H	6963790.379	3306754.008
I	6963796.775	3306893.111
J	6963785.987	3306911.111
K	6963787.573	3306940.387
L	6963799.588	3306957.756
M	6963800.715	3306974.265
N	6961922.907	3307063.146

LHAAP-46 L.U.C.A.
(63.772 ACRES)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	U.PTS U.LEG
10/20/2014	1103025U.DWG	DRAWN BY JTJ

LHAAP-46, 46-3

LAND USE CONTROL COMPLIANCE INSPECTION FORM

September 14, 2015

Sample Annual Land Use Control Compliance Certification Documentation

In accordance with the Remedial Design dated 9/30/11 for LHAAP-46 a certification of site was conducted by _____ [indicate transferee] on _____.

A summary of land use control mechanisms is as follows:

- Groundwater restriction – A restriction against use of groundwater will remain in effect until the levels of the COCs in groundwater and soil allow unrestricted use and unlimited exposure (UUUE). [Indicate whether groundwater restrictions are still required at LHAAP-46]

A summary of compliance with land use and restriction covenants is as follows:

- No use of groundwater, installation of new groundwater wells, or tampering with existing wells at LHAAP-46.

I, the undersigned, do document that the certification was performed as indicated above, and that the above information is true and correct to the best of my knowledge, information, and belief.

Date: _____

Name/Title: _____

Signature: _____

Annual compliance certification forms shall be completed no later than March 1 of each year for the previous calendar year.

LHAAP-49

NOTICE OF NONRESIDENTIAL LAND USE AT LHAAP-49 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2012-000000704

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

7 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000704 **Receipt No:** 1200645 **Amount:** $ 36.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. LHAAP-49 is a former Acid Storage location at the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. LHAAP-49 is considered an NPL listed site, and remedial activities at LHAAP-49 were performed in accordance with the FFA requirements.

LHAAP-49 is located in the west-central portion of LHAAP. LHAAP-49 is the former Acid Storage Area, which was used from 1942 to 1945 for storage and formulation of acids and acid mixtures in support of trinitrotoluene production during World War II. Nitric acid and sulfuric acid were manufactured and handled in large quantities in this area. A no further action Record of Decision for LHAAP-49 was signed by USEPA in 2010 establishing no remedy was required. Further information may be found in the Notice of Registration No. 30990 files, which are available for inspection upon request at TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or

in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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-49 is a 30.540 acre tract 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 United States Department of the Army has undertaken careful environmental study of LHAAP-49 and USEPA and TCEQ concluded that no further investigation or action is required.

Limited monitoring of LHAAP-49 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of LHAAP-49 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 21 th day of July, 2011.

BEFORE ME, on this the 21 th day of July, 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 21 day of July, 2011.

ANGELA HUMPHRIES
Notary Public State of Texas
COMM. EXP. 03-17-2015

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

FIELD NOTES DESCRIPTION OF
LHAAP-49
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 30.540 acres of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998768897, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "HMX-3" (N=6956487.252 feet E=3303483.509 feet) and "HMX-5" (N=6958206.213 feet E=3305201.721 feet). Said traverse indicates a surface distance of 2430.748 feet between said monuments. The computed land area is based on grid (State Plane) distances.

BEGINNING at a 60d nail set for the Southmost corner of this tract, said nail being in asphalt pavement at the intersection of 6th Street and 4th Street, from which nail the monument "HMX-3" referenced above bears N 09deg00'02"E 74.61' ,

THENCE N 46deg42'14"W crossing some of said asphalt pavement, then generally along 4th Street's Northeast edge of asphalt, then crossing a curved section of 4th Street's asphalt, and continuing beyond 4th Street's asphalt, for a total distance of 509.81', to a 60d nail set for the Southmost West corner of this tract,

THENCE N 45deg04'42"E eventually crossing 4th Street's asphalt, then generally along 4th Street's Southeast edge of asphalt, for a total distance of 1323.80', to a 60d nail set (in the Southeast edge of said asphalt pavement) for the Westerly reentrant corner of this tract,

THENCE N 45deg22'03"W crossing 4th Street's asphalt pavement and continuing for a total distance of 308.18' to a point (in the Southeasterly edge of flowing water [May 3, 2011] of Goose Prairie Creek) for the Northmost West corner of this tract, from which point a 1/2" iron rod with Tom Fidler orange plastic cap set for reference bears S 45deg22'03"E 11.34', said rod being at the top of the Southeasterly bank of Goose Prairie Creek,

THENCE N 47deg40'44"E 331.25' along a N.W. B.L. of this tract to a point (in the Southeasterly edge of flowing water [May 3, 2011] of Goose Prairie Creek) for the Westmost North corner of this tract, from which point a 1/2" iron rod with Tom Fidler orange plastic cap set for reference bears S 44deg45'45"E 13.46', said rod being at the top of the Southeasterly bank of Goose Prairie Creek,

THENCE S 44deg45'45"E along a N.E. B.L. of this tract, and eventually crossing 4th Street's asphalt pavement, for a total distance of 292.85' to a 60d nail set in the Southeast edge of said asphalt pavement for the Northerly reentrant corner of this tract,

THENCE N 44deg47'09"E generally along 4th Street's Southeast edge of asphalt pavement, then entering said pavement at the

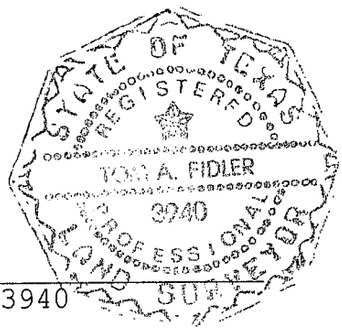
intersection of 4th Street and Avenue "C", for a total distance of 781.21' to a 60d nail set in said asphalt pavement for the Eastmost North corner of this tract,

THENCE S 45deg47'29"E crossing some of said pavement, then generally along the Southwest edge of the asphalt pavement of Avenue "C", then entering said pavement at the intersection of Avenue "C" and 6th Street, for a total distance of 507.27' to a 60d nail set for the Eastmost corner of this tract, from which the monument "HMX-5" referenced above bears N 13deg12'58"E 77.94' ,

THENCE S 44deg55'17"W crossing some of said pavement, then generally along the Northwest edge of the asphalt pavement of 6th Street, then entering said pavement at the aforementioned intersection of 6th Street and 4th Street, for a total distance of 2424.55' to this POINT OF BEGINNING.

This tract contains 30.540 acres, more or less.

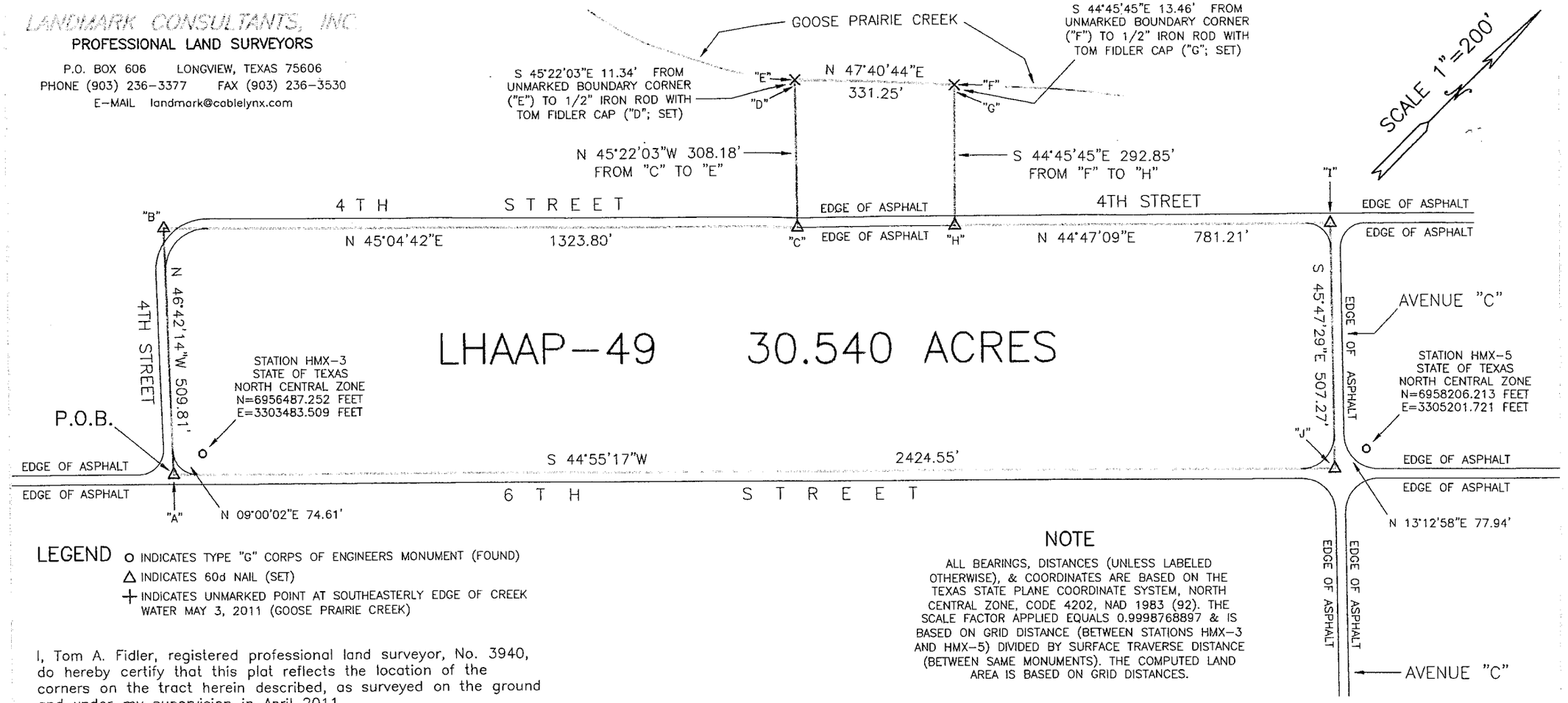
I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943280

LANDMARK CONSULTANTS, INC
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com



LEGEND

- o INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- △ INDICATES 60d NAIL (SET)
- + INDICATES UNMARKED POINT AT SOUTHEASTERLY EDGE OF CREEK WATER MAY 3, 2011 (GOOSE PRAIRIE CREEK)

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998768897 & IS BASED ON GRID DISTANCE (BETWEEN STATIONS HMX-3 AND HMX-5) DIVIDED BY SURFACE TRAVERSE DISTANCE (BETWEEN SAME MONUMENTS). THE COMPUTED LAND AREA IS BASED ON GRID DISTANCES.

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in April 2011.

Witness my hand and seal May 5, 2011.



Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

COORDINATE TABLE

POINT	NORTH	EAST
A	6956413.564	3303471.837
B	6956763.174	3303100.790
C	6957697.967	3304038.137
D(ROD)	6957906.516	3303826.894
E	6957914.483	3303818.824
F	6958137.506	3304063.741
G(ROD)	6958127.951	3304073.216
H	6957929.573	3304269.956
I	6958484.036	3304820.288
J	6958130.332	3305183.901

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

LHAAP-49
(30.540 ACRES)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #1104040	0407088.CRD	M.PTS M.LEG
MAY 5, 2011	1103025M.DWG	DRAWN BY JTJ

LHAAP-50, 50-1

LUCs FROM FINAL REMEDIAL DESIGN

September 14, 2015

Final
Remedial Design
LHAAP-50
Former Sump Water Tank, Group 4
Longhorn Army Ammunition Plant
Karnack, Texas

Prepared for U.S. Army Corps of Engineers – Tulsa District
1645 South 101st East Avenue
Tulsa, Oklahoma 74128

Prepared by Shaw Environmental, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

Contract No. W912QR-04-D-0027, Task Order No. DS02
Project No. 117591
Rev 0
September 2011

Shaw® a world of Solutions™

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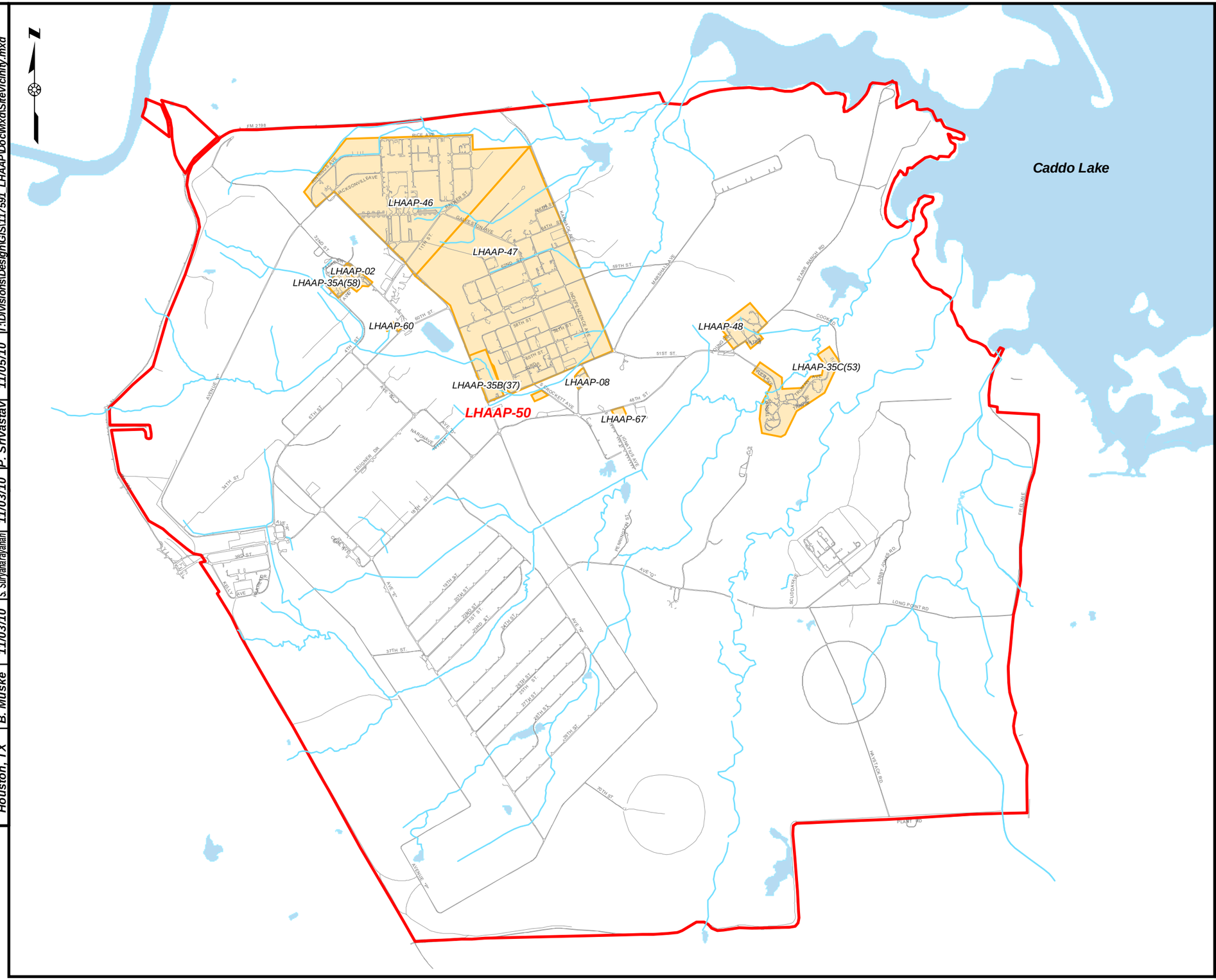
00943284

FILE PATH	T:\Divisions\Design\GIS\117591_LHAAP\Doc\Mxd\SiteVicinity.mxd
APPROVED BY	P. Srivastav 11/05/10
CHECKED BY	S. Suryanarayanan 11/03/10
DRAWN BY	B. Muske 11/03/10
OFFICE	Houston, TX



Shaw

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 1-2

SITE VICINITY MAP
LHAAP-50 REMEDIAL DESIGN

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

3.0 LAND USE CONTROL

The objective of LUC at LHAAP-50 is to prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health and ensure that there is no withdrawal or use of groundwater beneath the sites for anything other than environmental monitoring and testing until cleanup levels are met. Notification of the groundwater use restriction will accompany all transfer documents and will be recorded at the Harrison County Courthouse in accordance with Texas Administrative Code (TAC) Title 30, §335.566. **Appendix B** provides sample LUC compliance certification documentation.

The LUC addresses the area of LHAAP-50 that has groundwater plumes (in both the shallow and intermediate groundwater zones) with levels of contamination that require implementation of a remedy (see **Section 2.3**). The groundwater restriction LUC would be maintained until the concentration of contaminants and by-product contaminants have been reduced to below their respective cleanup levels.

The U.S. Army and regulators will consult to determine appropriate enforcement actions should there be a failure of an LUC objective at this site after it has transferred. The U.S. Army shall obtain USEPA and TCEQ concurrence prior to termination or significant modification of the LUC, or implementation of a change in land use inconsistent with the LUC objectives and use assumptions of the remedy. Although not a remedy, the land use assumption for LHAAP-50 forms the basis for the remedy. The future use of the site as part of a national wildlife refuge is consistent with an industrial risk exposure scenario. Notification of the land use assumption of this site will be made in transfer documentation and will be recorded in the Harrison County Courthouse in accordance with TAC Title 30, §335.566. Compliance with the use assumption will be documented in the five-year review reports.

6.0 LAND USE CONTROL DESIGN AND IMPLEMENTATION PLAN

This section describes the LUC design and implementation activities for LHAAP-50. The activities will result in a surveyed and recorded groundwater use restriction boundary and an operation and maintenance plan for the LUC.

The objective of the LUC at LHAAP-50 is to prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health and ensure that there is no withdrawal or use of groundwater beneath the site for anything other than environmental monitoring and testing until cleanup levels are met. Notification of the groundwater use restriction will accompany all transfer documents. The U.S. Army is responsible for long-term implementation, maintenance, inspection, reporting, and enforcement of the LUC.

The LUC will address the area of LHAAP-50 that includes two groundwater plumes with levels of contamination that require implementation of a remedy (see **Section 1.3**). The Land Use Control Operation and Maintenance Plan (LUC O&M) will identify the measures required for monitoring and enforcement of the groundwater use restriction. Upon review and concurrence of this RD, the LUC O&M Plan will be coordinated with regulators, finalized, and distributed as part of the Comprehensive LUC Management Plan for LHAAP.

6.1 Land Use Control Implementation

The U.S. Army will undertake the following actions to implement the groundwater restriction LUC for LHAAP-50:

- ***Define the Area of the Groundwater Use Restriction.*** The groundwater use restriction boundary will be defined based on the review of the first round of groundwater sampling data in conjunction with historic data. The extent of plume will be bounded by a buffer and may extend to natural groundwater and surface water boundaries.
- ***Survey the LUC Boundary.*** The proposed boundary will be finalized after all wells are installed and sampled. Concurrence by USEPA and TCEQ will be obtained, and the LUC boundary will be surveyed by a State-licensed surveyor. A legal description of the surveyed area will be appended to the survey plat.
- ***Record the LUC in Harrison County.*** The LUC plat, legal description and groundwater use restriction language will be recorded in the Harrison County Courthouse in accordance with TAC Title 30, §335.566.

- ***Notify the Texas Department of Licensing and Regulation of the LUC.*** The Texas Department of Licensing and Regulation will be notified of the groundwater restriction which includes the prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval from the U.S. Army, the USEPA, and the TCEQ. The survey plat, legal boundary and description of the groundwater restriction, in conjunction with a locator map, will be provided in hard and electronic copy.
- ***Develop the LUC O&M Plan.*** An LUC O&M Plan for LHAAP-50 will be developed. It will include the elements presented in **Section 6.2**, the county recordation of the LUC survey plat, legal description and restriction language, and the inspection/certification form.

6.2 Land Use Control Operation and Maintenance

The U.S. Army or its representatives will be responsible for the operation and maintenance of the LHAAP-50 LUC. This includes certification, reporting, and enforcement activities. The U.S. Army shall address LUC problems within its control that are likely to impact remedy integrity and shall address problems as soon as practicable. To facilitate long-term operation and maintenance of the groundwater use restriction LUC remedy, the U.S. Army will develop a plan that will encompass the elements described in the following subsections.

6.2.1 Site Certification and Reporting

Beginning with finalization of this RD and approval of the inspection form, the U.S. Army will undertake inspections and certify continued compliance with the LUC objectives. The U.S. Army or the transferee after transfer will retain the LUC Inspection Certification documents in the project files for incorporation into the five-year review reports, and these documents will be made available to USEPA and TCEQ upon request. In addition, should any violations be found during the certification, the U.S. Army will provide to USEPA and TCEQ, along with the document, a separate written explanation indicating the specific violations found and what efforts or measures have or will be taken to correct those violations. The need to continue certifications will be revisited at five year reviews.

6.2.2 Notice of Planned Property Conveyances

The U.S. Army shall provide notice to USEPA and TCEQ of plans to convey the LHAAP-50 acreage. The notice shall describe the mechanism by which the LUC will continue to be implemented, maintained, inspected, reported, and enforced. Upon transfer, such responsibilities may shift to the transferee via appropriate provisions placed in the Environmental Condition of Property (ECP) or other environmental document for transfer. Although the U.S. Army may transfer responsibility for various implementation actions, the U.S. Army shall retain its responsibility for remedy integrity. This means that the U.S. Army

Contract No. W912QR-04-D-0027, Task Order No. DS02• Final • Rev 0 • September 2011

is responsible for addressing substantive violations of the LUC performance objective that would undermine the U.S. Army's CERCLA remedy. The U.S. Army also will be responsible for incorporating RD information and outlining the transferee's LUC obligations into property transfer documentation.

6.2.3 Opportunity to Review Text of Intended Land Use Controls

The U.S. Army will provide a copy of the groundwater use restriction notification to TCEQ for review and approval prior to its recordation in Harrison County. The USEPA will also receive a copy for review. In addition, the U.S. Army will produce an ECP or other environmental document for transfer of LHAAP-50, but before executing transfer, the U.S. Army will provide USEPA and TCEQ with a copy of the ECP or other environmental document for transfer so that they may have reasonable opportunity, before transfer, to review all LUC-related provisions.

6.2.4 Notification Should Action(s) which Interfere with Land Use Control Effectiveness be Discovered Subsequent to Conveyance

Should the U.S. Army discover after conveyance of the site any activity on the property inconsistent with the LUC performance objective, the U.S. Army shall notify USEPA and TCEQ within 72 hours of such discovery. Consistent with **Section 6.2.5** below, the U.S. Army will then work with USEPA, TCEQ and the transferee to correct the problem(s) discovered. This reporting requirement does not preclude the U.S. Army from taking immediate action pursuant to its CERCLA authorities to prevent any perceived risk(s) to human health or the environment.

6.2.5 Land Use Control Enforcement

Should the LUC remedy reflected in this RD fail, the U.S. Army will coordinate with USEPA and TCEQ to ensure that appropriate actions are taken to reestablish its protectiveness. These actions may range from informal resolutions with the USFWS or its lessee, to the institution of judicial action against non-federal third parties. Alternatively, should the circumstances warrant such, the U.S. Army could choose to exercise its response authorities under CERCLA. Should the U.S. Army become aware that any future owner or user of the property has violated any LUC requirement over which a local agency may have independent jurisdiction; the U.S. Army may notify those agencies of such violation(s) and work cooperatively with them to re-achieve owner/user compliance with the LUC.

6.2.6 Modification or Termination of Land Use Controls

The U.S. Army shall not, without USEPA and TCEQ concurrence, make a significant modification to, or terminate an LUC, or make a land use change inconsistent with the LUC objective. Likewise, the U.S. Army shall seek prior USEPA and TCEQ concurrence before

commencing actions that may impact remedy integrity. In the case of an emergency action, the U.S. Army shall obtain prior USEPA and TCEQ concurrence as appropriate to the exigencies of the situation.

The LUC shall remain in effect until such time as the U.S. Army and USEPA agree that the concentrations of COCs have met cleanup levels. When this occurs, the LUC will be terminated as needed. The decision to terminate the LUC will be documented consistent with the NCP process for post-ROD changes, potentially including an explanation of significant differences or a remedial action completion report. If the property has been transferred and a determination by the U.S. Army and USEPA has been made to terminate the LUC, the U.S. Army shall provide to the owner of the property an appropriate release for recordation pertaining to the site and will also timely advise other local stakeholders of the action.

6.2.7 Comprehensive Land Use Control Management Plan

Upon finalization of the LUC O&M Plan, a copy will be inserted into the Comprehensive LUC Management Plan for Longhorn. The Comprehensive LUC Management Plan figure and table will be updated to reflect the inclusion of LHAAP-50.

The Comprehensive LUC Management Plan consists of LHAAP RD documents and a survey plat showing the locations where LUC being implemented at LHAAP are applied. The purpose of this Comprehensive LUC Management Plan is to ensure all site-specific LUC are compiled into one comprehensive location for both pre-transfer use by the installation and for post-transfer use by the transferee. This document will be provided to USEPA and TCEQ and is also accessible to the public. The Comprehensive LUC Management Plan is located in the Marshall Public Library to accompany LHAAP's Administrative Record.

The land use assumption of industrial use as part of a national wildlife refuge forms the basis for the remedy at LHAAP-50 and this land use assumption will be included in the Comprehensive LUC Management Plan with supporting documentation.

LHAAP-50, 50-2

NOTICE OF LAND USE CONTROLS AND NONRESIDENTIAL LAND USE AT LHAAP-50 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

00943291

2015-000006109

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

NOTICE

8 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 06/18/2015 01:32 PM **Document Number:** 2015-000006109 **Receipt No:** 1507040 **Amount:** $ 50.00 **By:** Vickie Gagnard, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox, Harrison County Clerk

Record and Return To:

AMANDA LAGARDE
112 EAST PECAN ST
SUITE 400
SAN ANTONIO, TX 78205

STATE OF TEXAS HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF LAND USE CONTROL AT LHAAP-50

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 in a former industrial area, located on the Former Longhorn Army Ammunition Plant (LHAAP) and is designated as LHAAP-50 (Former Sump Water Tank). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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-50 were performed in accordance with the FFA requirements.

The LHAAP-50 site, when operational, contained a 47,000-gallon capacity aboveground storage tank (AST) which received industrial wastewater from various industrial waste production sumps throughout LHAAP from 1955 to 1988. After the solids were filtered, the storage tank contents were discharged up stream of the bridge on Crockett Avenue, south of 51st Street into Goose Prairie Creek. The AST has been removed. A Record of Decision (ROD) for LHAAP-50 was signed by the U.S. Army and USEPA with TCEQ concurrence in 2010 establishing the final remedy which consists of a land use control (LUC) in conjunction with monitored natural attenuation (MNA) and limited perchlorate-impacted soil removal. The soil was removed to non-residential levels. The site was not remediated to levels suitable for unrestricted use. The LUC at LHAAP-50 will ensure protection of human health by restricting the use of contaminated groundwater to environmental monitoring and testing only. MNA will be implemented to establish confidence in attenuation trends and verify that the constituents of

concern (COCs) are stable or shrinking and will not migrate to nearby surface water at levels that may present an unacceptable risk to human health or the environment. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8:00 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-50 parcel is a 1 acre tract, 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**. Within the LHAAP-50 parcel is designated a LUC boundary which is a 23.891-acre tract, more or less, as described in **Exhibit A**. The LUC boundary is 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 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 educational purpose for children/young adults in grades kindergarten through 12. The United States Department of the Army has undertaken careful environmental study of the LHAAP-50 site and concluded that the LUC set forth below is required to ensure protection of human health and the environment.

(1) Groundwater Restriction. The groundwater use restriction boundary consists of the 23.891-acre tract, more or less. Groundwater underlying this land is contaminated with tetrachloroethylene (PCE), trichloroethylene (TCE), 1,1-dichloroethylene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), cis-1,2-dichloroethylene (cis-1,2-DCE), vinyl chloride and other volatile organic compounds (VOCs) and perchlorate and shall not be accessed or used for any purpose without the prior written approval of the U.S. Army, the USEPA, and the TCEQ. A LUC restricting the use of groundwater has been established for the protection of human health. The U.S. Army will notify the Texas Department of Licensing and Regulation of the groundwater restriction which includes prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval by the U.S. Army, the USEPA, and the TCEQ. A restriction against the residential use of groundwater will remain in effect until the levels of the COCs in groundwater and soil allow unrestricted use and unlimited exposure (UUUE).

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

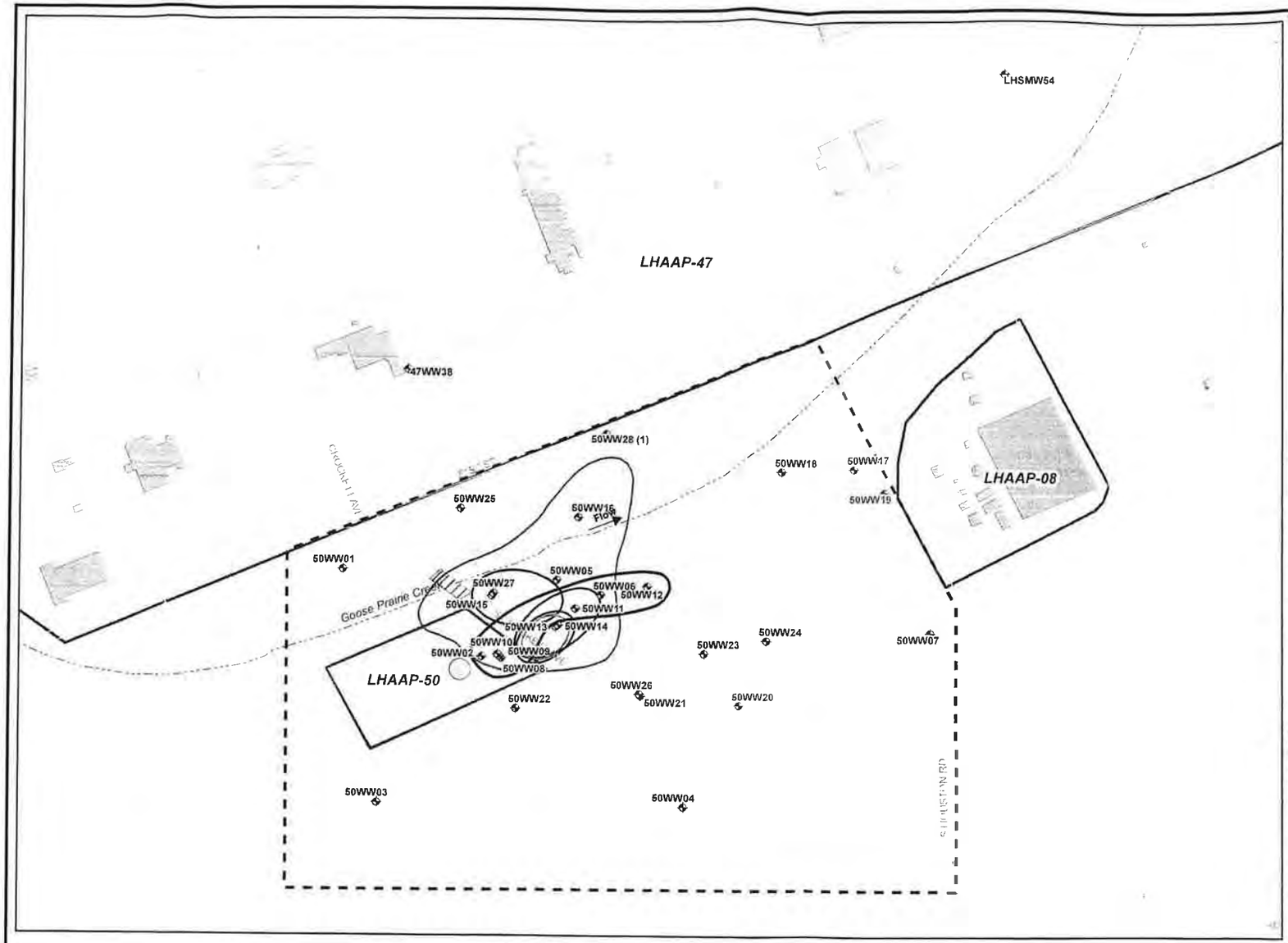
EXECUTED this the 18 th day of June, 2015.

BEFORE ME, on this the 18 th day of June, personally appeared Rose M. Zeiler, of 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.

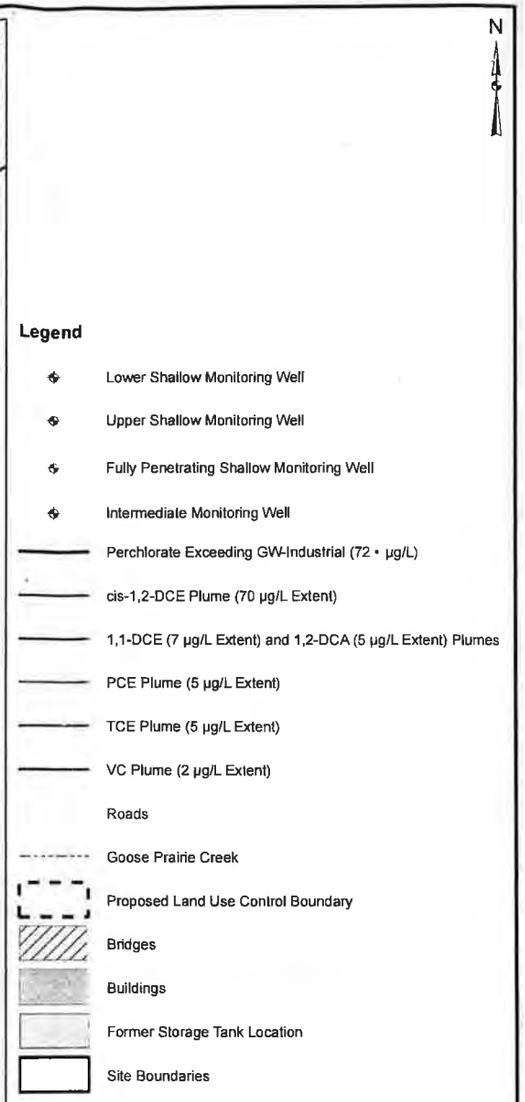
GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the 18th day of June, 2015.

GENIE WARNER
Notary Public State of Texas
COMM. EXP. 8/1/2018

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







Note:
1. 50WW28 installed in May 2014 and sampled in July 2014.

AECOM

Figure 1
Land Use Control Boundary
LHAAP-50 Site
Longhorn Army Ammunition Plant
Karnack, Texas

60256135

June 2015

Path: E:\Group\T_GIS\GIS Projects\Longhorn\MXDs\LHAAP-50\RAO Report\2015-Jan-20\Figure 2-1_LHAAP50_Land Use Control Boundary.mxd

EXHIBIT A

FIELD NOTES DESCRIPTION OF
"LHAAP-50" LAND USE CONTROL AREA
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, "LHAAP-50" Land Use Control Area being 23.891 acres of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), "LHAAP-50" Land Use Control Area being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999968791070, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "C-21" (N=6956579.781 feet E=3308499.969 feet), "IGNATIUS-1" (N=6957090.304 feet E=3311081.788 feet), and "RACE" (N=6958817.935 feet E=3310081.598 feet). The computed land area is based on State Plane distances. As used herein, the abbreviation I.R.O.P.C. indicates 1/2" iron rebar with orange plastic cap engraved "Fidler" and "RPLS 3940" .

Commencing at monument "C-21" referenced above,

THENCE N 59deg10'26"E 819.91' to an I.R.O.P.C. set for the Southwest corner of this tract and this POINT OF BEGINNING,

THENCE N 00deg00'15"E 644.05' along the W.B.L. of this tract to a concrete nail set in asphalt pavement for this tract's N.W.C.,

THENCE N 67deg57'46"E 1061.76' along the N.W. B.L. of this tract to a 60d nail set in asphalt pavement for the Northmost corner of this tract,

THENCE S 27deg45'58"E 573.94' along the N.E. B.L. of this tract to a 60d nail set for one of this tract's two Eastmost corners,

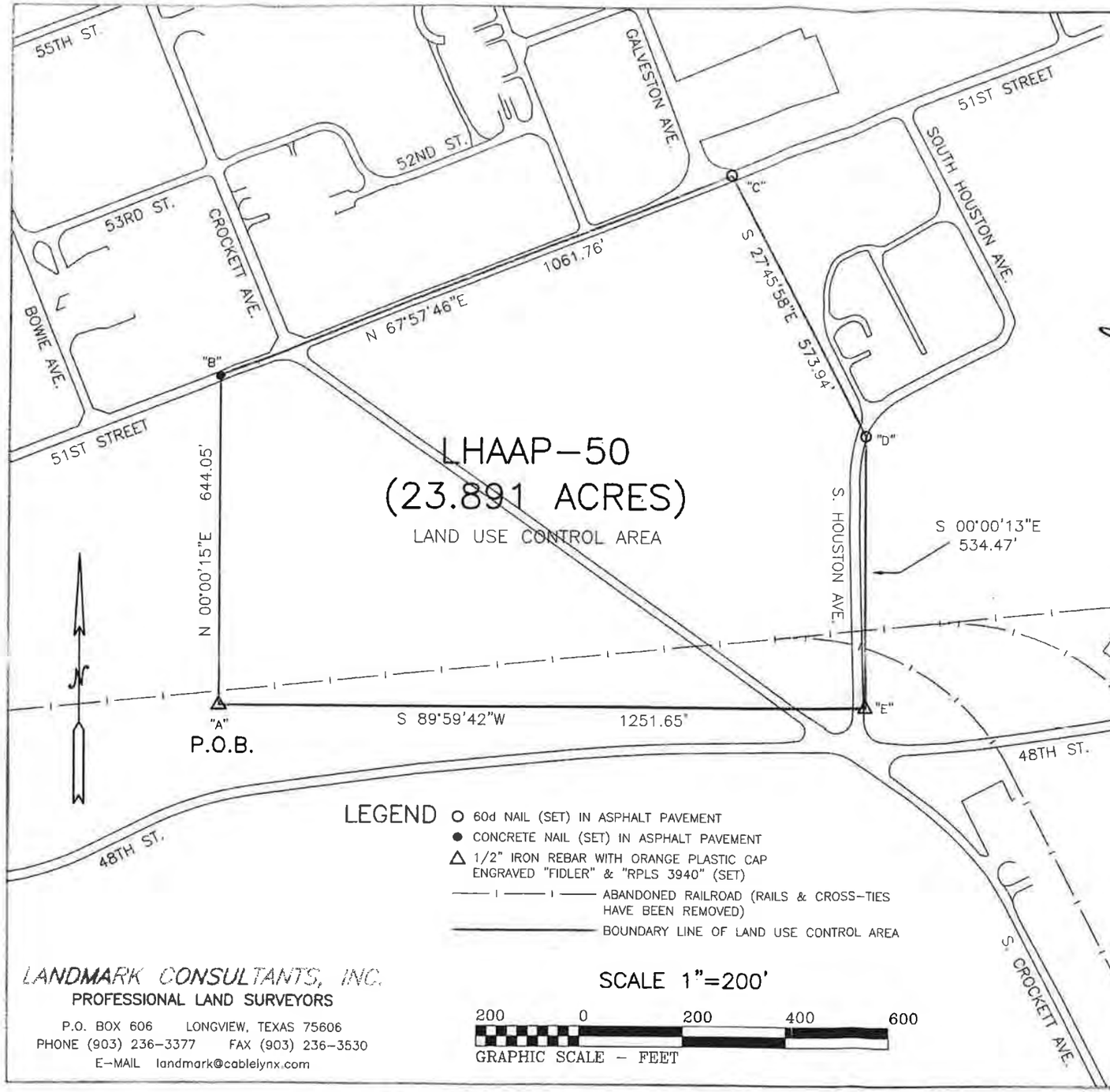
THENCE S 00deg00'13"E 534.47' along the E.B.L. of this tract to an I.R.O.P.C. set for this tract's S.E.C., from which "IGNATIUS-1" referenced above bears N 81deg47'47"E 632.57',

THENCE S 89deg59'42"W 1251.65' along the S.B.L. of this tract to this POINT OF BEGINNING, containing 23.891 acres, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940



I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision on April 29 & 30, 2015.

Witness my hand and seal this the 4th day of May, 2015.

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), AND COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999968791070 AND IS BASED ON CALCULATED DISTANCE BETWEEN PUBLISHED STATE PLANE COORDINATES (OF STATIONS C-21, IGNATIUS-1, & RACE) DIVIDED BY SURFACE TRAVERSE CALCULATED DISTANCE BETWEEN SAME THREE STATIONS. THE COMPUTED LAND AREA IS BASED ON STATE PLANE DISTANCES.

COORDINATE TABLE

	NORTH	EAST
A	6956999.929	3309204.044
B	6957643.979	3309204.091
C	6958042.360	3310188.284
D	6957534.507	3310455.661
E	6957000.041	3310455.696

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEET

LEGEND
- O 60d NAIL (SET) IN ASPHALT PAVEMENT
- ● CONCRETE NAIL (SET) IN ASPHALT PAVEMENT
- △ 1/2" IRON REBAR WITH ORANGE PLASTIC CAP ENGRAVED "FIDLER" & "RPLS 3940" (SET)
- ABANDONED RAILROAD (RAILS & CROSS-TIES HAVE BEEN REMOVED)
- BOUNDARY LINE OF LAND USE CONTROL AREA

SCALE 1"=200'

200 0 200 400 600
GRAPHIC SCALE - FEET

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

LHAAP-50 L.U.C.A.
(23.891 ACRES)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	W.PTS W.LEG
05/04/2015	1103025W.DWG	DRAWN BY JTJ

LHAAP-50, 50-3

LAND USE CONTROL COMPLIANCE INSPECTION FORM

September 14, 2015

Sample Annual Land Use Control Compliance Certification Documentation

In accordance with the Remedial Design dated 9/30/11 for LHAAP-50 a certification of site was conducted by _____ [indicate transferee] on _____.

A summary of land use control mechanisms is as follows:

- Groundwater restriction – A restriction against use of groundwater will remain in effect until the levels of the COCs in groundwater and soil allow unrestricted use and unlimited exposure (UUUE). [Indicate whether groundwater restrictions are still required at LHAAP-50]

A summary of compliance with land use and restriction covenants is as follows:

- No use of groundwater, installation of new groundwater wells, or tampering with existing wells at LHAAP-50.

I, the undersigned, do document that the certification was performed as indicated above, and that the above information is true and correct to the best of my knowledge, information, and belief.

Date: _____

Name/Title: _____

Signature: _____

Annual compliance certification forms shall be completed no later than March 1 of each year for the previous calendar year.

LHAAP-51

NOTICE OF NONRESIDENTIAL LAND USE AT LHAAP-51 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2010-000005557

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

7 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 04/27/2010 04:08 PM **Document Number:** 2010-000005557 **Receipt No:** 1006195 **Amount:** $ 36.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW E & I
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. The site, LHAAP-51, is the area of a demolished building location known as Building 60-B, former photographic lab, located within the Plant 3 production area of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-51 is not itself considered an NPL site. Environmental activities at LHAAP-51 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ as the lead regulatory agency that no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-51 (Building 60-B) was constructed in 1945 for the processing of X-ray film. The building had a concrete floor without a floor drain. Spent developing waste was drummed and transferred to another building for disposal. Small quantities of black and white developer and fixer solutions were generated by the X-ray lab. Activities ceased in the late 1970s or early 1980s. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-51 parcel is 5,754 square foot, more or less, or 0.13209 acre tract 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 United States Department of the Army has undertaken careful environmental study of the LHAAP-51 site and USEPA and TCEQ concluded that no further investigation or action is required for LHAAP-51. Contaminants in soil samples from LHAAP-51 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of LHAAP-51 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of LHAAP-51 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951
or
Assistant Chief of Staff for Installation Management
ATTN: DAIM-BDO (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 10th day of March, 2010.

BEFORE ME, on this the 10 th day of March, personally appeared Rose M. Zeiler, of 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 10 day of March, 2010.

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

ANGELA HUMPHRIES
Notary Public State of Texas
COMM. EXP. 3-17-2011

FIELD NOTES DESCRIPTION OF
"LHAAP-51" TRACT
(INCLUDES THE REMAINS OF A DEMOLISHED BUILDING)
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP-51" including, but not being limited to, the concrete slab of a demolished building in the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract "LHAAP-51" being more particularly described as follows :

Surveyor's Note #1: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999861727, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "X-11" (N=6960733.698 feet E=3304750.367 feet) and "HORSE" (N=6960008.269 feet E=3309591.340 feet). Said traverse indicates a surface distance of 4895.70 feet between said monuments. The computed land area is based on surface distances.

Surveyor's Note #2: This field notes description is based on State Plane coordinates supplied (in the form of an Autocad DXF file) by Shaw Environmental & Infrastructure Group.

Commencing at monument "HORSE" referenced above,

THENCE N 86deg33'08"W 1716.42' to a concrete nail with head dimple set for the S.E.C. of this tract and this POINT OF BEGINNING,

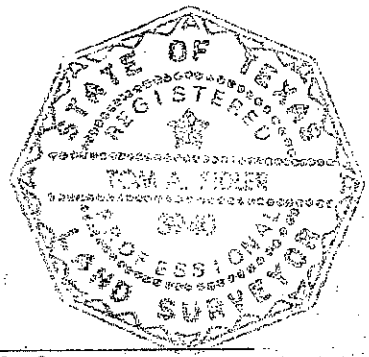
THENCE S 68deg51'01"W 68.17' along the S.B.L. of this tract to a 60d nail set for this tract's S.W.C. ,

THENCE N 21deg08'59"W 84.39' along the W.B.L. of this tract to a 60d nail set for this tract's N.W.C. , said nail being S 79deg23'36"E 3086.37' from said monument "X-11" ,

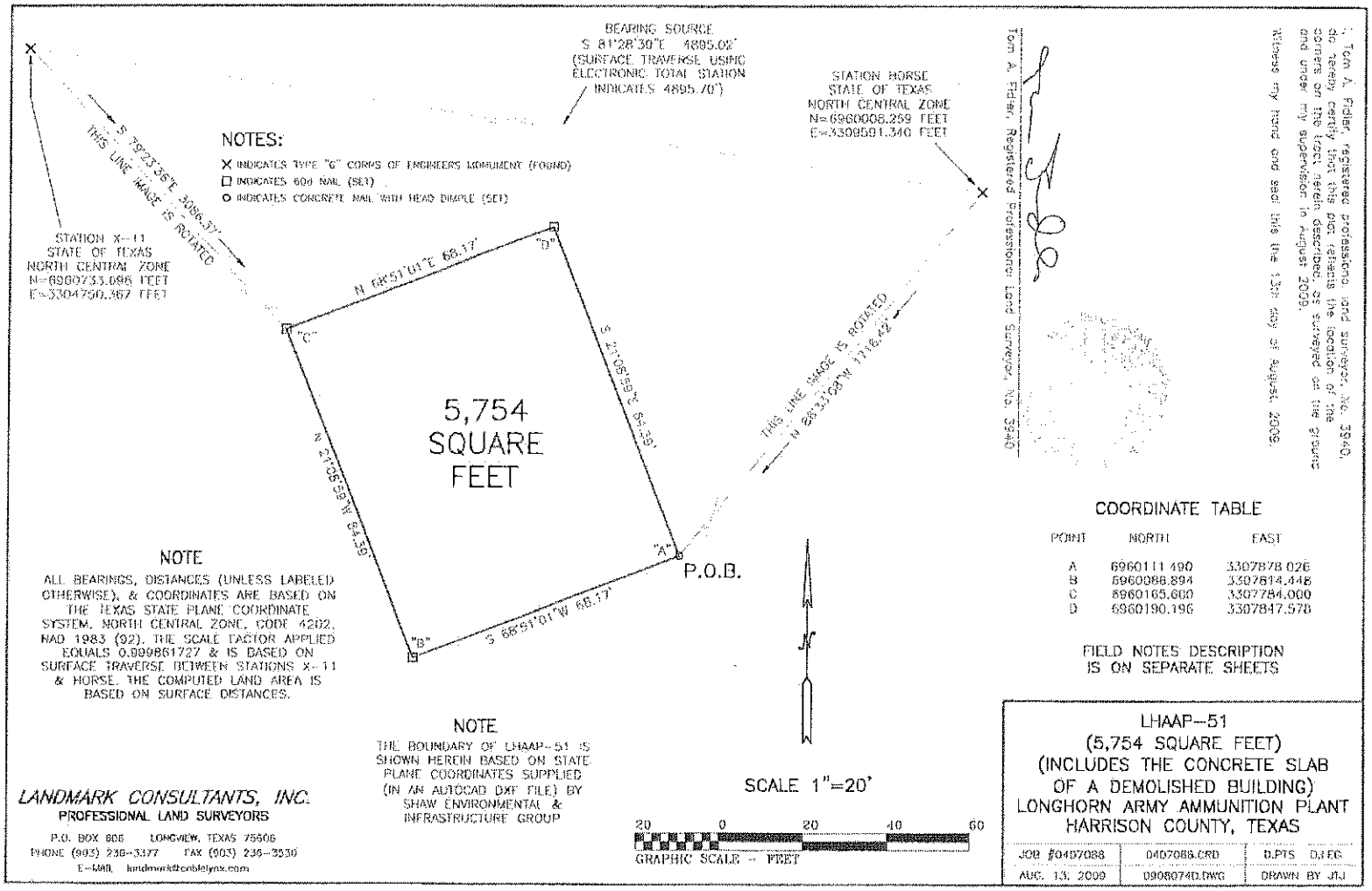
THENCE N 68deg51'01"E 68.17' along the N.B.L. of this tract to a 60d nail set for this tract's N.E.C. ,

THENCE S 21deg08'59"E 84.39' along the E.B.L. of this tract to this POINT OF BEGINNING. This tract contains 5,754 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940



I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August 2009.

Witness my hand and seal this the 13th day of August, 2009.

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999861727 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS X-11 & HORSE. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

NOTE

THE BOUNDARY OF LHAAP-51 IS SHOWN HEREIN BASED ON STATE PLANE COORDINATES SUPPLIED (IN AN AUTOCAD DXF FILE) BY SHAW ENVIRONMENTAL & INFRASTRUCTURE GROUP

COORDINATE TABLE

POINT	NORTH	EAST
A	6960111.490	3307878.026
B	6960086.894	3307814.448
C	6960165.600	3307784.000
D	6960190.196	3307847.578

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cebridge.net

LHAAP--51
(5,754 SQUARE FEET)
(INCLUDES THE CONCRETE SLAB OF A DEMOLISHED BUILDING)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	D.PTS	D.FB
AUG. 13, 2009	0908074D.DWG	DRAWN BY JTJ	

LHAAP-55

NOTICE OF NONRESIDENTIAL LAND USE AT SEPTIC TANK LOCATIONS FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2010-000005562

*****DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT*****

MISCELLANEOUS

34 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 04/27/2010 04:08 PM **Document Number:** 2010-000005562 **Receipt No:** 1006195 **Amount:** $ 144.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT COUNTY OF HARRISON, TEXAS

STATE OF TEXAS
COUNTY OF HARRISON
I hereby certify tbat 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.

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW E & I
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. The site, LHAAP-55, consisted of 10 septic tank and leachate field systems that served outlying areas of the former Longhorn Army Ammunition Plant (LHAAP) within or near LHAAP-48 and LHAAP-35C(53). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-55 is not itself considered an NPL site. Environmental activities at LHAAP-55 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ as the lead regulatory agency that no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-55 consisted of 10 septic tank and leachate field systems that served outlying areas of LHAAP that could not be connected to the plant sanitary sewer system. Although there was no history of industrial waste being placed into these septic tanks, soil samples were collected from borings installed at septic systems that were associated with industrial processes and analyzed for metals, explosives, semi volatile organic compounds, and volatile organic compounds where appropriate. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-55 parcel include: ST-01 with 1,807 square feet, more or less, or 0.04148 acre tract; ST-02 with 1,791 square feet, more or less, or 0.04111 acre tract; ST-03 with 1,784 square feet, more or less, or 0.04095 acre tract; ST-04 with 1,789 square feet, more or less, or 0.04106 acre tract; ST-05 with 1,825 square feet more or less, or 0.04189 acre tract; ST-06 with 1,800 square feet, more or less, or 0.04132 acre tract; ST-07 with 1,865 square feet, more or less, or 0.04281 acre tract; ST-08 with 1,785 square feet, more or less, or 0.04097 acre tract; ST-09 with 2,004 square feet, more or less, or 0.04600 acre tract; and ST-10 with 1,804 square feet, more or less, or 0.04141 acre tract 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 United States Department of the Army has undertaken careful environmental study of the LHAAP-55 site and USEPA and TCEQ concluded that no further investigation or action is required for LHAAP-55. Contaminants in soil samples from LHAAP-55 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of LHAAP-55 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of LHAAP-55 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951
or
Assistant Chief of Staff for Installation Management
ATTN: DAIM-BDO (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 10 th day of March, 2010.

BEFORE ME, on this the 10 th day of March, personally appeared Rose M. Zeiler, of 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 10 day of March, 2010.

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

ANGELA HUMPHRIES
Notary Public State of Texas
COMM. EXP. 3-17-2011

FIELD NOTES DESCRIPTION OF
SEPTIC TANK ST-01, ITS LEACHATE FIELD, AND A 2' WIDE
CORRIDOR CENTERED ON THE SEWER PIPE CONNECTING THE TWO

CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 1,807 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note #1: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998636625, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "IGNATIUS-1" (N=6957090.304 feet E=3311081.788 feet) and "IGNATIUS-2" (N=6955582.752 feet E=3311851.704 feet). Said traverse indicates a surface distance of 1693.005 feet between said monuments. The computed land area is based on surface distances.

Surveyor's Note #2: This field notes description is based on State Plane coordinates supplied by Shaw Environmental & Infrastructure Group. Landmark Consultants, Inc. has not probed the ground surface in this area in an attempt to determine the location of Septic Tank ST-01, its leachate field, or the sewer pipe connecting the two.

Commencing at monument "IGNATIUS-1" referenced above,

THENCE S 37deg17'23"E 1017.21' to a 60d nail set for the Westmost N.W.C. of this tract and this POINT OF BEGINNING,

THENCE N 63deg19'52"E 19.74' along a N.B.L. of this tract to a 60d nail set for this tract's Westmost N.E.C. ,

THENCE S 26deg40'08"E 4.90' along an E.B.L. of this tract to a 60d nail set for this tract's Northeast reentrant corner ,

THENCE N 89deg25'37"E 24.40' along a N.B.L. of this tract to a 60d nail set for this tract's Northwest reentrant corner ,

THENCE N 00deg00'00"E 18.03' along a W.B.L. of this tract to a 60d nail set for this tract's Eastmost N.W.C. ,

THENCE N 90deg00'00"E 46.53' along a N.B.L. of this tract to a 60d nail set for this tract's Eastmost N.E.C. ,

THENCE S 00deg00'00"E 32.43' along an E.B.L. of this tract to a 60d nail set for this tract's Eastmost S.E.C. ,

THENCE N 90deg00'00"W 46.53' along a S.B.L. of this tract to a 60d nail set for this tract's Eastmost S.W.C. ,

THENCE N 00deg00'00"E 12.40' along a W.B.L. of this tract to a 60d nail set for this tract's Southwest reentrant corner,

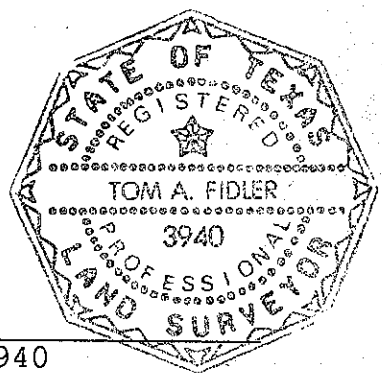
THENCE S 89deg25'37"W 23.40' along a S.B.L. of this tract to a 60d nail set for this tract's Southeast reentrant corner,

THENCE S 26deg40'08"E 5.57' along an E.B.L. of this tract to a 60d nail set for this tract's Westmost S.E.C. ,

THENCE S 63deg19'52"W 19.74' along a S.B.L. of this tract to a 60d nail set for this tract's Westmost S.W.C., from which station "IGNATIUS-2" referenced above bears S 12deg09'16"E 702.69' ,

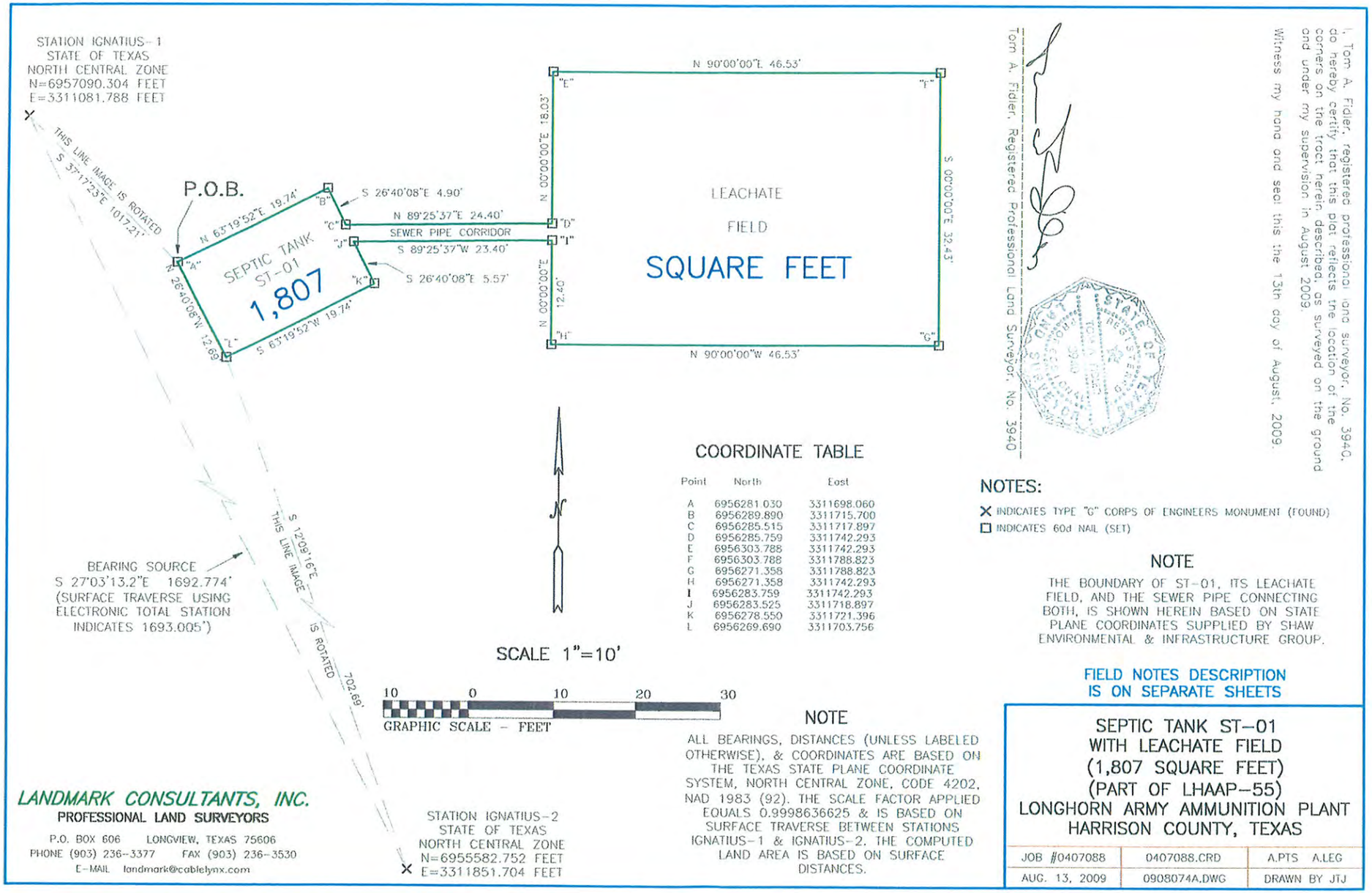
THENCE N 26deg40'08"W 12.69' along a W.B.L. of this tract to this POINT OF BEGINNING. This tract contains 1,807 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943316



COORDINATE TABLE

Point	North	East
A	6956281.030	3311698.060
B	6956289.890	3311715.700
C	6956285.515	3311717.897
D	6956285.759	3311742.293
E	6956303.788	3311742.293
F	6956303.788	3311788.823
G	6956271.358	3311788.823
H	6956271.358	3311742.293
I	6956283.759	3311742.293
J	6956283.525	3311718.897
K	6956278.550	3311721.396
L	6956269.690	3311703.756

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August 2009.

Witness my hand and seal this the 13th day of August, 2009.

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
SURVEYOR

NOTES:

X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)

☐ INDICATES 60d NAIL (SET)

NOTE

THE BOUNDARY OF ST-01, ITS LEACHATE FIELD, AND THE SEWER PIPE CONNECTING BOTH, IS SHOWN HEREIN BASED ON STATE PLANE COORDINATES SUPPLIED BY SHAW ENVIRONMENTAL & INFRASTRUCTURE GROUP.

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998636625 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS IGNATIUS-1 & IGNATIUS-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

SEPTIC TANK ST-01 WITH LEACHATE FIELD (1,807 SQUARE FEET) (PART OF LHAAP-55) LONGHORN ARMY AMMUNITION PLANT HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	A.PTS A.LEG
AUG. 13, 2009	0908074A.DWG	DRAWN BY JTJ

FIELD NOTES DESCRIPTION OF
SEPTIC TANK ST-02, ITS LEACHATE FIELD, AND A 2' WIDE
CORRIDOR CENTERED ON THE SEWER PIPE CONNECTING THE TWO

CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 1,791 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note #1: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Surveyor's Note #2: This field notes description is based on State Plane coordinates supplied by Shaw Environmental & Infrastructure Group. Landmark Consultants, Inc. has not probed the ground surface in this area in an attempt to determine the location of Septic Tank ST-02, its leachate field, or the sewer pipe connecting the two.

Commencing at monument "TYLER-1" referenced above,

THENCE N 05deg57'31"W 746.36' to a 60d nail set for the Eastmost S.E.C. of this tract and this POINT OF BEGINNING,

THENCE N 90deg00'00"W 19.74' along a S.B.L. of this tract to a 60d nail set (in an abandoned utility pole lying on the ground) for this tract's Eastmost S.W.C. ,

THENCE N 00deg00'00"E 5.36' along a W.B.L. of this tract to a 60d nail set for this tract's Southwest reentrant corner,

THENCE N 90deg00'00"W 15.73' along a S.B.L. of this tract to a 60d nail set for this tract's Southeast reentrant corner,

THENCE S 00deg00'00"W 15.91' along an E.B.L. of this tract to a 60d nail set for this tract's Westmost S.E.C. ,

THENCE N 90deg00'00"W 46.53' along a S.B.L. of this tract to a 60d nail set for this tract's Westmost S.W.C. ,

THENCE N 00deg00'00"E 32.43' along a W.B.L. of this tract to a 60d nail set for this tract's Westmost N.W.C. ,

THENCE N 90deg00'00"E 46.53' along a N.B.L. of this tract to a 60d nail set for this tract's Westmost N.E.C. ,

THENCE S 00deg00'00"E 14.52' along an E.B.L. of this tract to a 60d nail set for this tract's Northeast reentrant corner,

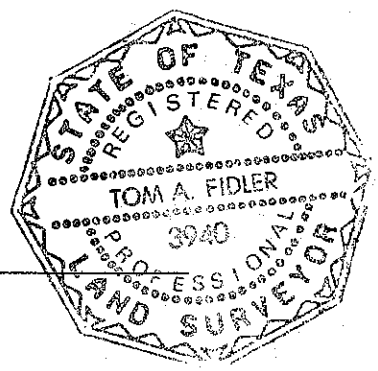
THENCE S 90deg00'00"E 15.73' along a N.B.L. of this tract to a 60d nail set for this tract's Northwest reentrant corner,

THENCE N 00deg00'00"W 5.33' along a W.B.L. of this tract to a 60d nail set for this tract's Eastmost N.W.C. ,

THENCE N 90deg00'00"E 19.74' along a N.B.L. of this tract to a 60d nail set for this tract's Eastmost N.E.C. ,

THENCE S 00deg00'00"E 12.69' along an E.B.L. of this tract to this POINT OF BEGINNING. This tract contains 1,791 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



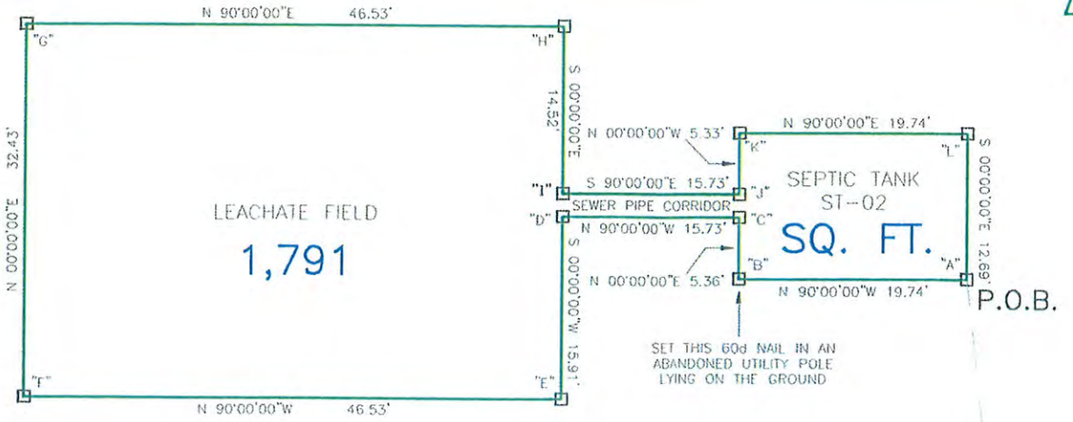
Tom A. Fidler, R.P.L.S. Number 3940

00943319

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202. NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999895238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.



COORDINATE TABLE

Point	North	East
A	6959249.790	3314202.020
B	6959249.790	3314182.280
C	6959255.150	3314182.280
D	6959255.150	3314166.552
E	6959239.240	3314166.552
F	6959239.240	3314120.022
G	6959271.670	3314120.022
H	6959271.670	3314166.552
I	6959257.150	3314166.552
J	6959257.150	3314182.280
K	6959262.480	3314182.280
L	6959262.480	3314202.020

NOTES:

- X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- □ INDICATES 60d NAIL (SET)
- o INDICATES UNMARKED POINT

NOTE

THE BOUNDARY OF ST-02, ITS LEACHATE FIELD, AND THE SEWER PIPE CORRIDOR CONNECTING BOTH, IS SHOWN HEREIN BASED ON STATE PLANE COORDINATES SUPPLIED (IN AN AUTOCAD DXF FILE) BY SHAW ENVIRONMENTAL & INFRASTRUCTURE GROUP.



SCALE 1"=10'



N 05°57'31"W 746.36'

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August through October 2009.

Witness my hand and seal October 26, 2009.



Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

SEPTIC TANK ST-02 WITH LEACHATE FIELD (1,791 SQUARE FEET) (PART OF LHAAP-55) LONGHORN ARMY AMMUNITION PLANT HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	J.PTS J.LEG
10/26/2009	0908074J.DWG	DRAWN BY JTJ

FIELD NOTES DESCRIPTION OF
SEPTIC TANK ST-03, ITS LEACHATE FIELD, AND A 2' WIDE
CORRIDOR CENTERED ON THE SEWER PIPE CONNECTING THE TWO

CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 1,784 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note #1: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Surveyor's Note #2: This field notes description is based on State Plane coordinates supplied by Shaw Environmental & Infrastructure Group. Landmark Consultants, Inc. has not probed the ground surface in this area in an attempt to determine the location of Septic Tank ST-03, its leachate field, or the sewer pipe connecting the two.

Commencing at monument "TYLER-1" referenced above,

THENCE N 24deg50'41"E 537.01' to a 60d nail set for the Southmost South corner of this tract and this POINT OF BEGINNING,

THENCE N 35deg57'31"W 30.43' along a S.W. B.L. of this tract to a 60d nail set for a South reentrant corner of this tract,

THENCE S 54deg02'29"W 1.92' along a S.E. B.L. of this tract to a 60d nail set for a South corner of this tract,

THENCE N 38deg10'26"W 12.26' along a S.W. B.L. of this tract to a 60d nail set for a South reentrant corner of this tract,

THENCE S 50deg49'08"W 5.10' along a S.E. B.L. of this tract to a 60d nail set for this tract's Northmost South corner,

THENCE N 39deg10'52"W 19.74' along a S.W. B.L. of this tract to a 60d nail set for this tract's Westmost corner,

THENCE N 50deg49'08"E 12.69' along a N.W. B.L. of this tract to a 60d nail set for this tract's Westmost North corner,

THENCE S 39deg10'52"E 19.74' along a N.E. B.L. of this tract to a 60d nail set for this tract's Westmost East corner,

THENCE S 50deg49'08"W 5.58' along a S.E. B.L. of this tract to a 60d nail set for this tract's East reentrant corner,

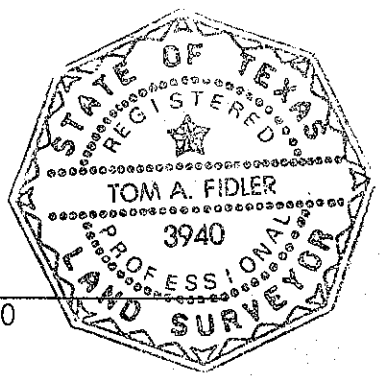
THENCE S 38deg10'26"E 10.37' along a N.E. B.L. of this tract to a 60d nail set for this tract's North reentrant corner,

THENCE N 54deg02'29"E 46.53' along a N.W. B.L. of this tract to a 60d nail set for this tract's Eastmost North corner,

THENCE S 35deg57'31"E 32.43' along a N.E. B.L. of this tract to a 60d nail set for this tract's Eastmost East corner,

THENCE S 54deg02'29"W 46.53' along a S.E. B.L. of this tract to this POINT OF BEGINNING. This tract contains 1,784 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943322

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
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NOTE

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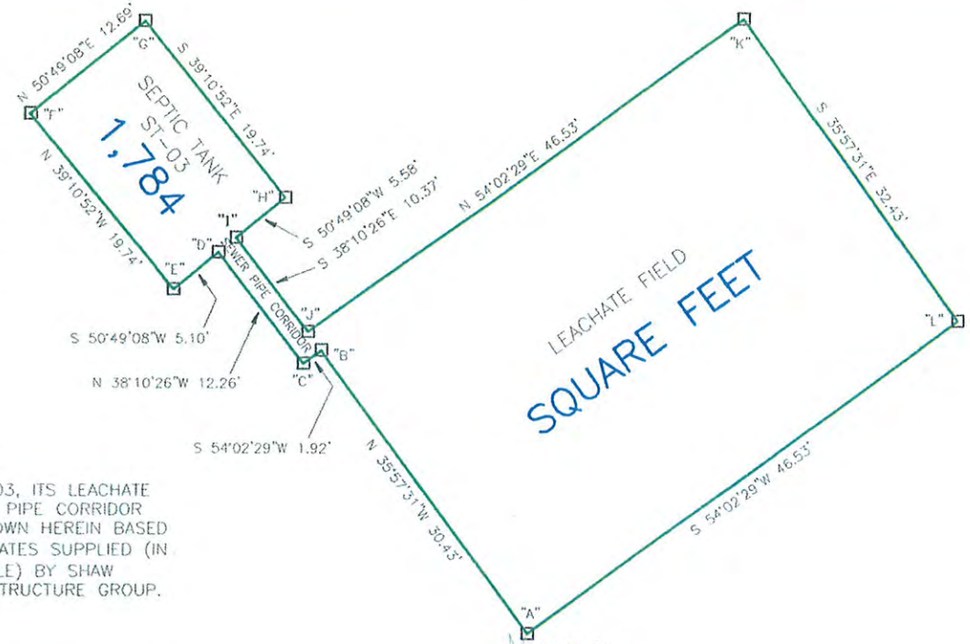


NOTE

THE BOUNDARY OF ST-03, ITS LEACHATE FIELD, AND THE SEWER PIPE CORRIDOR CONNECTING BOTH, IS SHOWN HEREIN BASED ON STATE PLANE COORDINATES SUPPLIED (IN AN AUTOCAD DXF FILE) BY SHAW ENVIRONMENTAL & INFRASTRUCTURE GROUP.

NOTES:

- X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- □ INDICATES 60d NAIL (SET)
- O INDICATES UNMARKED POINT

COORDINATE TABLE

Point	North	East
A	6958994.769	3314505.128
B	6959019.400	3314487.259
C	6959018.270	3314485.702
D	6959027.905	3314478.127
E	6959024.680	3314474.170
F	6959039.982	3314461.699
G	6959047.999	3314471.535
H	6959032.697	3314484.007
I	6959029.169	3314479.678
J	6959021.019	3314486.085
K	6959048.342	3314523.748
L	6959022.091	3314542.791

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August through October 2009.

Witness my hand and seal October 26, 2009.

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

SCALE 1"=10'

10 0 10 20 30
GRAPHIC SCALE - FEET

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1116.219')

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

SEPTIC TANK ST-03 WITH LEACHATE FIELD (1,784 SQUARE FEET) (PART OF LHAAP-55) LONGHORN ARMY AMMUNITION PLANT HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	K.PTS K.LEG
10/26/2009	0908074K.DWG	DRAWN BY JTJ

FIELD NOTES DESCRIPTION OF
SEPTIC TANK ST-04, ITS LEACHATE FIELD, AND A 2' WIDE
CORRIDOR CENTERED ON THE SEWER PIPE CONNECTING THE TWO

CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 1,789 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note #1: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Surveyor's Note #2: This field notes description is based on State Plane coordinates supplied by Shaw Environmental & Infrastructure Group. Landmark Consultants, Inc. has not probed the ground surface in this area in an attempt to determine the location of Septic Tank ST-04, its leachate field, or the sewer pipe connecting the two.

Commencing at monument "TYLER-1" referenced above,

THENCE S 64deg44'32"W 426.66' to a 60d nail set for the Southmost S.E.C. of this tract and this POINT OF BEGINNING,

THENCE N 89deg51'08"W 32.43' along a S.B.L. of this tract to a 60d nail set for this tract's Southmost S.W.C. ,

THENCE N 00deg08'52"E 46.53' along a W.B.L. of this tract to a 60d nail set for this tract's Southmost N.W.C. ,

THENCE S 89deg51'08"E 14.56' along a N.B.L. of this tract to a 60d nail set for this tract's Northwest reentrant corner,

THENCE N 00deg00'00"W 14.73' along a W.B.L. of this tract to a 60d nail set for this tract's Southwest reentrant corner,

THENCE N 89deg42'35"W 5.65' along a S.B.L. of this tract to a 60d nail set for this tract's Northmost S.W.C. ,

THENCE N 00deg17'25"E 19.74' along a W.B.L. of this tract to a concrete nail with head dimple set (in old asphalt) for this tract's Northmost N.W.C. ,

THENCE S 89deg42'35"E 12.69' along a N.B.L. of this tract to a 60d nail set for this tract's Northmost N.E.C. ,

THENCE S 00deg17'25"W 19.74' along an E.B.L. of this tract to a 60d nail set for this tract's Northmost S.E.C. ,

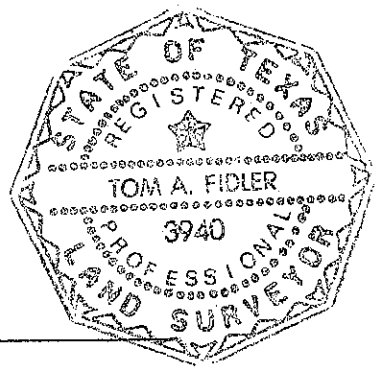
THENCE N 89deg42'35"W 5.04' along a S.B.L. of this tract to a 60d nail set for this tract's Southeast reentrant corner,

THENCE S 00deg00'00"E 14.73' along an E.B.L. of this tract to a 60d nail set for this tract's Northeast reentrant corner,

THENCE S 89deg51'08"E 15.87' along a N.B.L. of this tract to a 60d nail set for this tract's Southmost N.E.C. ,

THENCE S 00deg08'52"W 46.53' along an E.B.L. of this tract to this POINT OF BEGINNING. This tract contains 1,789 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August through October 2009.

Witness my hand and seal October 26, 2009.

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

LANDMARK CONSULTANTS, INC.
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PHONE (903) 236-3377 FAX (903) 236-3530
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NOTE

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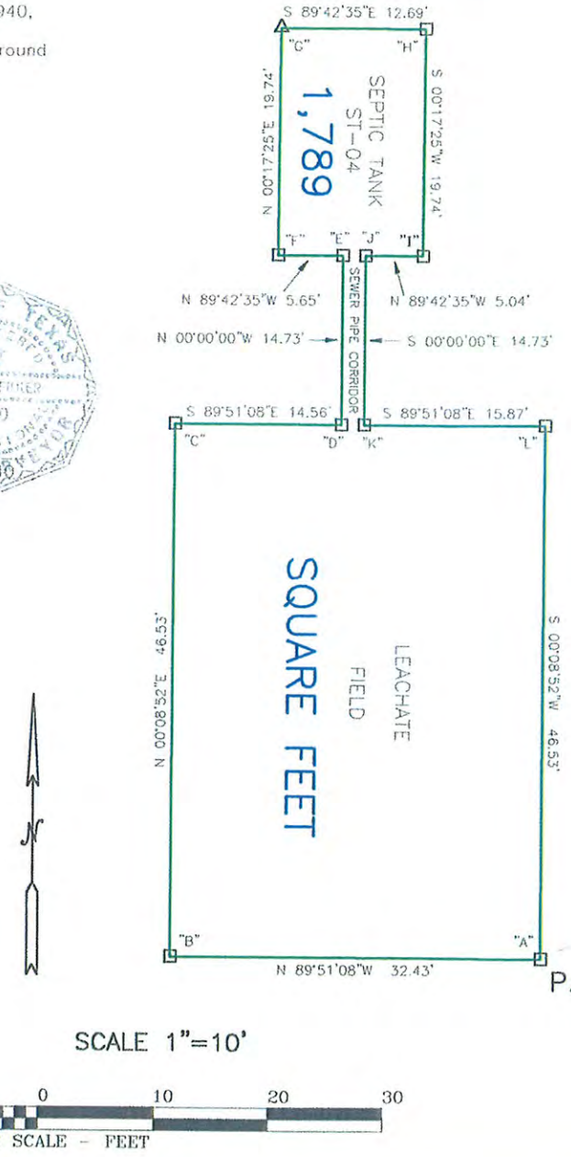
NOTE

THE BOUNDARY OF ST-04, ITS LEACHATE FIELD, AND THE SEWER PIPE CORRIDOR CONNECTING BOTH, IS SHOWN HEREIN BASED ON STATE PLANE COORDINATES SUPPLIED (IN AN AUTOCAD DXF FILE) BY SHAW ENVIRONMENTAL & INFRASTRUCTURE GROUP.

NOTES:

- X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- □ INDICATES 60d NAIL (SET)
- △ INDICATES CONCRETE NAIL WITH HEAD DIMPLE (SET)

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

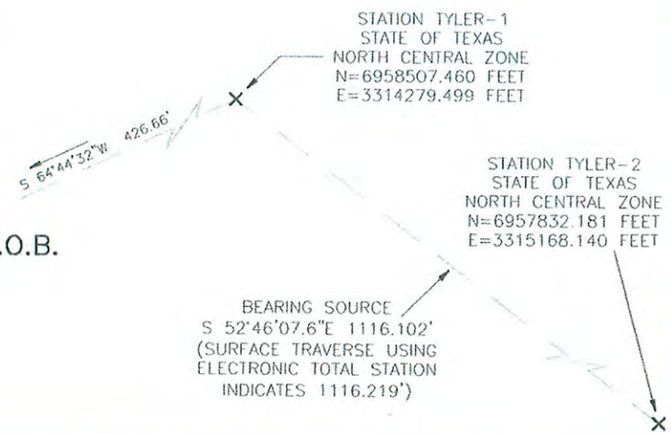


SCALE 1"=10'

10 0 10 20 30
GRAPHIC SCALE - FEET

COORDINATE TABLE

Point	North	East
A	6958325.408	3313893.629
B	6958325.492	3313861.199
C	6958372.022	3313861.319
D	6958371.984	3313875.880
E	6958386.716	3313875.880
F	6958386.744	3313870.230
G	6958406.484	3313870.330
H	6958406.420	3313883.020
I	6958386.680	3313882.920
J	6958386.706	3313877.880
K	6958371.979	3313877.880
L	6958371.938	3313893.749



SEPTIC TANK ST-04
WITH LEACHATE FIELD
(1,789 SQUARE FEET)
(PART OF LHAAP-55)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	1.PTS 1.LEG
10/26/2009	09080741.DWG	DRAWN BY JTJ

FIELD NOTES DESCRIPTION OF
SEPTIC TANK ST-05, ITS LEACHATE FIELD, AND A 2' WIDE
CORRIDOR CENTERED ON THE SEWER PIPE CONNECTING THE TWO

CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 1,825 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note #1: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Surveyor's Note #2: This field notes description is based on State Plane coordinates supplied by Shaw Environmental & Infrastructure Group. Landmark Consultants, Inc. has not probed the ground surface in this area in an attempt to determine the location of Septic Tank ST-05, its leachate field, or the sewer pipe connecting the two.

Commencing at monument "TYLER-2" referenced above,

THENCE N 52deg46'07.6"W 36.82' to a point, said point being S 52deg46'07.6"E 1079.28' from said monument "TYLER-1" ,

THENCE S 37deg13'52"W 81.68' to a 60d nail set for the Northmost East corner of this tract and this POINT OF BEGINNING ,

THENCE S 33deg39'28"W 12.69' along a S.E. B.L. of this tract to a 60d nail set for this tract's Northmost South corner,

THENCE N 56deg20'32"W 17.74' along a S.W. B.L. of this tract to a chisled "X" set in concrete for this tract's South reentrant corner,

THENCE S 36deg51'06"W 32.79' along a S.E. B.L. of this tract to a 60d nail set for this tract's East reentrant corner,

THENCE S 57deg33'12"E 44.52' along a N.E. B.L. of this tract to a 60d nail set for this tract's Southmost East corner,

THENCE S 32deg26'48"W 32.43' along a S.E. B.L. of this tract to a 60d nail set for this tract's Southmost South corner,

THENCE N 57deg33'12"W 46.53' along a S.W. B.L. of this tract to a 60d nail set for this tract's West corner,

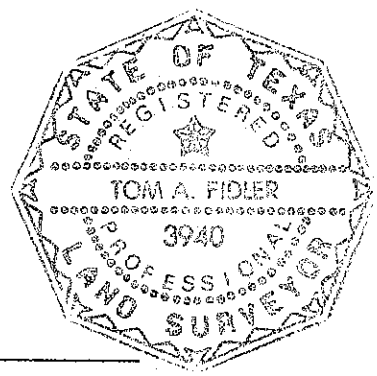
THENCE N 32deg26'48"E 32.43' along a N.W. B.L. of this tract to a 60d nail set for deflection corner,

THENCE N 36deg51'06"E 32.84' along a N.W. B.L. of this tract to a chisled "X" set in concrete for deflection corner,

THENCE N 33deg39'28"E 12.69' along a N.W. B.L. of this tract to a 60d nail set for this tract's North corner,

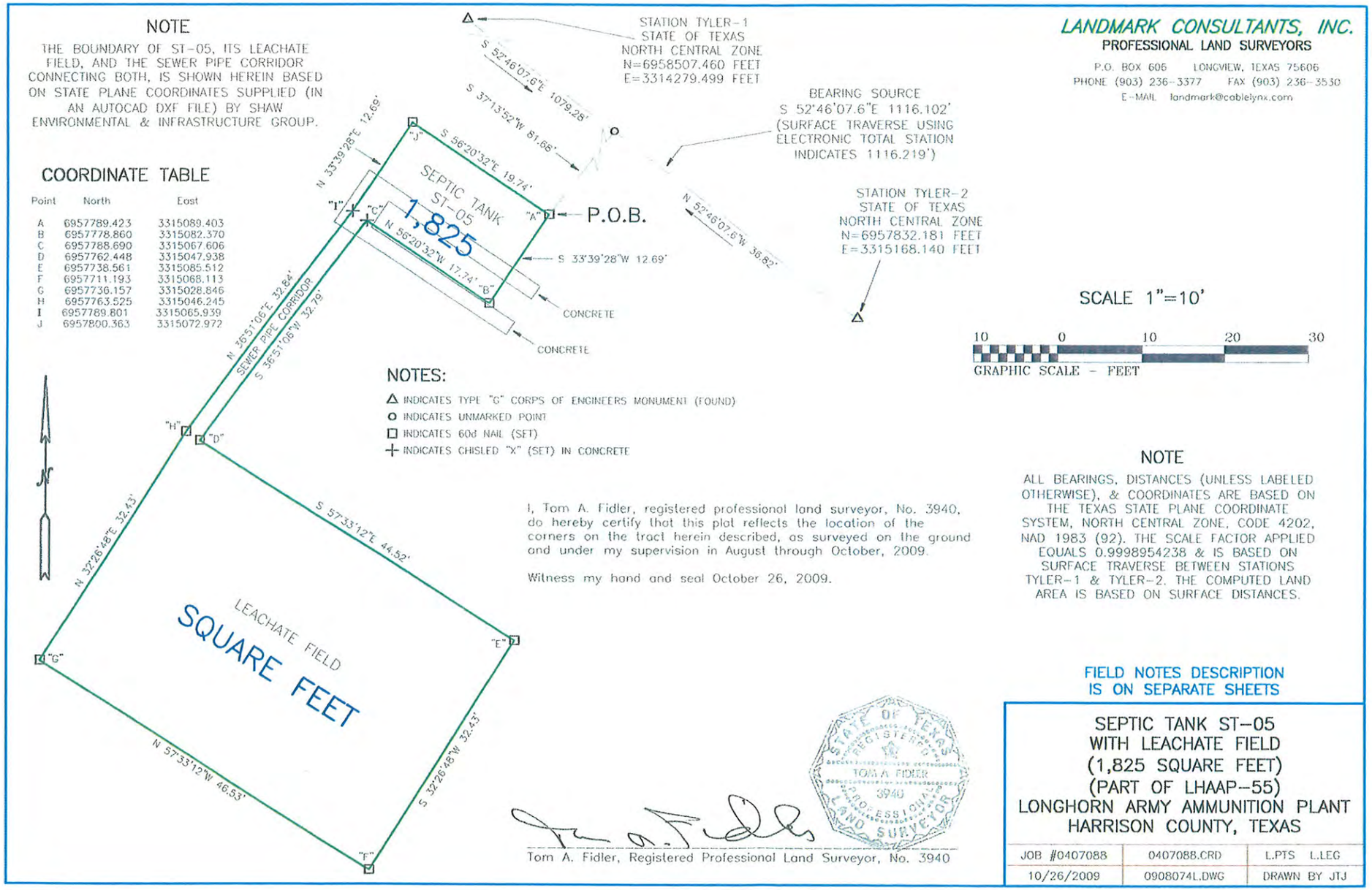
THENCE S 56deg20'32"E 19.74' along a N.E. B.L. of this tract to this POINT OF BEGINNING. This tract contains 1,825 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943328



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FIELD NOTES DESCRIPTION OF
SEPTIC TANK ST-06, ITS LEACHATE FIELD, AND A 2' WIDE
CORRIDOR CENTERED ON THE SEWER PIPE CONNECTING THE TWO

CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 1,800 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note #1: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Surveyor's Note #2: This field notes description is based on State Plane coordinates supplied by Shaw Environmental & Infrastructure Group. Landmark Consultants, Inc. has not probed the ground surface in this area in an attempt to determine the location of Septic Tank ST-06, its leachate field, or the sewer pipe connecting the two.

Commencing at monument "TYLER-2" referenced above,

THENCE S 85deg57'52"E 1425.64' to a 60d nail set for the Northmost N.W.C. of this tract and this POINT OF BEGINNING,

THENCE N 67deg08'12"E 12.69' along a N.B.L. of this tract to a 60d nail set for this tract's Northmost N.E.C. ,

THENCE S 22deg51'48"E 19.74' along an E.B.L. of this tract to a 60d nail set for this tract's Northmost S.E.C. ,

THENCE S 67deg08'12"W 4.97' along a S.B.L. of this tract to a 60d nail set for this tract's S.E. reentrant corner,

THENCE S 22deg49'50"E 19.87' along an E.B.L. of this tract to a 60d nail set for this tract's N.E. reentrant corner,

THENCE N 64deg30'12"E 16.55' along a N.B.L. of this tract to a

60d nail set for this tract's Southmost N.E.C. ,

THENCE S 25deg29'48"E 46.53' along an E.B.L. of this tract to a 60d nail set for this tract's Southmost S.E.C. ,

THENCE S 64deg30'12"W 32.43' along a S.B.L. of this tract to a 60d nail set for this tract's Southmost S.W.C. ,

THENCE N 25deg29'48"W 46.53' along a W.B.L. of this tract to a 60d nail set for this tract's Southmost N.W.C. ,

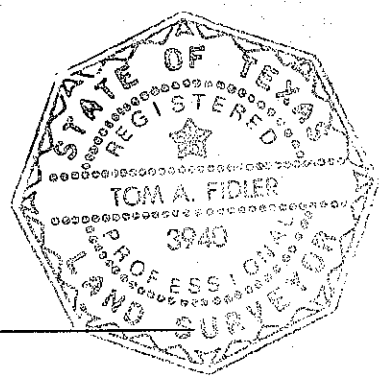
THENCE N 64deg30'12"E 13.88' along a N.B.L. of this tract to a 60d nail set for this tract's N.W. reentrant corner,

THENCE N 22deg49'50"W 19.96' along a W.B.L. of this tract to a 60d nail set for this tract's S.W. reentrant corner,

THENCE S 67deg08'12"W 5.72' along a S.B.L. of this tract to a 60d nail set for this tract's Northmost S.W.C. ,

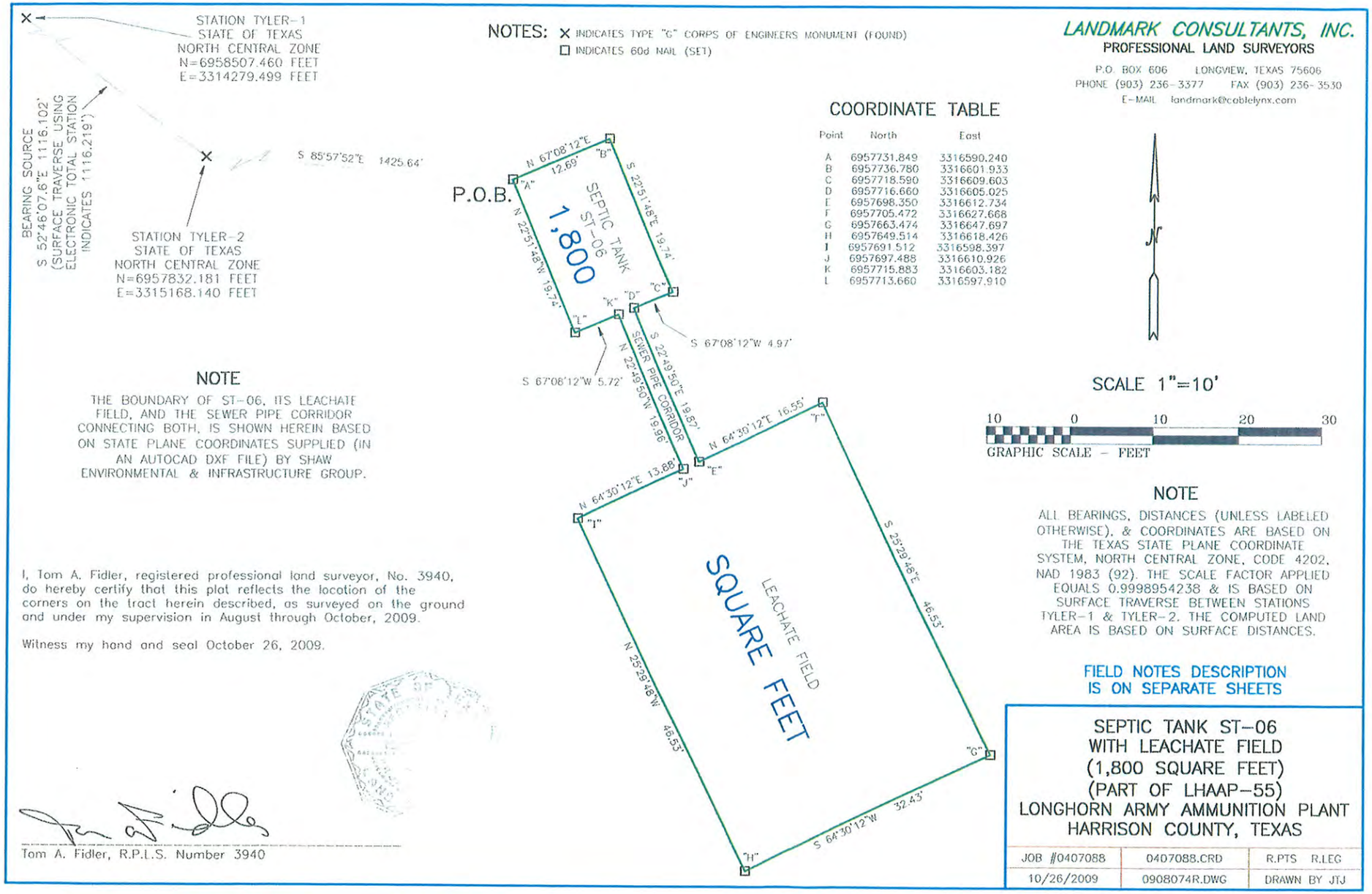
THENCE N 22deg51'48"W 19.74' along a W.B.L. of this tract to this POINT OF BEGINNING. This tract contains 1,800 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943331



COORDINATE TABLE

Point	North	East
A	6957731.849	3316590.240
B	6957736.780	3316601.933
C	6957718.590	3316609.603
D	6957716.660	3316605.025
E	6957698.350	3316612.734
F	6957705.472	3316627.668
G	6957663.474	3316647.697
H	6957649.514	3316618.426
I	6957691.512	3316598.397
J	6957697.488	3316610.926
K	6957715.883	3316603.182
L	6957713.660	3316597.910

SCALE 1"=10'

10 0 10 20 30

GRAPHIC SCALE – FEET

NOTE

THE BOUNDARY OF ST-06, ITS LEACHATE FIELD, AND THE SEWER PIPE CORRIDOR CONNECTING BOTH, IS SHOWN HEREIN BASED ON STATE PLANE COORDINATES SUPPLIED (IN AN AUTOCAD DXF FILE) BY SHAW ENVIRONMENTAL & INFRASTRUCTURE GROUP.

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August through October, 2009.

Witness my hand and seal October 26, 2009.

Tom A. Fidler, R.P.L.S. Number 3940

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

SEPTIC TANK ST-06 WITH LEACHATE FIELD (1,800 SQUARE FEET) (PART OF LHAAP-55) LONGHORN ARMY AMMUNITION PLANT HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	R.PTS R.LEG
10/26/2009	0908074R.DWG	DRAWN BY JTJ

FIELD NOTES DESCRIPTION OF
SEPTIC TANK ST-07, ITS LEACHATE FIELD, AND A 2' WIDE
CORRIDOR CENTERED ON THE SEWER PIPE CONNECTING THE TWO

CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 1,865 square feet of land out of the Longhorn Ordance Works Reservation, (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note #1: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Surveyor's Note #2: This field notes description is based on State Plane coordinates supplied by Shaw Environmental & Infrastructure Group. Landmark Consultants, Inc. has not probed the ground surface in this area in an attempt to determine the location of Septic Tank ST-07, its leachate field, or the sewer pipe connecting the two.

Commencing at monument "TYLER-2" referenced above,

THENCE S 20deg14'47"E 467.25' to a 60d nail set for the N.E.C. corner of this tract and this POINT OF BEGINNING ,

THENCE S 13deg37'37"E 32.43' along an E.B.L. of this tract to a 60d nail set for this tract's S.E.C. ,

THENCE S 76deg22'23"W 46.53' along a S.B.L. of this tract to a 60d nail set for this tract's S.W.C. ,

THENCE N 13deg37'37"W 14.74' along a W.B.L. of this tract to a 60d nail set for this tract's Eastmost reentrant corner,

THENCE S 77deg04'57"W 23.21' along a S.B.L. of this tract to a 60d nail set for a somewhat reentrant corner of this tract,

THENCE S 29deg56'20"W 28.62' along a S.E. B.L. of this tract

to a 60d nail set for this tract's Southmost reentrant corner,

THENCE S 54deg24'06"E 5.82' along a N.E. B.L. of this tract to a 60d nail set for this tract's East corner,

THENCE S 35deg35'54"W 19.74' along a S.E. B.L. of this tract to a 60d nail set for this tract's South corner,

THENCE N 54deg24'06"W 12.69' along a S.W. B.L. of this tract to a 60d nail set for this tract's West corner,

THENCE N 35deg35'54"E 19.74' along a N.W. B.L. of this tract to a 60d nail set for this tract's North corner,

THENCE S 54deg24'06"E 4.86' along a N.E. B.L. of this tract to a 60d nail set for this tract's Westmost reentrant corner,

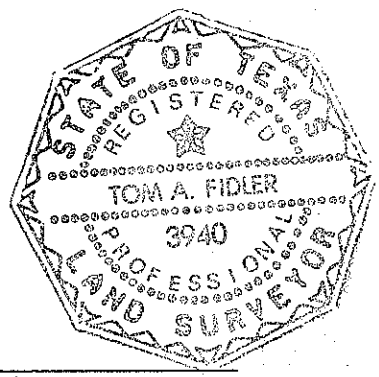
THENCE N 29deg56'20"E 29.29' along a N.W. B.L. of this tract to a 60d nail set for this tract's Southmost N.W.C. ,

THENCE N 77deg04'57"E 24.06' along a N.B.L. of this tract to a 60d nail set for this tract's Northmost reentrant corner,

THENCE N 13deg37'37"W 15.69' along a W.B.L. of this tract to a 60d nail set for this tract's Northmost N.W.C. ,

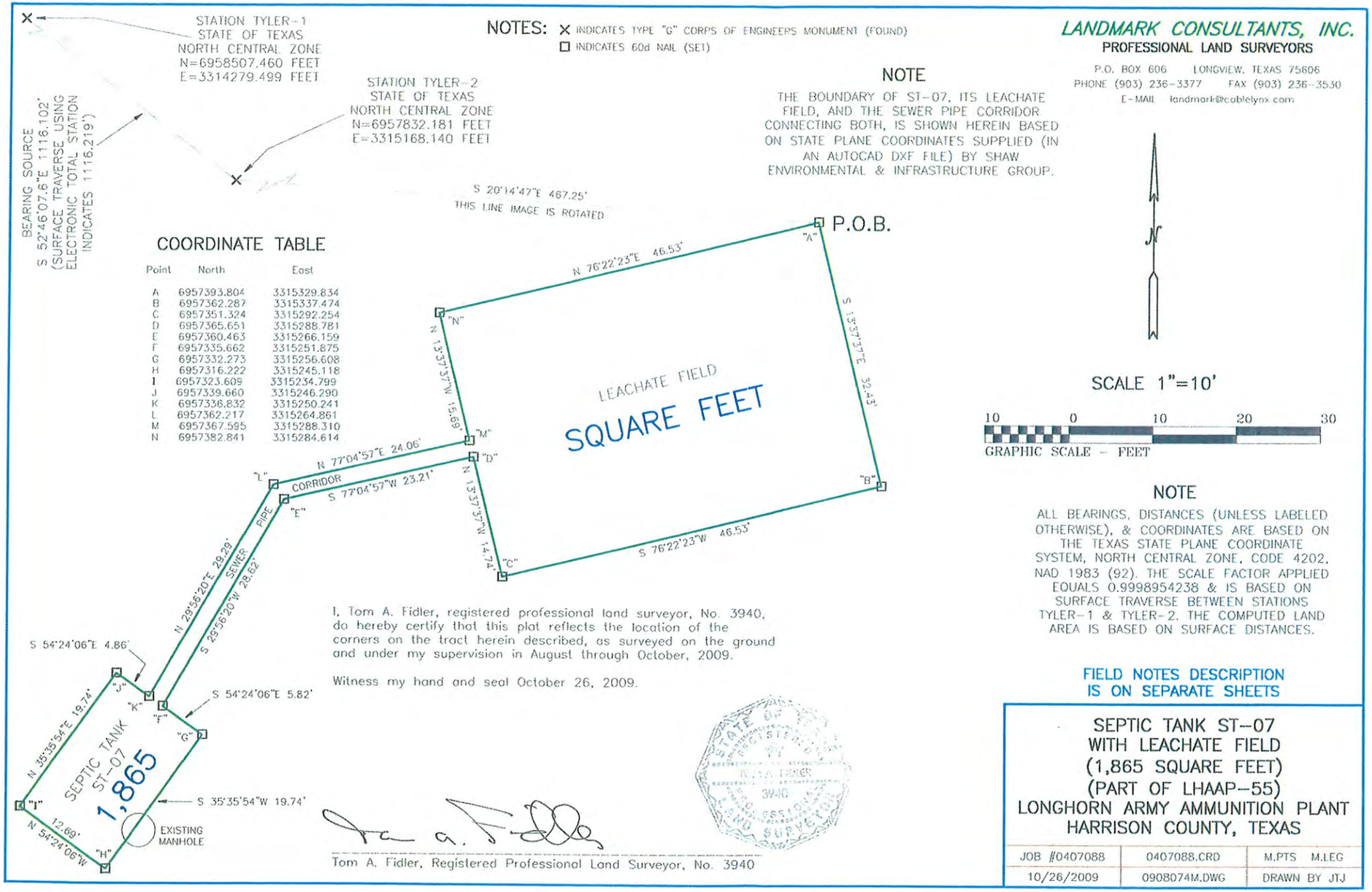
THENCE N 76deg22'23"E 46.53' along a N.B.L. of this tract to this POINT OF BEGINNING. This tract contains 1,865 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943334



NOTES: × INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
□ INDICATES 60d NAIL (SET)

COORDINATE TABLE

Point	North	East
A	6957393.804	3315329.834
B	6957362.287	3315337.474
C	6957351.324	3315292.254
D	6957365.651	3315288.781
E	6957360.463	3315266.159
F	6957335.662	3315251.875
G	6957332.273	3315256.608
H	6957316.222	3315245.118
I	6957323.609	3315234.799
J	6957339.660	3315246.290
K	6957336.832	3315250.241
L	6957362.217	3315264.861
M	6957367.595	3315288.310
N	6957382.841	3315284.614

NOTE

THE BOUNDARY OF ST-07, ITS LEACHATE FIELD, AND THE SEWER PIPE CORRIDOR CONNECTING BOTH, IS SHOWN HEREIN BASED ON STATE PLANE COORDINATES SUPPLIED (IN AN AUTOCAD DXF FILE) BY SHAW ENVIRONMENTAL & INFRASTRUCTURE GROUP.

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PROFESSIONAL LAND SURVEYORS
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PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

N

SCALE 1"=10'

10 0 10 20 30
GRAPHIC SCALE - FEET

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August through October, 2009.

Witness my hand and seal October 26, 2009.

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

SEPTIC TANK ST-07 WITH LEACHATE FIELD (1,865 SQUARE FEET) (PART OF LHAAP-55) LONGHORN ARMY AMMUNITION PLANT HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	M.PTS M.LEG
10/26/2009	0908074M.DWG	DRAWN BY JTJ

FIELD NOTES DESCRIPTION OF
SEPTIC TANK ST-08, ITS LEACHATE FIELD, AND A 2' WIDE
CORRIDOR CENTERED ON THE SEWER PIPE CONNECTING THE TWO

CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 1,785 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note #1: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Surveyor's Note #2: This field notes description is based on State Plane coordinates supplied by Shaw Environmental & Infrastructure Group. Landmark Consultants, Inc. has not probed the ground surface in this area in an attempt to determine the location of Septic Tank ST-08, its leachate field, or the sewer pipe connecting the two.

Commencing at monument "TYLER-2" referenced above,

THENCE S 37deg52'57"E 620.24' to a 60d nail set for the Northmost N.E.C. corner of this tract and this POINT OF BEGINNING,

THENCE S 16deg08'12"E 46.53' along an E.B.L. of this tract to a 60d nail set for this tract's Eastmost S.E.C. ,

THENCE S 73deg51'48"W 32.43' along a S.B.L. of this tract to a 60d nail set for slight deflection corner,

THENCE S 70deg49'57"W 12.79' along a S.B.L. of this tract to a 60d nail set for this tract's Southmost reentrant corner,

THENCE S 17deg16'09"E 6.37' along an E.B.L. of this tract to a 60d nail set for this tract's Westmost S.E.C. ,

THENCE S 72deg43'51"W 19.74' along a S.B.L. of this tract to a 60d nail set for this tract's only S.W.C. ,

THENCE N 17deg16'09"W 12.69' along a W.B.L. of this tract to a chisled "X" set in concrete for this tract's Southmost N.W.C. ,

THENCE N 72deg43'51"E 19.74' along a N.B.L. of this tract to a 60d nail set for this tract's Southmost N.E.C. ,

THENCE S 17deg16'09"E 4.32' along an E.B.L. of this tract to a 60d nail set for this tract's Westmost reentrant corner,

THENCE N 70deg49'57"E 12.83' along a N.B.L. of this tract to a 60d nail set for this tract's Eastmost reentrant corner,

THENCE N 16deg08'12"W 44.52' along a W.B.L. of this tract to a 60d nail set for this tract's Northmost N.W.C. ,

THENCE N 73deg51'03"E 32.43' along a N.B.L. of this tract to this POINT OF BEGINNING. This tract contains 1,785 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, R.P.L.S. Number 3940

00943337

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING
ELECTRONIC TOTAL STATION
INDICATES 1116.219')

NOTES: o INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
□ INDICATES 60d NAIL (SET)
X INDICATES CHISLED "X" SET IN CONCRETE

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
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PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

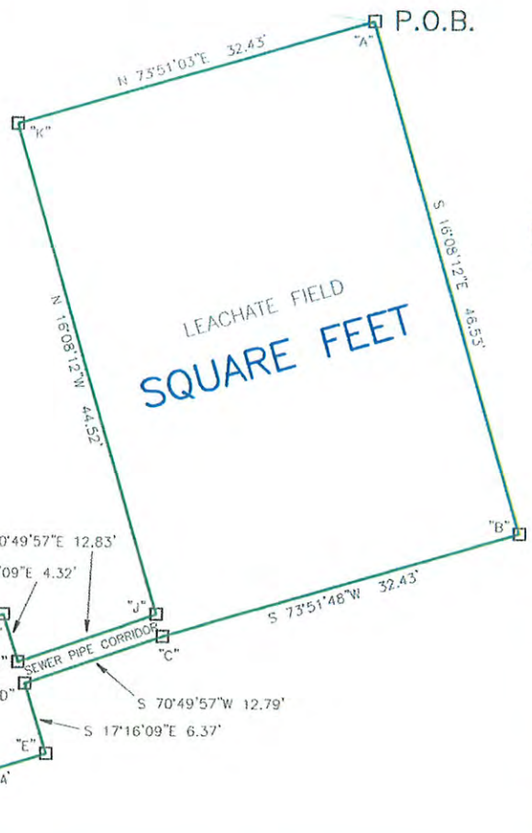
NOTE

THE BOUNDARY OF ST-08, ITS LEACHATE FIELD, AND THE SEWER PIPE CORRIDOR CONNECTING BOTH, IS SHOWN HEREIN BASED ON STATE PLANE COORDINATES SUPPLIED (IN AN AUTOCAD DXF FILE) BY SHAW ENVIRONMENTAL & INFRASTRUCTURE GROUP.

S 37°52'57"E 620.24'
THIS LINE IMAGE IS ROTATED

COORDINATE TABLE

Point	North	East
A	6957342.644	3315548.994
B	6957297.947	3315561.926
C	6957288.934	3315530.774
D	6957284.733	3315518.689
E	6957278.650	3315520.580
F	6957272.790	3315501.730
G	6957284.908	3315497.963
H	6957290.768	3315516.813
I	6957286.644	3315518.095
J	6957290.858	3315530.217
K	6957333.624	3315517.844



I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August through October, 2009.

Witness my hand and seal October 26, 2009.

Tom A. Fidler, R.P.L.S. Number 3940

SCALE 1"=10'

10 0 10 20 30
GRAPHIC SCALE - FEET

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEETS

SEPTIC TANK ST-08
WITH LEACHATE FIELD
(1,785 SQUARE FEET)
(PART OF LHAAP-55)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	N.PTS N.LEG
10/26/2009	0908074N.DWG	DRAWN BY JTJ

FIELD NOTES DESCRIPTION OF
SEPTIC TANK ST-09, ITS LEACHATE FIELD, AND A 2' WIDE
CORRIDOR CENTERED ON THE SEWER PIPE CONNECTING THE TWO

CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 2,004 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note #1: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Surveyor's Note #2: This field notes description is based on State Plane coordinates supplied by Shaw Environmental & Infrastructure Group. Landmark Consultants, Inc. has not probed the ground surface in this area in an attempt to determine the location of Septic Tank ST-09, its leachate field, or the sewer pipe connecting the two.

Commencing at monument "TYLER-2" referenced above,

THENCE S 03deg30'04"E 1101.12' to a 60d nail set for the North corner of this tract and this POINT OF BEGINNING,

THENCE S 47deg56'14"E 12.69' along a N.E. B.L. of this tract to a 60d nail set for this tract's East corner,

THENCE S 42deg03'46"W 19.74' along a S.E. B.L. of this tract to a 60d nail set for this tract's South corner,

THENCE N 47deg56'14"W 4.08' along a S.W. B.L. of this tract to a 60d nail set for this tract's S.E. reentrant corner,

THENCE S 18deg07'53"E 120.09' along an E.B.L. of this tract to a 60d nail set for this tract's N.E. reentrant corner,

THENCE N 67deg40'46"E 15.01' along a N.B.L. of this tract to a

60d nail set for this tract's N.E.C. ,

THENCE S 22deg19'14"E 46.53' along an E.B.L. of this tract to a 60d nail set for this tract's S.E.C. ,

THENCE S 67deg40'46"W 32.43' along a S.B.L. of this tract to a 60d nail set for this tract's S.W.C. ,

THENCE N 22deg19'14"W 46.53' along a W.B.L. of this tract to a 60d nail set for this tract's N.W.C. ,

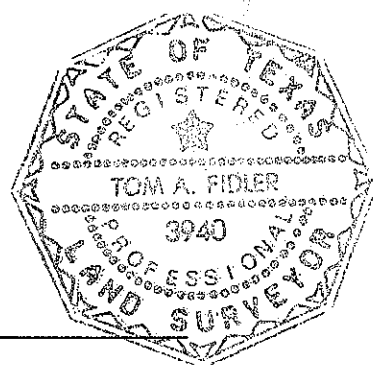
THENCE N 67deg40'46"E 15.42' along a N.B.L. of this tract to a 60d nail set for this tract's N.W. reentrant corner,

THENCE N 18deg07'53"W 123.73' along a W.B.L. of this tract to a 60d nail set for this tract's S.W. reentrant corner,

THENCE N 47deg56'14"W 4.59' along a S.W. B.L. of this tract to a 60d nail set for this tract's West corner,

THENCE N 42deg03'46"E 19.74' along a N.W. B.L. of this tract to this POINT OF BEGINNING. This tract contains 2,004 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

SEPTIC TANK ST-09 WITH LEACHATE FIELD (2,004 SQUARE FEET) (PART OF LHAAP-55) LONGHORN ARMY AMMUNITION PLANT HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	P.PTS P.LEG
10/26/2009	0908074P.DWG	DRAWN BY JTJ

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August through October, 2009.

Witness my hand and seal October 26, 2009.

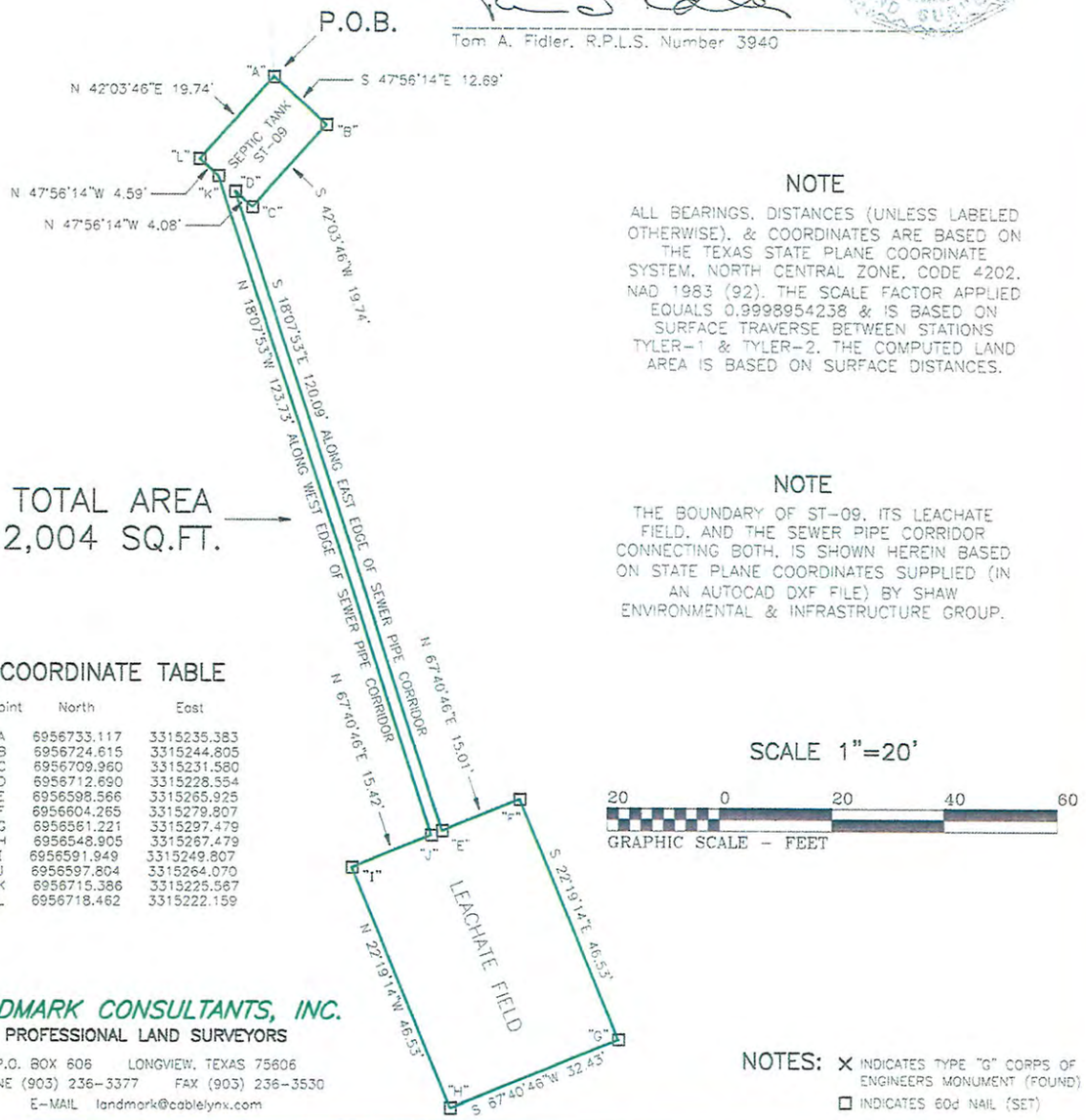
Tom A. Fidler, R.P.L.S. Number 3940

STATION TYLER-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6958507.460 FEET
E=3314279.499 FEET

STATION TYLER-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6957832.181 FEET
E=3315168.140 FEET

BEARING SOURCE
S 52°46'07.6"E 1116.102'
(SURFACE TRAVERSE USING
ELECTRONIC TOTAL STATION
INDICATES 1116.219')

S 03°30'04"E 1101.12'



TOTAL AREA
2,004 SQ.FT.

COORDINATE TABLE

Point	North	East
A	6956733.117	3315235.383
B	6956724.615	3315244.805
C	6956709.960	3315231.580
D	6956712.690	3315228.554
E	6956598.566	3315265.925
F	6956604.265	3315279.807
G	6956561.221	3315297.479
H	6956548.905	3315267.479
I	6956591.949	3315249.807
J	6956597.804	3315264.070
K	6956715.386	3315225.567
L	6956718.462	3315222.159

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

NOTE

THE BOUNDARY OF ST-09, ITS LEACHATE FIELD, AND THE SEWER PIPE CORRIDOR CONNECTING BOTH, IS SHOWN HEREIN BASED ON STATE PLANE COORDINATES SUPPLIED (IN AN AUTOCAD DXF FILE) BY SHAW ENVIRONMENTAL & INFRASTRUCTURE GROUP.

SCALE 1"=20'

20 0 20 40 60
GRAPHIC SCALE - FEET

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

NOTES: X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
□ INDICATES 60d NAIL (SET)

FIELD NOTES DESCRIPTION OF
SEPTIC TANK ST-10, ITS LEACHATE FIELD, AND A 2' WIDE
CORRIDOR CENTERED ON THE SEWER PIPE CONNECTING THE TWO

CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 1,804 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note #1: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998954238, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "TYLER-1" (N=6958507.460 feet E=3314279.499 feet) and "TYLER-2" (N=6957832.181 feet E=3315168.140 feet). Said traverse indicates a surface distance of 1116.219 feet between said monuments. The computed land area is based on surface distances.

Surveyor's Note #2: This field notes description is based on State Plane coordinates supplied by Shaw Environmental & Infrastructure Group. Landmark Consultants, Inc. has not probed the ground surface in this area in an attempt to determine the location of Septic Tank ST-10, its leachate field, or the sewer pipe connecting the two.

Commencing at monument "TYLER-2" referenced above,

THENCE S 34deg34'49"E 861.93' to a 60d nail set for the Westmost N.W.C. of this tract and this POINT OF BEGINNING,

THENCE S 81deg33'36"E 46.53' along a N.B.L. of this tract to a 60d nail set for this tract's Westmost N.E.C. ,

THENCE S 08deg26'24"W 13.21' along an E.B.L. of this tract to a 60d nail set for this tract's N.E. reentrant corner,

THENCE S 82deg30'08"E 21.87' along a N.B.L. of this tract to a 60d nail set for this tract's N.W. reentrant corner,

THENCE N 08deg55'06"E 4.34' along a W.B.L. of this tract to a 60d nail set for this tract's Eastmost N.W.C. ,

THENCE S 81deg04'54"E 19.74' along a N.B.L. of this tract to a 60d nail set for this tract's Eastmost N.E.C. ,

THENCE S 08deg55'06"W 12.69' along an E.B.L. of this tract to a 60d nail set for this tract's Eastmost S.E.C. ,

THENCE N 81deg04'54"W 19.74' along a S.B.L. of this tract to a 60d nail set for this tract's Eastmost S.W.C. ,

THENCE N 08deg55'06"E 6.34' along a W.B.L. of this tract to a 60d nail set for this tract's S.W. reentrant corner,

THENCE N 82deg30'08"W 21.85' along a S.B.L. of this tract to a 60d nail set for this tract's S.E. reentrant corner,

THENCE S 08deg26'24"W 17.22' along an E.B.L. of this tract to a 60d nail set for this tract's Westmost S.E.C. ,

THENCE N 81deg33'36"W 46.53' along a S.B.L. of this tract to a 60d nail set for this tract's Westmost S.W.C. ,

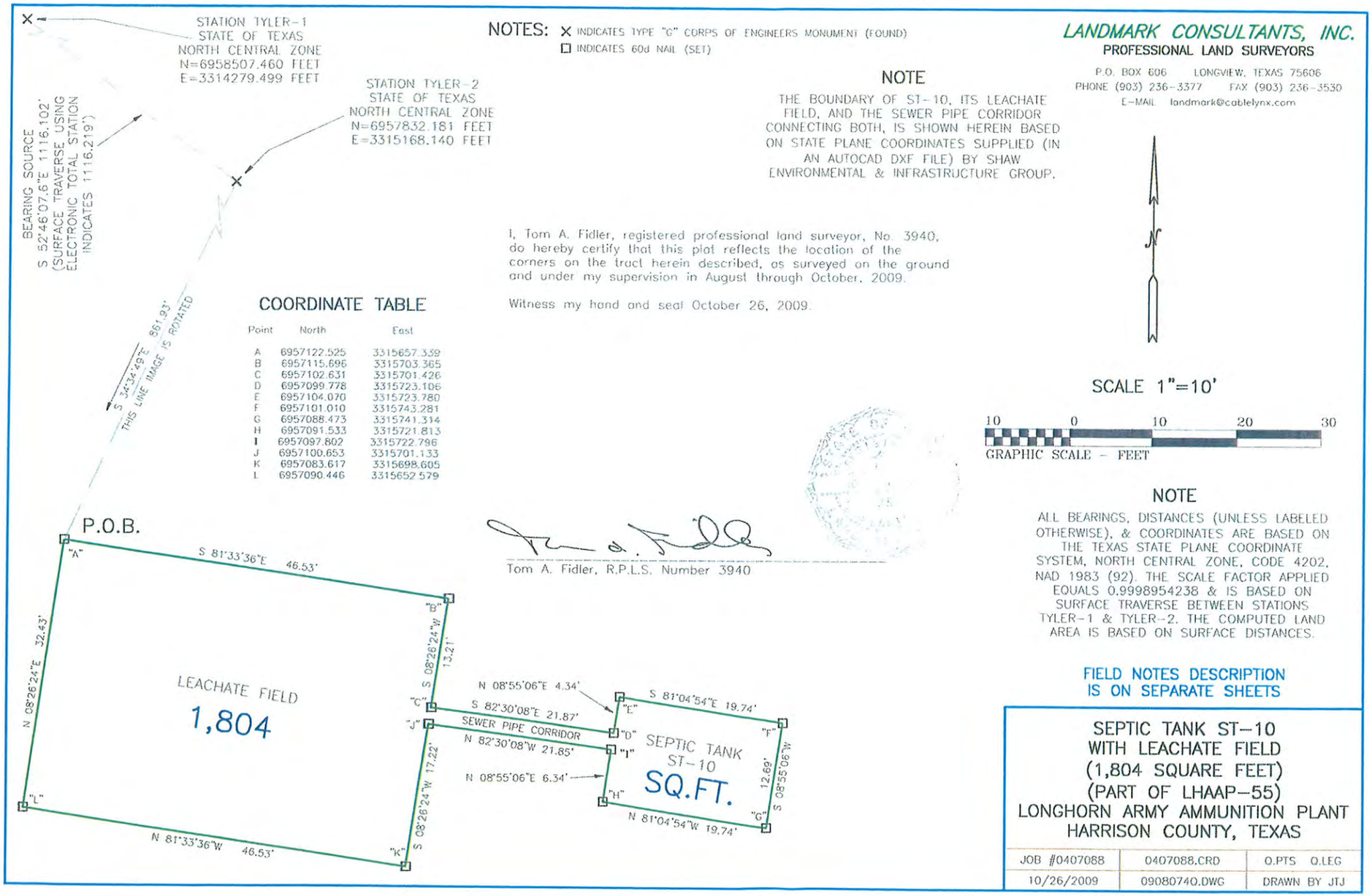
THENCE N 08deg26'24"E 32.43' along a W.B.L. of this tract to this POINT OF BEGINNING. This tract contains 1,804 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, R.P.L.S. Number 3940

00943343



NOTES: ✕ INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
☐ INDICATES 60d NAIL (SET)

NOTE

THE BOUNDARY OF ST-10, ITS LEACHATE FIELD, AND THE SEWER PIPE CORRIDOR CONNECTING BOTH, IS SHOWN HEREIN BASED ON STATE PLANE COORDINATES SUPPLIED (IN AN AUTOCAD DXF FILE) BY SHAW ENVIRONMENTAL & INFRASTRUCTURE GROUP.

COORDINATE TABLE

Point	North	East
A	6957122.525	3315657.359
B	6957115.696	3315703.365
C	6957102.631	3315701.426
D	6957099.778	3315723.106
E	6957104.070	3315723.780
F	6957101.010	3315743.281
G	6957088.473	3315741.314
H	6957091.533	3315721.813
I	6957097.802	3315722.796
J	6957100.653	3315701.133
K	6957083.617	3315698.605
L	6957090.446	3315652.579

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August through October, 2009.

Witness my hand and seal October 26, 2009.

Tom A. Fidler, R.P.L.S. Number 3940

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

SCALE 1"=10'

10 0 10 20 30
GRAPHIC SCALE - FEET

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998954238 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS TYLER-1 & TYLER-2. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEETS

SEPTIC TANK ST-10
WITH LEACHATE FIELD
(1,804 SQUARE FEET)
(PART OF LHAAP-55)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	O.PTS Q.LEG
10/26/2009	09080740.DWG	DRAWN BY JTJ

LHAAP-35A(58), 58-1

LUCs FROM FINAL REMEDIAL DESIGN

September 14, 2015

Final

Remedial Design
LHAAP-35A(58), Shops Area, Group 4
Longhorn Army Ammunition Plant
Karnack, Texas

Prepared for U.S. Army Corps of Engineers – Tulsa District
1645 South 101st East Avenue
Tulsa, Oklahoma 74128

Prepared by Shaw Environmental, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

Contract No. W912QR-04-D-0027, Task Order No. DS02
Project No. 117591
Rev 0
September 2011

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00943347

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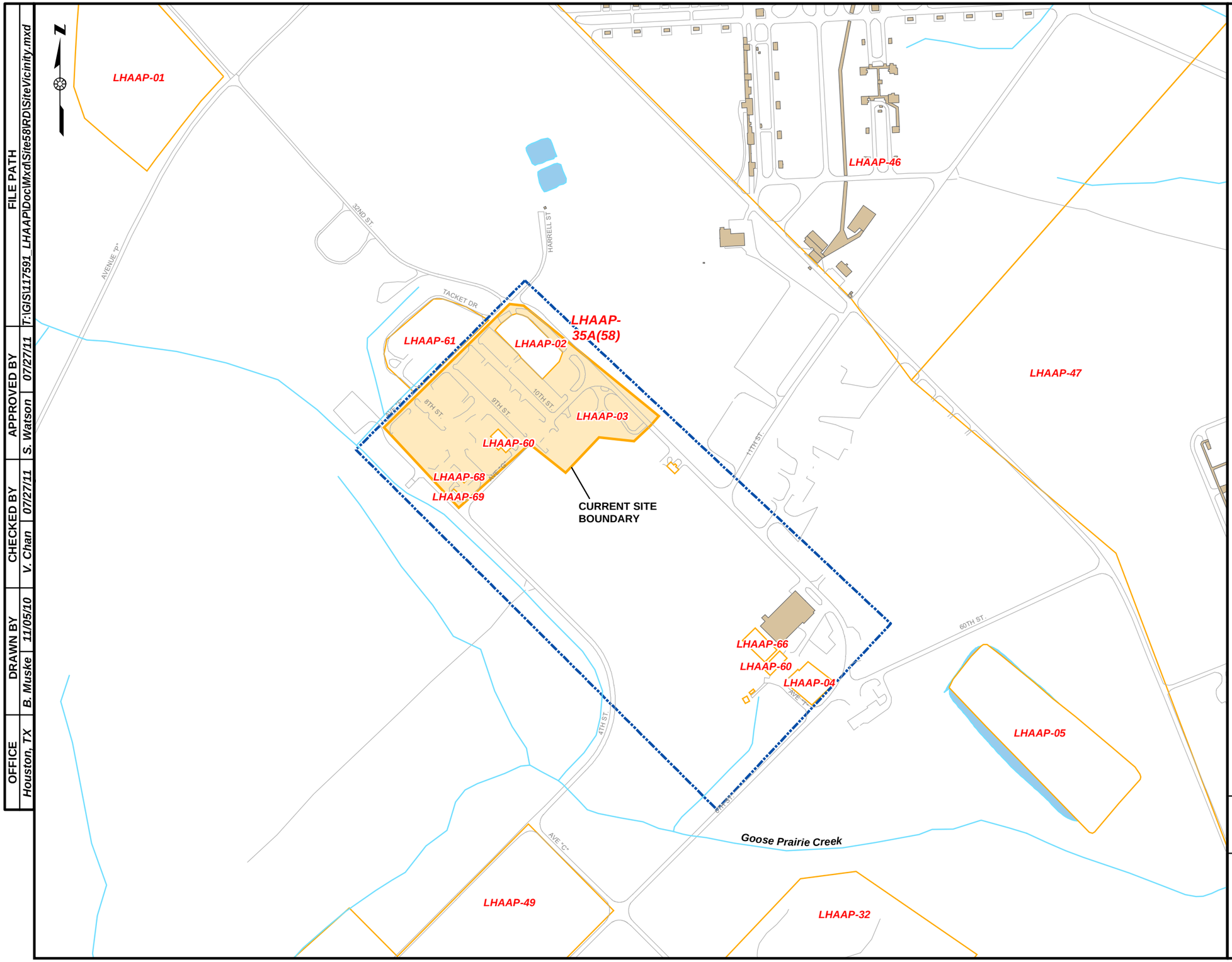
		S. Watson 07/27/11	



LEGEND

- Stream
- Road
- Existing Building
- Historic LHAAP-35A(58) Site Boundary
- Other LHAAP Site
- LHAAP-35A(58) Site
- Lake/Pond

0 200 400 800 Feet

Shaw

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 1-2

SITE VICINITY MAP
LHAAP-35A(58) GROUP 4

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

2.0 LAND USE CONTROL

The objective of the LUC at LHAAP-35A(58) is to prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health and ensure that there is no withdrawal or use of groundwater beneath the site for anything other than environmental monitoring and testing until cleanup goals are met. Notification of the groundwater use restriction will accompany all transfer documents and will be recorded at the Harrison County Courthouse in accordance with Texas Administrative Code (TAC) Title 30, §335.566. **Appendix A** provides sample LUC compliance certification documentation.

The LUC addresses the two groundwater plumes at LHAAP-35A(58) with levels of contamination that require implementation of a remedy (see **Section 1.3**). The U.S. Army is responsible for implementing, maintaining, monitoring, reporting on, and enforcing the LUC.

U.S. Army and regulators will consult to determine appropriate enforcement actions should there be a failure of an LUC objective at this site after it has transferred. U.S. Army shall obtain USEPA and Texas Commission on Environmental Quality (TCEQ) concurrence prior to termination or significant modification of the LUC, or implementation of a change in land use inconsistent with the LUC objectives and use assumptions of the remedy. Although not a remedy, the land use assumption for LHAAP-35A(58) forms the basis for the remedy. The future use of the site as part of a national wildlife refuge is consistent with the industrial risk exposure scenario. Notification of the land use assumption of this site will be made in transfer documentation and will be recorded in the Harrison County Courthouse in accordance with TAC Title 30, §335.566. Compliance with the use assumption will be documented in the five-year review reports.

4.0 LAND USE CONTROL DESIGN AND IMPLEMENTATION PLAN

This section describes the LUC design and implementation activities for LHAAP-35A(58). The activities will result in a surveyed and recorded groundwater use restriction boundary and an operation and maintenance plan for the LUC.

The objective of the LUC at LHAAP-35A(58) is to prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health and ensure that there is no withdrawal or use of groundwater beneath the site for anything other than environmental monitoring and testing until cleanup goals are met. Notification of the groundwater use restriction will accompany all transfer documents. The U.S. Army is responsible for long-term implementation, maintenance, inspection, reporting, and enforcement of the LUC.

The LUC will address the area of LHAAP-35A(58) that includes two groundwater plumes with levels of contamination that require implementation of a remedy (see **Section 1.3**). The Land Use Control Operation and Maintenance (LUC O&M) Plan will identify the measures required for monitoring and enforcement of the groundwater use restriction. Upon review and concurrence of this RD, the LUC O&M Plan will be coordinated with regulators, finalized, and distributed as part of the Comprehensive LUC Management Plan.

4.1 Land Use Control Implementation

The U.S. Army will undertake the following actions to implement the groundwater restriction LUC for LHAAP-35A(58):

- Define the Area of the Groundwater Use Restriction. The groundwater use restriction boundary will be defined based on the review of the first round of groundwater sampling data in conjunction with historic data. The extent of plume will be bounded by a buffer and may extend to natural groundwater and surface water boundaries.

- Survey the LUC Boundary. The proposed boundary will be finalized after all wells are installed and sampled. Concurrence by USEPA and TCEQ will be obtained, and the LUC boundary will be surveyed by a State-licensed surveyor. A legal description of the surveyed area will be appended to the survey plat.

- Record the LUC in Harrison County. The LUC plat, legal description and groundwater use restriction language will be recorded in the Harrison County Courthouse in accordance with TAC Title 30, §335.566.

- Notify the Texas Department of Licensing and Regulation of the LUC. The Texas Department of Licensing and Regulation will be notified of the groundwater restriction which includes the prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval from the Army, the USEPA, and the TCEQ. The survey plat, legal boundary and description of the groundwater restriction, in conjunction with a locator map, will be provided in hard and electronic copy.

- Develop the LUC O&M Plan. A LUC O&M Plan for LHAAP-35A(58) will be developed. It will include the elements presented in **Section 4.2**, the county recordation of the LUC survey plat, legal description and restriction language, and the inspection/certification form.

4.2 Land Use Control Operation and Maintenance

The U.S. Army or its representatives will be responsible for the operation and maintenance of the LHAAP-35A(58) LUC. This includes certification, reporting and enforcement activities. The U.S. Army shall address LUC problems within its control that are likely to impact remedy integrity and shall address problems as soon as practicable. To facilitate long-term operation and maintenance of the groundwater use restriction LUC remedy, the U.S. Army will develop a plan that will encompass the elements described in the following subsections.

4.2.1 Site Certification and Reporting

Beginning with finalization of this RD and approval of the inspection form, the U.S. Army will undertake inspections and certify continued compliance with the LUC objectives. The U.S. Army, or the transferee after transfer, will retain the LUC Inspection Certification documents in the project files for incorporation into the five-year review reports, and these documents will be made available to USEPA and TCEQ upon request. In addition, should any violations be found during the certification, the U.S. Army will provide to USEPA and TCEQ, along with the document, a separate written explanation indicating the specific violations found and what efforts or measures have or will be taken to correct those violations. The need to continue certifications will be revisited at five year reviews.

4.2.2 Notice of Planned Property Conveyances

The U.S. Army shall provide notice to USEPA and TCEQ of plans to convey the LHAAP-35A(58) acreage. The notice shall describe the mechanism by which the LUC will continue to be implemented, maintained, inspected, reported, and enforced. Upon transfer, such responsibilities may shift to the transferee via appropriate provisions placed in the Environmental Condition of Property (ECP) or other environmental document for transfer. Although the U.S. Army may transfer responsibility for various implementation actions, the U.S. Army shall retain its responsibility for remedy integrity. This means that the U.S. Army

Contract No. W912QR-04-D-0027, Task Order No. DS02• Final • Rev 0 • September 2011

is responsible for addressing substantive violations of the LUC performance objective that would undermine the U.S. Army's CERCLA remedy. The U.S. Army also will be responsible for incorporating RD information and outlining the transferee's LUC obligations into property transfer documentation.

4.2.3 Opportunity to Review Text of Intended Land Use Controls

U.S. Army will provide a copy of the groundwater use restriction notification to TCEQ for review and approval prior to its recordation in Harrison County. USEPA will also receive a copy for review. In addition, the U.S. Army will produce an ECP or other environmental document for transfer of LHAAP-35A(58), but before executing transfer, the U.S. Army will provide USEPA and TCEQ with a copy of the ECP or other environmental document for transfer so that they may have reasonable opportunity, before transfer, to review all LUC-related provisions.

4.2.4 Notification Should Action(s) Which Interfere with Land Use Control Effectiveness be Discovered Subsequent to Conveyance

Should the U.S. Army discover after conveyance of the site any activity on the property inconsistent with the LUC performance objective, the U.S. Army shall notify USEPA and TCEQ within 72 hours of such discovery. Consistent with **Section 4.2.5** below, the U.S. Army will then work with USEPA, TCEQ and the transferee to correct the problem(s) discovered. This reporting requirement does not preclude the U.S. Army from taking immediate action pursuant to its CERCLA authorities to prevent any perceived risk(s) to human health or the environment.

4.2.5 Land Use Control Enforcement

Should the LUC remedy reflected in this RD fail, the U.S. Army will coordinate with USEPA and TCEQ to ensure that appropriate actions are taken to reestablish its protectiveness. These actions may range from informal resolutions with the United States Fish and Wildlife Service (USFWS) or its lessee, to the institution of judicial action against non-federal third-parties. Alternatively, should the circumstances warrant such, the U.S. Army could choose to exercise its response authorities under CERCLA. Should the U.S. Army become aware that any future owner or user of the property has violated any LUC requirement over which a local agency may have independent jurisdiction, the U.S. Army may notify those agencies of such violation(s) and work cooperatively with them to re-achieve owner/user compliance with the LUC.

4.2.6 Modification or Termination of Land Use Controls

The U.S. Army shall not, without USEPA and TCEQ concurrence, make a significant modification to, or terminate a LUC, or make a land use change inconsistent with the LUC

objective. Likewise, the U.S. Army shall seek prior USEPA and TCEQ concurrence before commencing actions that may impact remedy integrity. In the case of an emergency action, the U.S. Army shall obtain prior USEPA and TCEQ concurrence as appropriate to the exigencies of the situation.

The LUC shall remain in effect until such time as the U.S. Army and USEPA agree that the concentrations of COCs have met cleanup levels. When this occurs, the LUC will be terminated as needed. The decision to terminate the LUC will be documented consistent with the NCP process for post-ROD changes, potentially including an explanation of significant differences or a remedial action completion report. If the property has been transferred and a determination by the U.S. Army and USEPA has been made to terminate the LUC, the U.S. Army shall provide to the owner of the property an appropriate release for recordation pertaining to the site and will also timely advise other local stakeholders of the action.

4.2.7 Comprehensive Land Use Control Management Plan

Upon finalization of the LUC O&M Plan, a copy will be inserted into the Comprehensive LUC Management Plan for Longhorn. The Comprehensive LUC Management Plan figure and table will be updated to reflect the inclusion of LHAAP-35A(58).

The Comprehensive LUC Management Plan consists of LHAAP RD documents and a survey plat showing the locations where LUCs being implemented at LHAAP are applied. The purpose of this Comprehensive LUC Management Plan is to ensure all site specific LUCs are compiled into one comprehensive location for both pre-transfer use by the installation and for post-transfer use by the transferee. This document will be provided to USEPA and TCEQ, and is also accessible to the local government and the public. The Comprehensive LUC Management Plan is located in the Marshall Public Library to accompany LHAAP's Administrative Record.

The land use assumption of industrial use as part of a national wildlife refuge forms the basis for the remedy at LHAAP-35A(58) and this land use assumption will be included in the Comprehensive LUC Management Plan with supporting documentation.

LHAAP-35A(58), 58-2

NOTICE OF LAND USE CONTROLS AND NONRESIDENTIAL LAND USE AT LHAAP-35A (58) FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

00943354

2015-000002402

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

NOTICE

8 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 03/16/2015 11:17 AM **Document Number:** 2015-000002402 **Receipt No:** 1502837 **Amount:** $ 50.00 **By:** Denise Kio, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

AECOM
112 E. PECAN ST,STE 400
FED-EX ENVELOPE
SAN ANTONIO, TX 78205

STATE OF TEXAS HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF LAND USE CONTROL AT LHAAP-35A (58)

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 in a former industrial area, located on the Former Longhorn Army Ammunition Plant (LHAAP) and is designated as LHAAP-35A (58) (Shops Area). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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-35A (58) were performed in accordance with the FFA requirements.

The Shops Area now designated as LHAAP-35A (58) was established in 1942 as part of the installation's initial construction (Shaw, 2011). The facility was used to provide plant-operated laundry, automotive, woodworking, metalworking, painting, refrigeration, and electrical services. The site was active throughout LHAAP's mission and was deactivated along with the rest of the installation in 1996-1997. A Record of Decision (ROD) for LHAAP-35A (58) was signed by the U.S. Army and USEPA with TCEQ concurrence in 2010 establishing the final remedy which is separated into two areas: 1) eastern plume; and 2) western plume. The eastern plume remedy includes land use control (LUC); enhanced in-situ bioremediation (EISB) in the area of highest levels of constituents of concern (COCs) followed by monitored natural attenuation (MNA). The western plume remedy consists of LUC and MNA. The site was not remediated to levels suitable for unrestricted use. The LUC at LHAAP-35A (58) is required to prevent human exposure to contaminated groundwater. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-35A (58) parcel is a 11-acre tract, 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. Associated with the LHAAP-35A (58) parcel is designated a LUC boundary which is a 46.524-acre tract, more or less, as described in Exhibit A. The LUC boundary is also presented in the attached Figure 1. Contained within the LHAAP-35A (58) LUC boundary are sites LHAAP-02, LHAAP-03, LHAAP-56, LHAAP-59, LHAAP-60, LHAAP-65, LHAAP-68 and LHAAP-69.

Future use of the parcel is intended as a national wildlife refuge consistent with non-residential use. For purposes of this certification, residential use includes, but is not limited to, single family or multifamily residences; child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12. The United States Department of the Army has undertaken careful environmental study of the LHAAP-35A (58) site and concluded that the LUC set forth below is required to ensure protection of human health and the environment.

(1) Groundwater Restriction. The groundwater use restriction boundary consists of the 46.524-acre tract, more or less. Groundwater underlying this land is contaminated with tetrachloroethene (PCE), trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), cis-1,2-DCE), trans-1,2-DCE, and vinyl chloride (VC) and shall not be accessed or used for any purpose without the prior written approval of the U.S. Army, the USEPA, and the TCEQ. A LUC restricting the use of groundwater has been established for the protection of human health. The U.S. Army will notify the Texas Department of Licensing and Regulation of the groundwater restriction which includes prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval by the U.S. Army, the USEPA, and the TCEQ. A restriction against the residential use of groundwater will remain in effect until the levels of the COCs in groundwater and soil allow unrestricted use and unlimited exposure (UUUE).

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

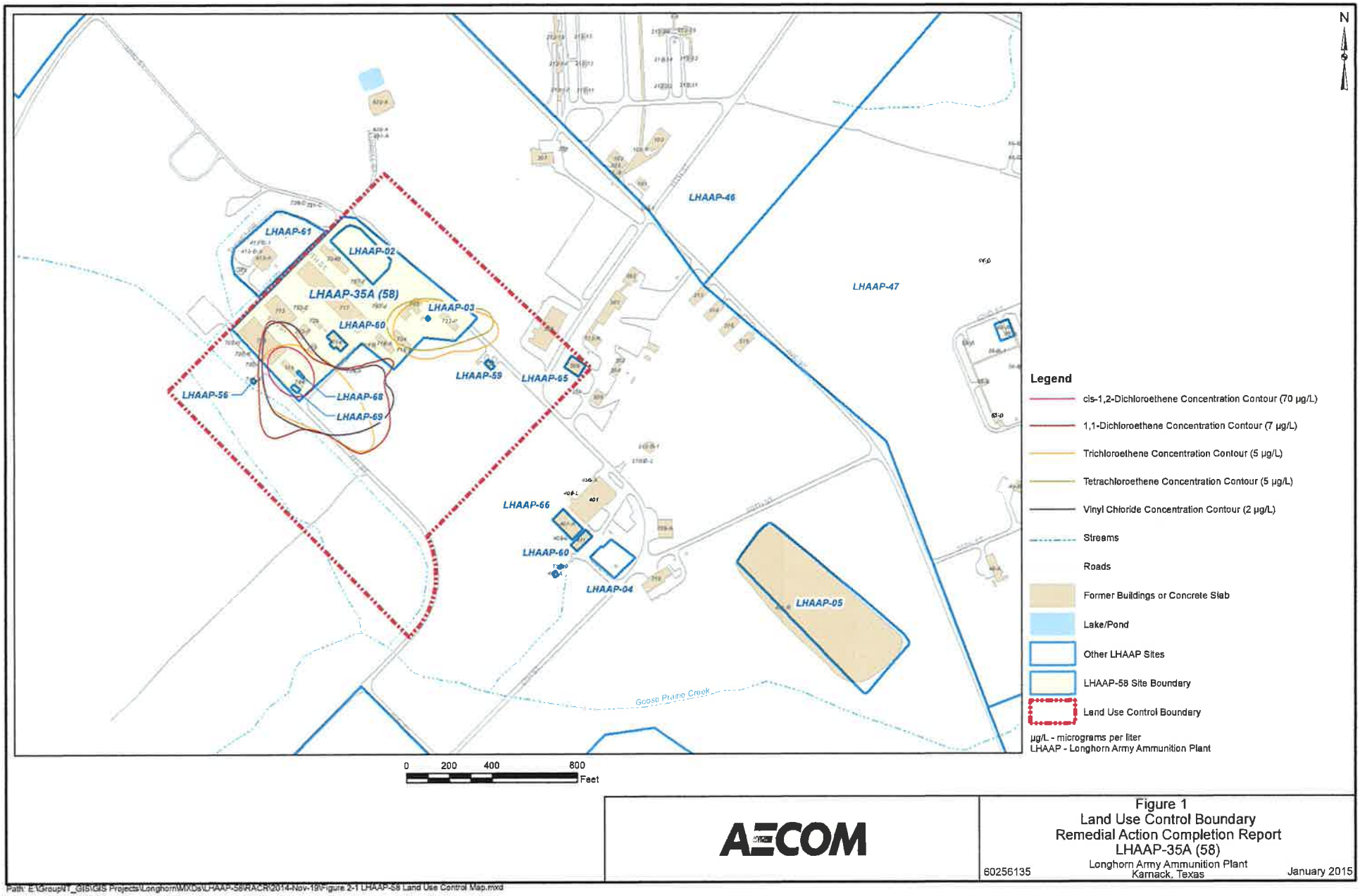
EXECUTED this the ____th day of _____, 2015.

BEFORE ME, on this the 19 th day of February 2015, personally appeared Rose M. Zeiler, of 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 19th day of February, 2015.

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

GENIE WARNER
Notary Public State of Texas
COMM. EXP. 8/1/2018



AECOM

Figure 1
Land Use Control Boundary
Remedial Action Completion Report
LHAAP-35A (58)
Longhorn Army Ammunition Plant
Karnack, Texas

60256135

January 2015

Path: E:\Group\IT_GIS\GIS Projects\Longhorn\MXDs\LHAAP-58\RACR\2014-Nov-19\Figure 2-1 LHAAP-58 Land Use Control Map.mxd

EXHIBIT A
SURVEY PLAT

FIELD NOTES DESCRIPTION OF
"LHAAP-35A(58)" LAND USE CONTROL AREA
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, "LHAAP-35A(58)" Land Use Control Area being 46.524 acres of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), "LHAAP-35A(58)" Land Use Control Area being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.99991470929, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "X-11" (N=6960733.698 feet E=3304750.367 feet) and "HMX-5" (N=6958206.213 feet E=3305201.721 feet). Said traverse indicates a surface distance of 2567.689 feet between said monuments. The computed land area is based on State Plane distances. As used herein, the abbreviation I.R.O.P.C. indicates 1/2" iron rebar with orange plastic cap engraved "Fidler" and "RPLS 3940" .

Commencing at monument "X-11" referenced above,

THENCE N 52deg16'47"E 216.98' to an I.R.O.P.C. set for the North corner of this tract and this POINT OF BEGINNING,

THENCE S 47deg09'34"E 1327.84' along the N.E. B.L. of this tract to an I.R.O.P.C. set for this tract's East corner,

THENCE S 44deg05'45"W 1089.57' along a S.E. B.L. of this tract to a 60d nail set (near the Easterly edge of the asphalt pavement of "4th Street") for this tract's only reentrant corner,

THENCE along a curve to the right (having a radius of 397.10' and an arc length of 496.33', being subtended by a chord of S 09deg27'29"W 464.64') defining this tract's E.B.L., said curve approximating the curved Easterly edge of the asphalt pavement of "4th Street", to a 60d nail found for the South end of said curve,

THENCE S 45deg14'57"W 21.48' along a S.E. B.L. of this tract to a point for this tract's Southmost corner, said point being N 17deg16'14"W 525.07' from the aforementioned "HMX-5" monument and S 44deg25'14"E 8.86' from a concrete nail set for reference near the centerline of the asphalt pavement of "4th Street",

THENCE N 44deg25'14"W 1614.70' along the S.W. B.L. of this tract to an I.R.O.P.C. set for this tract's West corner,

THENCE N 45deg01'15"E 1422.64' along the N.W. B.L. of this tract to this POINT OF BEGINNING, containing 46.524 acres, more or less.

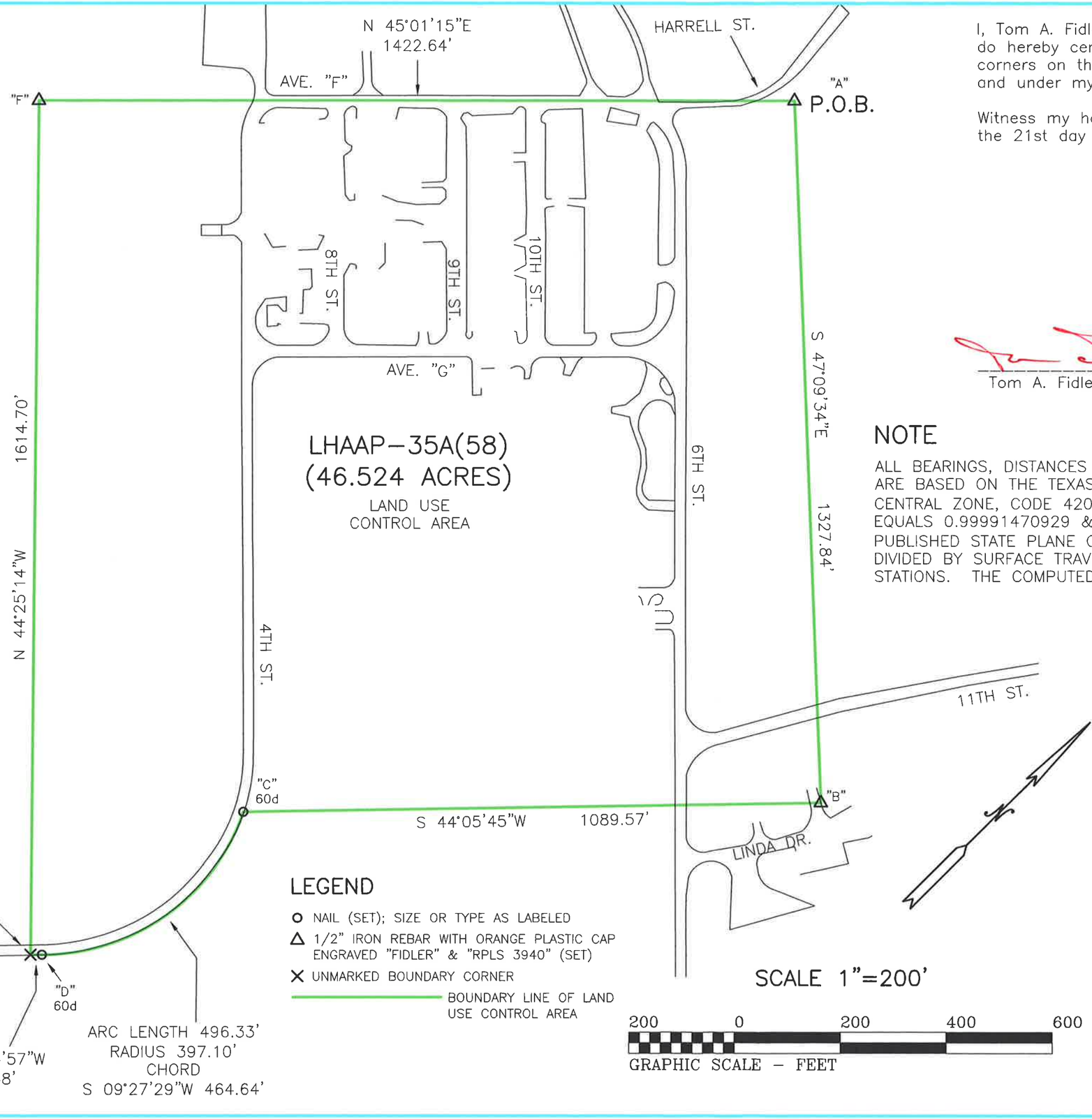
I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943361

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com



LEGEND

- NAIL (SET); SIZE OR TYPE AS LABELED
- △ 1/2" IRON REBAR WITH ORANGE PLASTIC CAP ENGRAVED "FIDLER" & "RPLS 3940" (SET)
- X UNMARKED BOUNDARY CORNER
- BOUNDARY LINE OF LAND USE CONTROL AREA

SCALE 1"=200'

200 0 200 400 600
GRAPHIC SCALE – FEET

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in January, 2015.

Witness my hand and seal this the 21st day of January, 2015.

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), AND COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.99991470929 & IS BASED ON CALCULATED DISTANCE BETWEEN PUBLISHED STATE PLANE COORDINATES (OF STATIONS X-11 & HMX-5) DIVIDED BY SURFACE TRAVERSE CALCULATED DISTANCE BETWEEN SAME TWO STATIONS. THE COMPUTED LAND AREA IS BASED ON STATE PLANE DISTANCES.

COORDINATE TABLE

	NORTH	EAST
A	6960866.446	3304921.998
B	6959963.566	3305895.634
C	6959181.058	3305137.444
D	6958722.729	3305061.091
E	6958707.606	3305045.836
F	6959860.854	3303915.676

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEET

LHAAP-35A(58) L.U.C.A.
(46.524 ACRES)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	V.PTS V.LEG
01/21/2015	1103025V.DWG	DRAWN BY JTJ

LHAAP-35A(58), 58-3

LAND USE CONTROL COMPLIANCE INSPECTION FORM

September 14, 2015

Sample Annual Land Use Control Compliance Certification Documentation

In accordance with the Remedial Design dated 9/30/11 for LHAAP-35A (58) a certification of site was conducted by _____ [indicate transferee] on _____.

A summary of land use control mechanisms is as follows:

- Groundwater restriction – A restriction against use of groundwater will remain in effect until the levels of the COCs in groundwater and soil allow unrestricted use and unlimited exposure (UUUE). [Indicate whether groundwater restrictions are still required at LHAAP-35A (58)]

A summary of compliance with land use and restriction covenants is as follows:

- No use of groundwater, installation of new groundwater wells, or tampering with existing wells at LHAAP-35A (58).

I, the undersigned, do document that the certification was performed as indicated above, and that the above information is true and correct to the best of my knowledge, information, and belief.

Date: _____

Name/Title: _____

Signature: _____

Annual compliance certification forms shall be completed no later than March 1 of each year for the previous calendar year.

LHAAP-59

NOTICE OF NONRESIDENTIAL LAND USE FOR LHAAP-59 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

00943365

2011-000003378

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

NOTICE

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 03/24/2011 03:52 PM **Document Number:** 2011-000003378 **Receipt No:** 1103745 **Amount:** $ 32.00 **By:** Lauren Boyd, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

AARON WILLIAMS EC-ER
1645 SOUTH 101ST EAST AVENUE

[redacted]

STATE OF TEXAS HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remedial investigation of the land described herein. The site, LHAAP-59, the former Pesticide Storage Building 725, was constructed in 1984 to support maintenance activities at the plant as a pesticide storage building. LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-59 is not itself considered an NPL site. Environmental activities at LHAAP-59 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ as the lead regulatory agency that no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-59 consists of a Building 725 and the surrounding area. The building, now removed, contained a concrete floor with floor drains that discharged to two nearby sumps. Soil samples were collected near the building and sumps and analyzed for metals, semivolatile organic compounds, volatile organic compounds, dioxins and furans in the 1990s and in 2007 additional samples were collected and analyzed for pesticides and herbicides near the sumps and at the building. Low levels of pesticides were detected. An analysis demonstrated that

these chemicals in soil did not exhibit a potential for release to the groundwater in excess of the groundwater MSC (GW-Ind) and were considered to be protective for nonresidential worker exposure, as specified in 30 TAC §335.559(g)(2)(B). 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30
p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-59 parcel is a 0.2537 acre tract 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 United States Department of the Army has undertaken careful environmental study of the LHAAP-59 site and USEPA and TCEQ concluded that no further investigation or action is required for LHAAP-59. Contaminants in soil samples from LHAAP-59 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of LHAAP-59 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of LHAAP-59 is consistent with the non-residential use scenario evaluated in the risk screening. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multifamily residences; child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through
12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-BDO (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 25 th day of January, 2011.

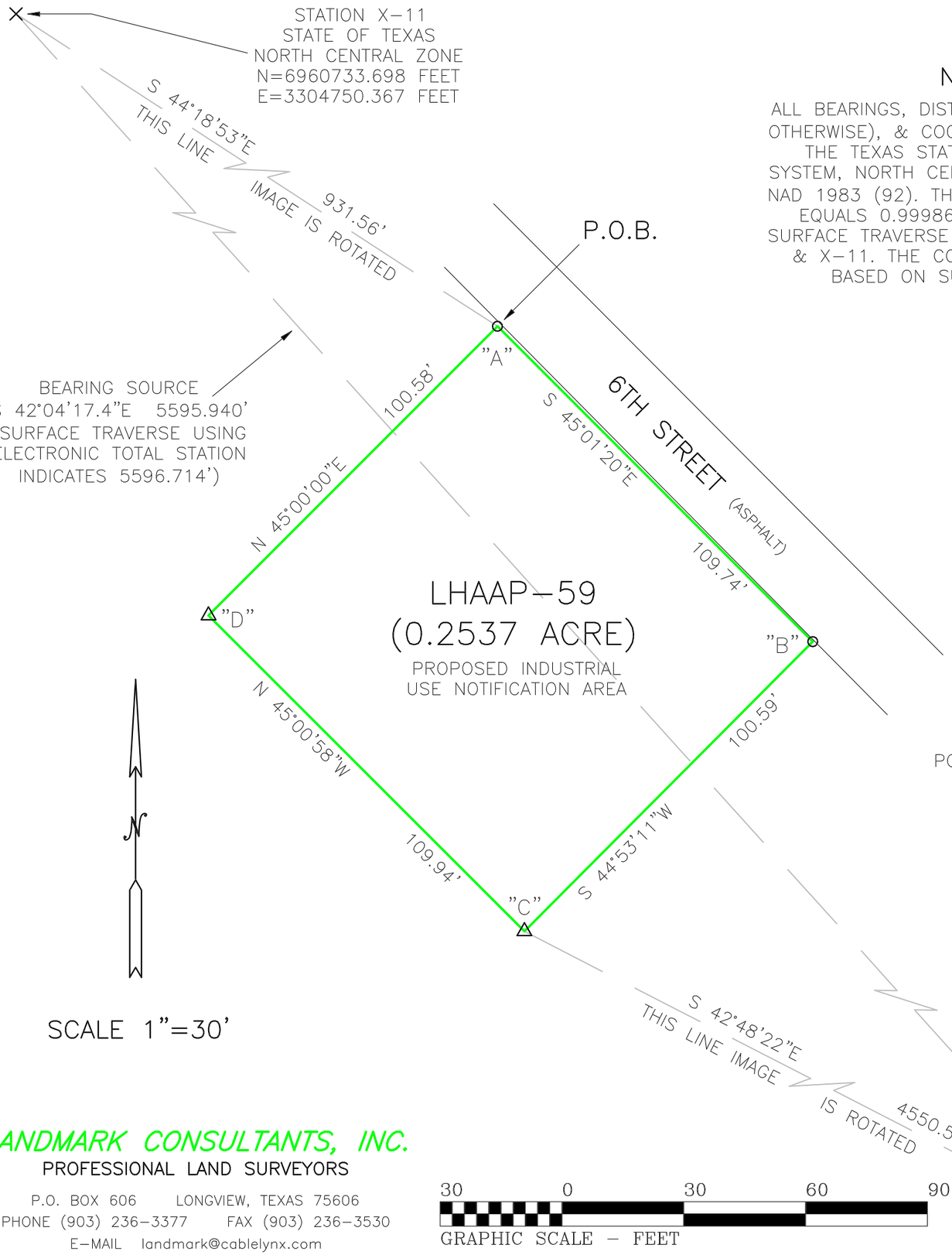
BEFORE ME, on this the 25 th day of Jan 2011, personally appeared Rose M. Zeiler, of United States Army, United States Department of Defense, known to me to be the person and agent of said agency whose name is subscribed to the foregoing instrument, and she acknowledged to me that she executed the same for the purposes and in the capacity therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the 25 day of January, 2011.

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

ANGELA I UMPHRES
Notary Public State of Texas
COMM EXP. 3-17-2011

00943369



NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999861727 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS C–21 & X–11. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in July 2008.

Witness my hand and seal this the 29th day of July, 2008

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

COORDINATE TABLE

POINT	NORTH	EAST
A	6960067.154	3305401.154
B	6959989.588	3305478.780
C	6959918.320	3305407.794
D	6959996.035	3305330.035

NOTES:

- X INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- O INDICATES CONCRETE NAIL IN BOTTLE CAP (SET IN ASPHALT)
- △ INDICATES 1/2" IRON REBAR WITH ORANGE PLASTIC CAP ENGRAVED "FIDLER" & "RPLS 3940" (SET)
- ——— INDICATES BOUNDARY OF PROPOSED INDUSTRIAL USE NOTIFICATION AREA

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEET

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236–3377 FAX (903) 236–3530
E–MAIL landmark@cablelynx.com

LHAAP–59
(0.2537 ACRE)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	0605063D.DWG
07/29/2008	0605063.CRD	DRAWN BY JTJ

FIELD NOTES DESCRIPTION OF
"LHAAP–59" TRACT
(PROPOSED INDUSTRIAL USE NOTIFICATION AREA)
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP–59" being 0.2537 acre of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract "LHAAP–59" being more particularly described as follows :

Surveyor's Note: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999861727, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "X–11" (N=6960733.698 feet E=3304750.367 feet) and "C–21" (N=6956579.781 feet E=3308499.969 feet). Said traverse indicates a surface distance of 5596.714 feet between said monuments. The computed land area is based on surface distances. As used herein, the abbreviation I.R.O.P.C. indicates 1/2" iron rebar with orange plastic cap engraved "Fidler" & "RPLS 3940", and the abbreviation C.N.I.B.C. indicates concrete nail in bottle cap.

Commencing at monument "X–11" referenced above,

THENCE S 44deg18'53"E 931.56' to a C.N.I.B.C. set (in the asphalt pavement of the road known as 6th Street) for the North corner of this tract and this POINT OF BEGINNING,

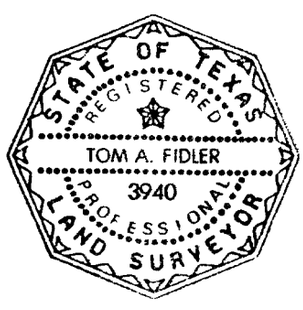
THENCE S 45deg01'20"E 109.74' along the N.E. B.L. of this tract to a C.N.I.B.C. set (in the asphalt pavement of the road known as 6th Street) for this tract's East corner,

THENCE S 44deg53'11"W 100.59' along the S.E. B.L. of this tract to an I.R.O.P.C. set for this tract's South corner, from which the monument "C–21" referenced above bears S 42deg48'22"E 4550.54',

THENCE N 45deg00'58"W 109.94' along the S.W. B.L. of this tract to an I.R.O.P.C. set for this tract's West corner,

THENCE N 45deg00'00"E 100.58' along the N.W. B.L. of this tract to this POINT OF BEGINNING, containing 0.2537 acre, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler

Tom A. Fidler, R.P.L.S. Number 3940

LHAAP-60

NOTICE OF NONRESIDENTIAL LAND USE AT LHAAP-60 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2010-000005561

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

16 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 04/27/2010 04:08 PM **Document Number:** 2010-000005561 **Receipt No:** 1006195 **Amount:** $ 72.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT COUNTY OF HARRISON, 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.

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW E & I
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. The site, LHAAP-60, consisted of four pesticide storage buildings located in the steam plant and shops area of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-60 is not itself considered an NPL site. Environmental activities at LHAAP-60 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ as the lead regulatory agency that no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-60 consisted of buildings 411, 411-A, 714, and shed TS-80, which were located in the northwestern portion of LHAAP near the steam plant and shops area in the general vicinity of sites LHAAP-02, LHAAP-04, LHAAP-35A(58), and LHAAP-66. Pesticides and herbicides were stored in the now demolished buildings. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at

the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-60 parcels include: Building 411 with 4,242 square feet, more or less, or 0.09738 acre tract; Building TS-80 with 186 square feet, more or less, or 0.00426 acre tract; Building 411-A with 484 square feet, more or less, or 0.01111 acre tract; and Building 714 with 4,468 square feet, more or less, or 0.10463 acre tract 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 United States Department of the Army has undertaken careful environmental study of the LHAAP-60 site and USEPA and TCEQ concluded that no further investigation or action is required for LHAAP-60. Contaminants in soil samples from LHAAP-60 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of LHAAP-60 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of LHAAP-60 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951
or
Assistant Chief of Staff for Installation Management
ATTN: DAIM-BDO (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 10 th day of March 2010.

BEFORE ME, on this the 10 th day of March, personally appeared Rose M. Zeiler, of 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 10 day of March, 2010.

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

ANGELA HUMPHRIES
Notary Public State of Texas
COMM. EXP. 3-17-2011

FIELD NOTES DESCRIPTION OF
"LHAAP-60A" TRACT
(FOUNDATION SLAB OF DEMOLISHED BUILDING 411)
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP-60A" being the concrete foundation slab of demolished Building 411, "LHAAP-60A" being located within the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract "LHAAP-60A" being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999861727, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "X-11" (N=6960733.698 feet E=3304750.367 feet) and "C-21" (N=6956579.781 feet E=3308499.969 feet). Said traverse indicates a surface distance of 5596.714 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "X-11" referenced above,

THENCE S 42deg04'17.4"E 1875.89' to a point, from which point monument "C-21" referenced above bears S 42deg04'17.4"E 3720.05',

(as used below, the abbreviation C.C.F.S. indicates corner of concrete foundation slab)

THENCE S 47deg55'43"W 188.47' to a C.C.F.S. found for the Northmost corner of this tract and this description's POINT OF BEGINNING,

THENCE S 45deg09'46"E 41.80' along the Northeast B.L. of this tract to a C.C.F.S. found for this tract's Eastmost corner,

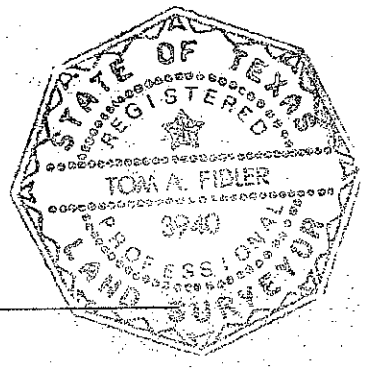
THENCE S 44deg51'53"W 101.29' along the Southeast B.L. of this

tract to a C.C.F.S. found for this tract's Southmost corner,

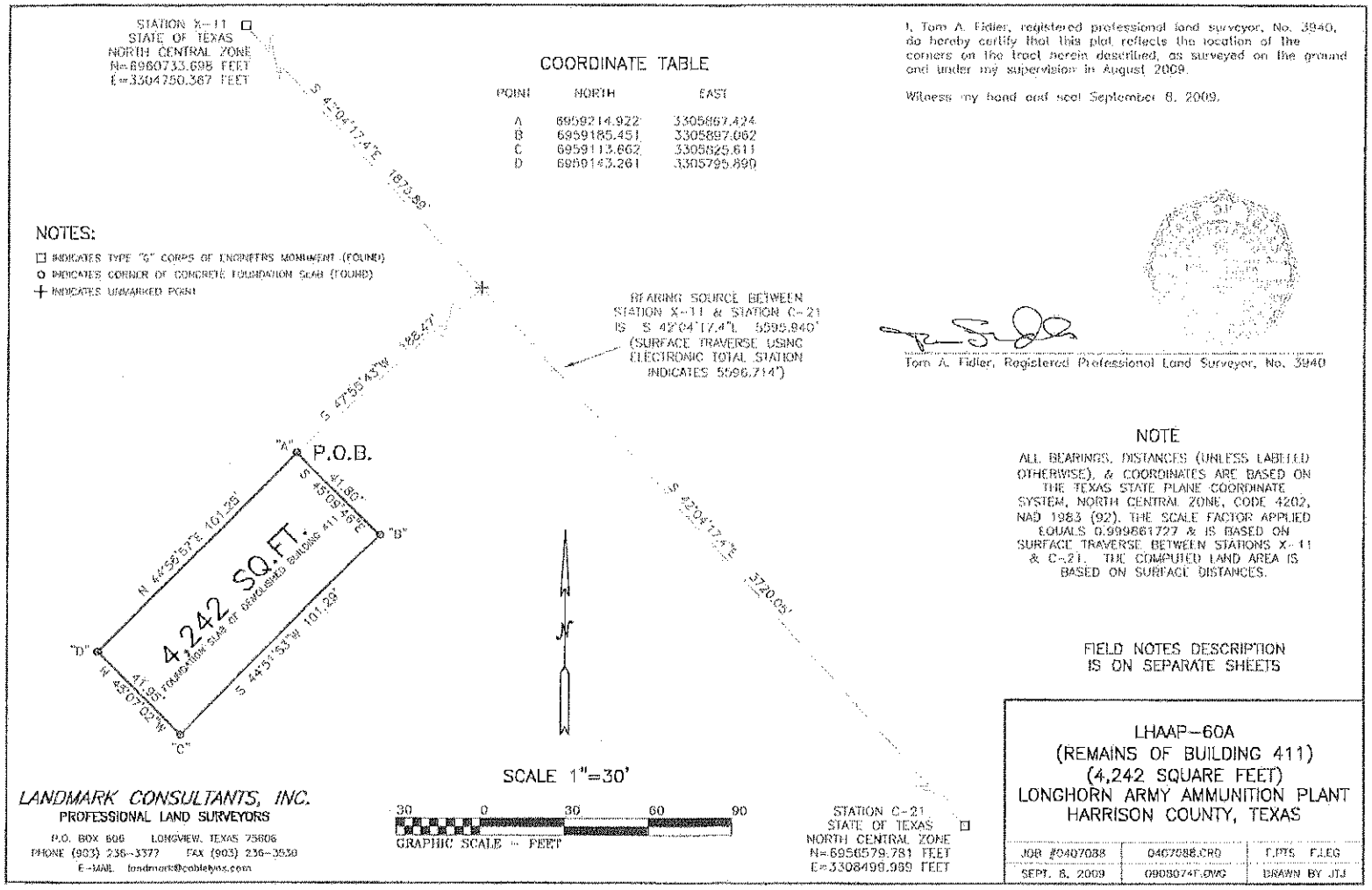
THENCE N 45deg07'02"W 41.95' along the Southwest B.L. of this tract to a C.C.F.S. found for this tract's Westmost corner,

THENCE N 44deg56'57"E 101.25' along the Northwest B.L. of this tract to this POINT OF BEGINNING. This tract contains 4,242 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940



COORDINATE TABLE

POINT	NORTH	EAST
A	6959214.922	3305867.424
B	6959185.451	3305897.062
C	6959113.662	3305825.611
D	6959143.261	3305795.890

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August 2009.

Witness my hand and seal September 8, 2009.

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

NOTES:

- ☐ INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- O INDICATES CORNER OF CONCRETE FOUNDATION SLAB (FOUND)
- + INDICATES UNMARKED POINT

BEARING SOURCE BETWEEN STATION X-11 & STATION C-21 IS S 42°04'17.4"E 5595.840' (SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 5596.714')

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.99986727 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS X-11 & C-21. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

SCALE 1"=30'

30 0 30 60 90
GRAPHIC SCALE = FEET

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 806 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cableone.com

LHAAP-60A
(REMAINS OF BUILDING 411)
(4,242 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	F.PTS F.LEG
SEPT. 8, 2009	0908074F.DWG	DRAWN BY JTJ

"LHAAP-60B" TRACT
(BUILDING TS-80)
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, the perimeter of tract "LHAAP-60B" being defined by the four corners of the external face of the exterior walls of Building TS-80 (said Building is constructed of galvanized corrugated sheet metal), tract "LHAAP-60B" being located within the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract "LHAAP-60B" being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999861727, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "X-11" (N=6960733.698 feet E=3304750.367 feet) and "C-21" (N=6956579.781 feet E=3308499.969 feet). Said traverse indicates a surface distance of 5596.714 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "X-11" referenced above,

THENCE S 42deg04'17.4"E 1919.72' to a point, from which point monument "C-21" referenced above bears S 42deg04'17.4"E 3676.22',

(as used below, the abbreviation C.E.F.E.W. indicates Corner of the External Face of the Exterior Walls of Building TS-80)

THENCE S 47deg55'43"W 378.14' to a C.E.F.E.W. found for the Northmost corner of this tract and this description's POINT OF BEGINNING,

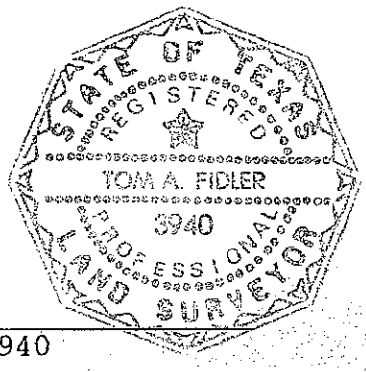
THENCE S 41deg54'33"E 8.55' along the Northeast B.L. of this tract to a C.E.F.E.W. found for this tract's Eastmost corner,

THENCE S 48deg12'22"W 22.54' along the Southeast B.L. of this tract to a C.E.F.E.W. found for this tract's Southmost corner,

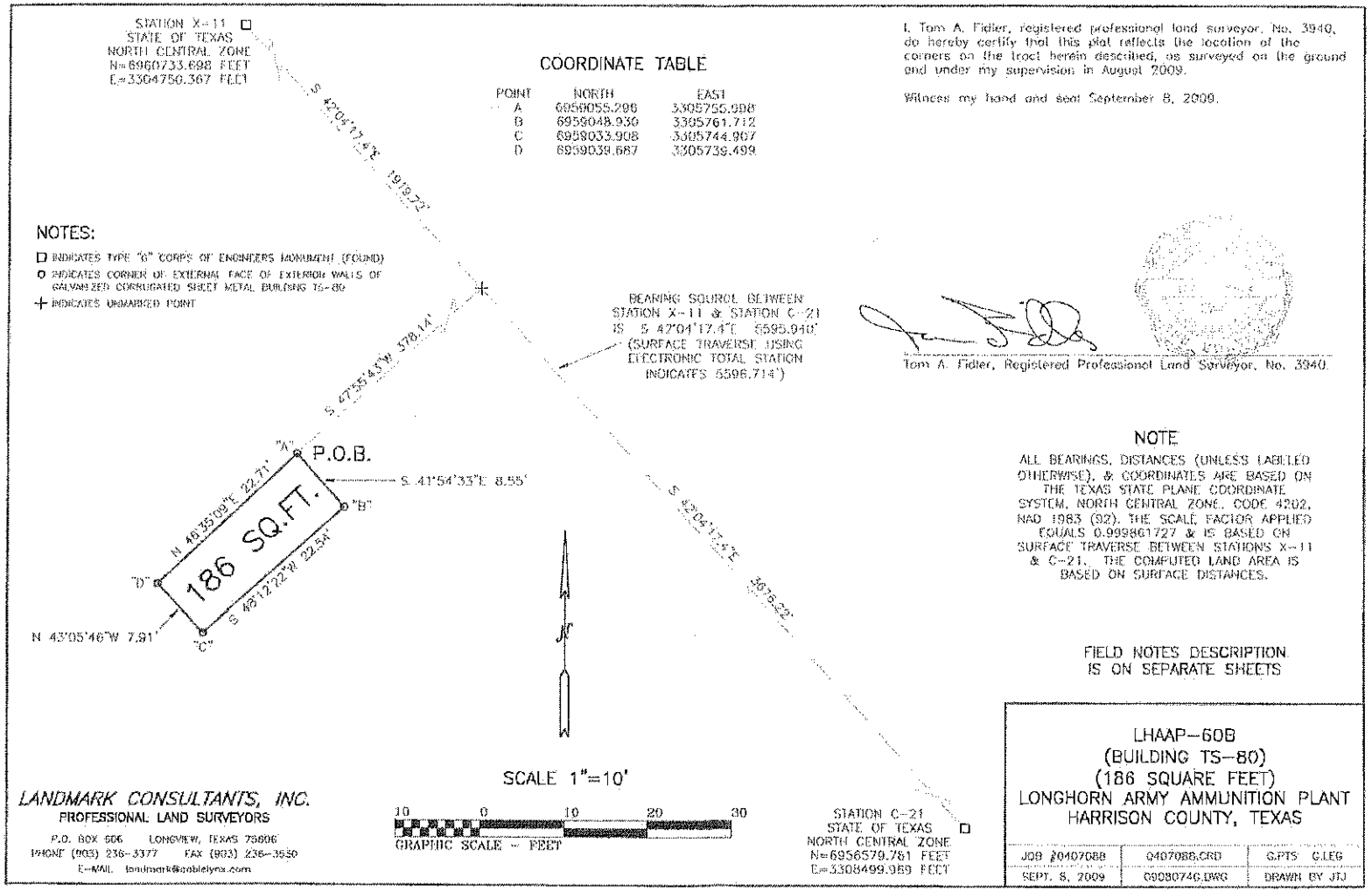
THENCE N 43deg05'46"W 7.91' along the Southwest B.L. of this tract to a C.E.F.E.W. found for this tract's Westmost corner,

THENCE N 46deg35'09"E 22.71' along the Northwest B.L. of this tract to this POINT OF BEGINNING. This tract contains 186 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940



COORDINATE TABLE

POINT	NORTH	EAST
A	6959055.296	3305755.988
B	6959048.930	3305761.712
C	6959033.908	3305744.907
D	6959039.687	3305739.499

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August 2009.

Witness my hand and seal September 8, 2009.

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940.

NOTES:

- ☐ INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- O INDICATES CORNER OF EXTERNAL FACE OF EXTERIOR WALLS OF GALVANIZED CORRUGATED SHEET METAL BUILDING TS-80
- + INDICATES UNMARKED POINT

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999861727 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS X-11 & C-21. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 506 LONGVIEW, TEXAS 75606
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E-MAIL landmark@cablelynx.com

LHAAP-60B
(BUILDING TS-80)
(186 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	G.PTS C.LEG
SEPT. 8, 2009	0908074C.DWG	DRAWN BY JTJ

FIELD NOTES DESCRIPTION OF
"LHAAP-60C" TRACT
(FOUNDATION SLAB OF DEMOLISHED BUILDING 411-A)
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP-60C" being the concrete foundation slab of demolished Building 411-A, tract "LHAAP-60C" being located within the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract "LHAAP-60C" being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999861727, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "X-11" (N=6960733.698 feet E=3304750.367 feet) and "C-21" (N=6956579.781 feet E=3308499.969 feet). Said traverse indicates a surface distance of 5596.714 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "X-11" referenced above,

THENCE S 42deg04'17.4"E 1924.12' to a point, from which point monument "C-21" referenced above bears S 42deg04'17.4"E 3671.82',

(as used below, the abbreviation C.C.F.S. indicates corner of concrete foundation slab)

THENCE S 47deg55'43"W 418.77' to a C.C.F.S. found for the Northmost corner of this tract and this description's POINT OF BEGINNING,

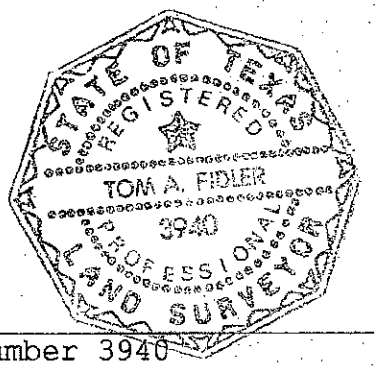
THENCE S 28deg26'16"E 24.08' along the Northeast B.L. of this tract to a C.C.F.S. found for this tract's Eastmost corner,

THENCE S 61deg38'48"W 20.15' along the Southeast B.L. of this tract to a C.C.F.S. found for this tract's Southmost corner,

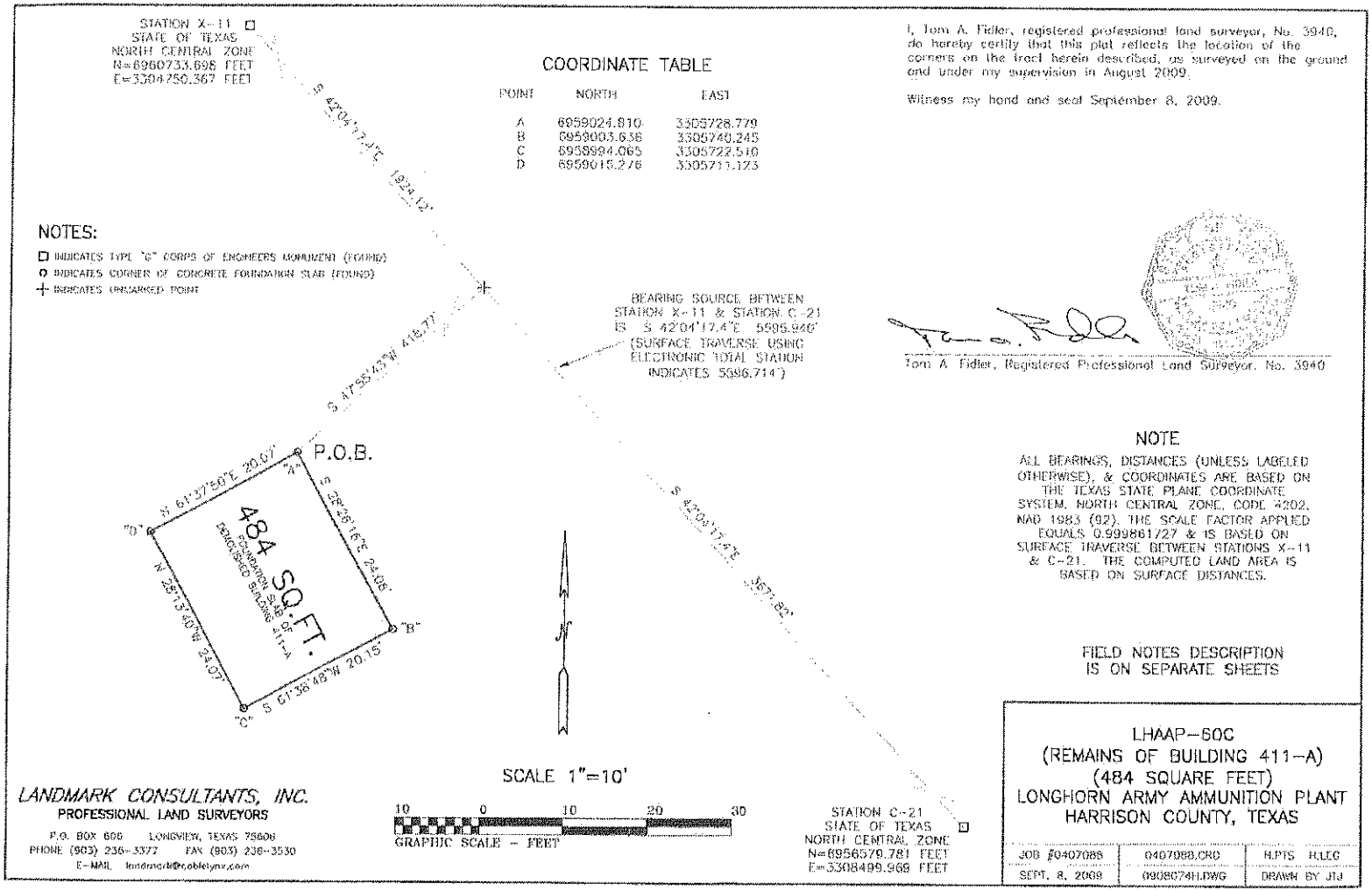
THENCE N 28deg13'40"W 24.07' along the Southwest B.L. of this tract to a C.C.F.S. found for this tract's Westmost corner,

THENCE N 61deg37'50"E 20.07' along the Northwest B.L. of this tract to this POINT OF BEGINNING. This tract contains 484 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940



COORDINATE TABLE

POINT	NORTH	EAST
A	6959024.810	3305728.779
B	6959003.636	3305740.245
C	6958994.065	3305722.510
D	6959015.276	3305711.173

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August 2009.

Witness my hand and seal September 8, 2009.

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

NOTES:

- ☐ INDICATES TYPE "C" CORPS OF ENGINEERS MONUMENT (FOUND)
- O INDICATES CORNER OF CONCRETE FOUNDATION SLAB (FOUND)
- ⊕ INDICATES UNMARKED POINT

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999861727 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS X-11 & C-21. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEETS

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PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cobblynx.com

LHAAP-60C
(REMAINS OF BUILDING 411-A)
(484 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	H.PTS H.LLG
SEPT. 8, 2009	0908074HLDWG	DRAWN BY JTJ

FIELD NOTES DESCRIPTION OF
"LHAAP-60D" TRACT
(INCLUDES FOUNDATION SLAB OF DEMOLISHED BUILDING #714)
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP-60D" including the concrete foundation slab of demolished Building #714 plus an area adjacent to the Southwest edge of said slab, "LHAAP-60D" being located within the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract "LHAAP-60D" being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999861727, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "X-11" (N=6960733.698 feet E=3304750.367 feet) and "C-21" (N=6956579.781 feet E=3308499.969 feet). Said traverse indicates a surface distance of 5596.714 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "X-11" referenced above,

THENCE S 42deg04'17.4"E 395.512' to a point, from which point monument "C-21" referenced above bears S 42deg04'17.4"E 5200.428'

(as used below, the abbreviation C.C.F.S. indicates corner of concrete foundation slab)

THENCE S 47deg55'43"W 442.92' to a C.C.F.S. found for the Northmost corner of this tract and this description's POINT OF BEGINNING,

THENCE S 44deg51'26"E 91.43' along the Northeast B.L. of this tract, and generally along the Northeast edge of said concrete slab, to a C.C.F.S. found for this tract's Eastmost corner,

THENCE S 44deg50'54"W 44.35' along a Southeast B.L. of this tract, and generally along the Southeast edge of said concrete slab, to a C.C.F.S. found for this tract's Southmost corner,

THENCE N 44deg59'57"W 29.43' along a Southwest B.L. of this tract, and generally along the Southwest edge of said concrete slab, to a point for this tract's Southmost reentrant corner,

THENCE S 45deg00'03"W 14.90' along a Southeast B.L. of this tract to a 60d nail set for this tract's Westmost South corner,

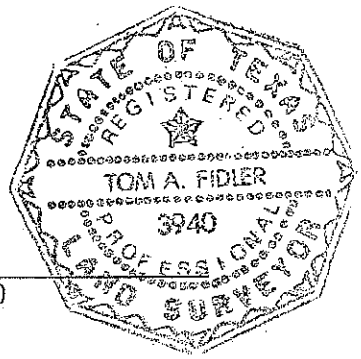
THENCE N 44deg59'57"W 32.36' along a Southwest B.L. of this tract to a 60d nail set for this tract's Southmost West corner,

THENCE N 45deg00'03"E 14.90' along a Northwest B.L. of this tract to a point for this tract's Northmost reentrant corner,

THENCE N 44deg59'57"W 30.02' along a Southwest B.L. of this tract, and generally along the Southwest edge of said concrete slab, to a C.C.F.S. found for this tract's Northmost West corner,

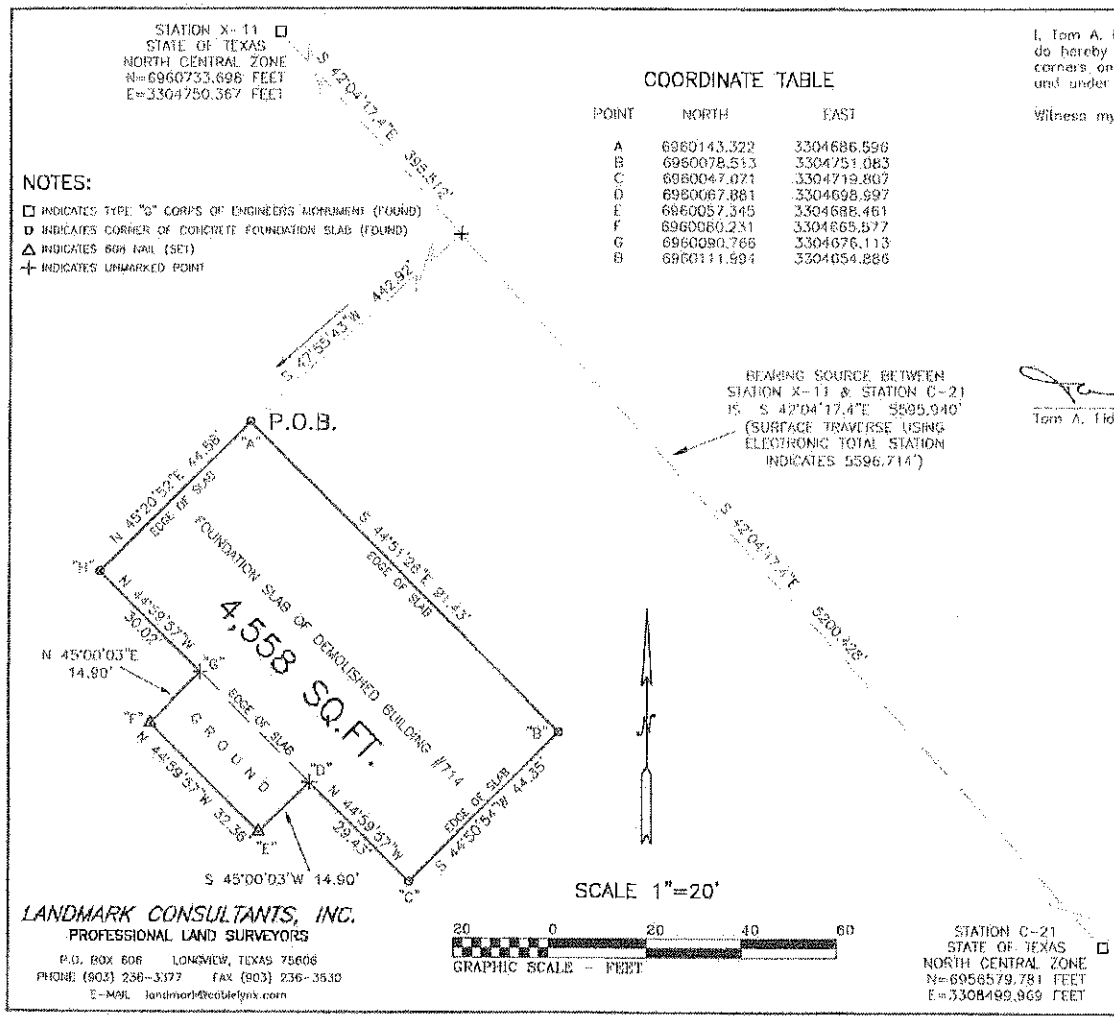
THENCE N 45deg20'52"E 44.58' along a Northwest B.L. of this tract, and generally along the Northwest edge of said concrete slab, to this POINT OF BEGINNING. This tract contains 4,558 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943387



COORDINATE TABLE

POINT	NORTH	EAST
A	6960143.322	3304686.596
B	6960078.513	3304751.083
C	6960047.071	3304719.807
D	6960067.881	3304698.997
E	6960057.345	3304688.461
F	6960080.231	3304665.577
G	6960090.766	3304676.113
B	6960111.994	3304054.886

NOTES:

- □ INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- D INDICATES CORNER OF CONCRETE FOUNDATION SLAB (FOUND)
- △ INDICATES 60# NAIL (SET)
- + INDICATES UNMARKED POINT

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August through October, 2009.

Witness my hand and seal October 26, 2009.

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.990861727 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS X-11 & C-21. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

SCALE 1"=20'

20 0 20 40 60

GRAPHIC SCALE - FEET

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
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LHAAP-60D
(4,558 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	T.PTS T.LEG
10/26/2009	09080741.DWG	DRAWN BY JTJ

LHAAP-64

NOTICE OF NONRESIDENTIAL LAND USE AT LHAAP-64 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2010-000005558

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

7 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 04/27/2010 04:08 PM **Document Number:** 2010-000005558 **Receipt No:** 1006195 **Amount:** $ 36.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT COUNTY OF HARRISON, 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.

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW E & I
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. The site, LHAAP-64, is the location of a former transformer storage area located in the western portion of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-64 is not itself considered an NPL site. Environmental activities at LHAAP-64 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ as the lead regulatory agency that no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-64 is located next to site LHAAP-29. Polychlorinated biphenyl (PCB)-containing transformers were stored on a pad on Zeugner Drive immediately southwest of Building 707-B. Approximately 20 out-of-service non-PCB transformers were stored on pallets with no curbs or other containment. The site was used for the storage of transformer oil. The contaminants of concern were petroleum and oil lubricants and PCBs. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas

75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-64 parcel is 847 square feet, more or less, or 0.01944 acre tract 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 United States Department of the Army has undertaken careful environmental study of the LHAAP-64 site and USEPA and TCEQ concluded that no further investigation or action is required for LHAAP-64. Contaminants in soil samples from LHAAP-64 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of LHAAP-64 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of LHAAP-64 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951
or
Assistant Chief of Staff for Installation Management
ATTN: DAIM-BDO (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 10th day of March, 2010.

BEFORE ME, on this the 10 th day of March, personally appeared Rose M. Zeiler, of 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 10 day of March, 2010.

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

ANGELA HUMPHRIES
Notary Public State of Texas
COMM. EXP. 3-17-2011

FIELD NOTES DESCRIPTION OF
"LHAAP-64" TRACT
(ADJACENT TO FOUNDATION SLAB OF DEMOLISHED BUILDING #707-B)
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP-64" being located within the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), tract "LHAAP-64" being adjacent to the Southwest edge of the concrete foundation slab of demolished Building #707-B, tract "LHAAP-64" being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998463585, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "C-1" (N=6955947.067 feet E=3305400.600 feet) and "C-22" (N=6955892.461 feet E=3307823.958 feet). Said traverse indicates a surface distance of 2424.346 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "C-1" referenced above,

THENCE S 32deg52'16"W 338.58' to the West corner of the concrete slab of demolished building 707-B, said slab corner marking the North corner of this tract and this POINT OF BEGINNING,

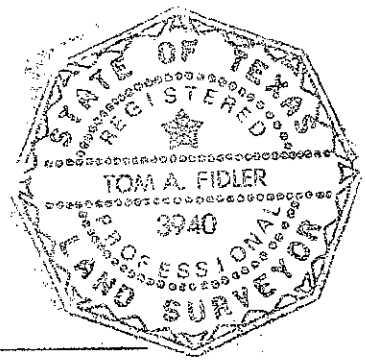
THENCE S 45deg00'47"E 29.76' along the N.E. B.L. of this tract, and generally along the Southwest edge of said concrete slab, to the South corner of said concrete slab, said slab corner marking the East corner of this tract,

THENCE S 44deg55'45"W 28.44' along the S.E. B.L. of this tract to a concrete nail with head dimple set (in asphalt) for the South corner of this tract,

THENCE N 45deg00'47"W 29.75' along the S.W. B.L. of this tract to a concrete nail with head dimple set (in asphalt) for the West corner of this tract,

THENCE N 44deg54'27"E 28.44' along the N.W. B.L. of this tract to this POINT OF BEGINNING. This tract contains 847 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

NOTES:

□ INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
O INDICATES CORNER OF CONCRETE FOUNDATION SLAB (FOUND)
△ INDICATES 60d NAIL (SET)
+ INDICATES CONCRETE NAIL WITH HEAD DIMPLE (SET)

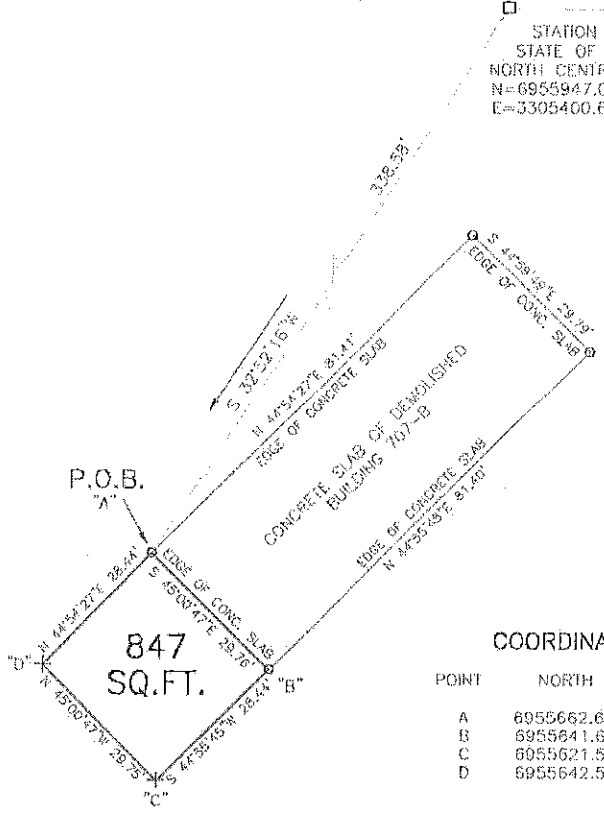
I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August through November, 2009.

Witness my hand and seal November 12, 2009.

STATION C-1
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6955947.067 FEET
E=3305400.600 FEET

BEARING SOURCE BETWEEN
STATION C-1 & STATION C-22
IS S 88°42'33.0"E 2423.973'
(SURFACE TRAVERSE USING
ELECTRONIC TOTAL STATION
INDICATES 2424.346')

STATION C-22
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6955892.461 FEET
E=3307823.958 FEET





Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

COORDINATE TABLE

POINT	NORTH	EAST
A	6955662.694	3305216.833
B	6955641.654	3305237.884
C	6955621.519	3305217.798
D	6955642.552	3305196.756

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999846358S & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS C-1 & C-22. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEETS

SCALE 1"=20'

20 0 20 40 60
GRAPHIC SCALE – FEET

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-5377 FAX (903) 236-5530
E-MAIL landmark@cableone.com

LHAAP-64
(847 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	0 PTS 0 LEG
NOV. 12, 2009	090807AU.DWG	DRAWN BY JDJ

LHAAP-66

NOTICE OF NONRESIDENTIAL LAND USE AT LHAAP-66 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2010-000005559

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

7 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 04/27/2010 04:08 PM **Document Number:** 2010-000005559 **Receipt No:** 1006195 **Amount:** $ 36.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW E & I
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. The site, LHAAP-66, is the location of a leaking transformer from the electric power substation and transformer area, near Building 401. Building 401 housed gas-fired boilers that generated steam for distribution throughout the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-66 is not itself considered an NPL site. Environmental activities at LHAAP-66 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ as the lead regulatory agency that no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-66 is located at the electric power substation and includes several transformers. One of these transformers was reported to be leaking, but subsequent environmental activities confirmed there was no release to the soil from polychlorinated biphenyls. The electric power substation still provides power to parts of LHAAP. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465,

Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-66 parcel is 8,616 square foot, more or less, or 0.19779 acre tract 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 United States Department of the Army has undertaken careful environmental study of the LHAAP-66 site and USEPA and TCEQ concluded that no further investigation or action is required for LHAAP-66. Contaminants in soil samples from LHAAP-66 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of LHAAP-66 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of LHAAP-66 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951
or
Assistant Chief of Staff for Installation Management
ATTN: DAIM-BDO (T. Lederle)
600 Army Pentagon
Washington D:C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 10th day of March, 2010.

BEFORE ME, on this the 10 th day of March, personally appeared Rose M. Zeiler, of 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 10 day of March, 2010.

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

ANGELA HUMPHRIES
Notary Public State of Texas
COMM. EXP. 3-17-2011

FIELD NOTES DESCRIPTION OF
"LHAAP-66" TRACT
(CONTAINS AN ELECTRIC POWER SUBSTATION)
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP-66" containing an electric power substation, including transformers, "LHAAP-66" being located within the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract "LHAAP-66" being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999861727, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "X-11" (N=6960733.698 feet E=3304750.367 feet) and "C-21" (N=6956579.781 feet E=3308499.969 feet). Said traverse indicates a surface distance of 5596.714 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "X-11" referenced above,

THENCE S 42deg04'17.4"E 1722.19' to a point, from which point monument "C-21" referenced above bears S 42deg04'17.4"E 3873.75',

(as used below, the abbreviation F.C.P. indicates 2-1/2" diameter chain link fence corner pipe)

THENCE S 47deg55'43"W 210.22' to an F.C.P. found (leaning approximately 15 degrees) for the Northmost corner of this tract and this description's POINT OF BEGINNING,

THENCE S 45deg10'23"E 130.14' along a chain link fence found for the Northeast B.L. of this tract to an F.C.P. found for this tract's Eastmost corner,

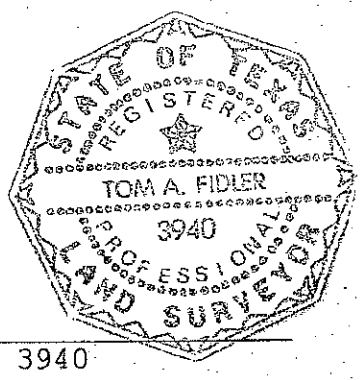
THENCE S 44deg46'19"W 65.93' along a chain link fence found for

the Southeast B.L. of this tract to an F.C.P. found for this tract's Southmost corner,

THENCE N 45deg18'44"W 130.52' along a chain link fence found for the Southwest B.L. of this tract to an F.C.P. found for this tract's Westmost corner,

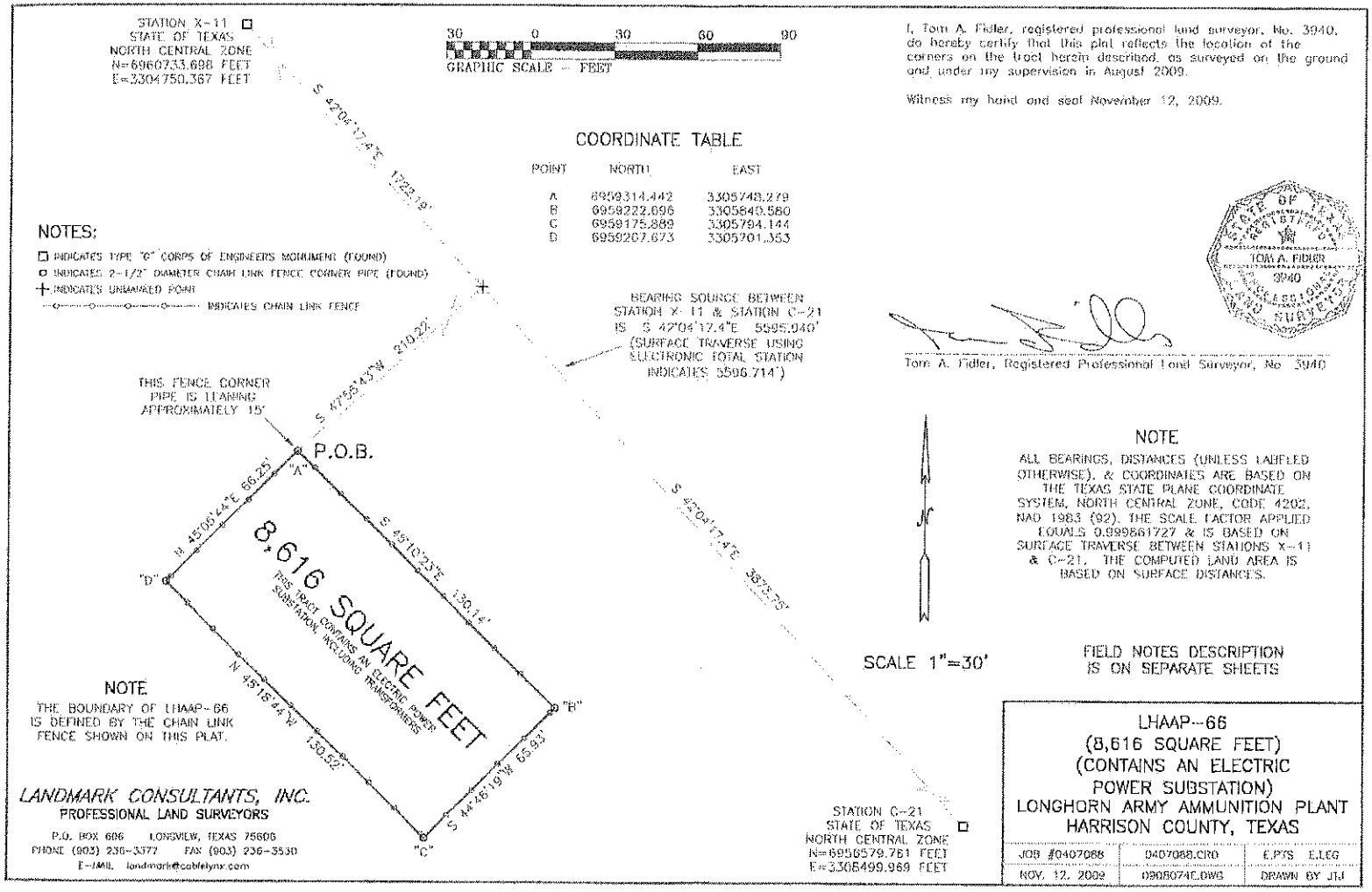
THENCE N 45deg05'44"E 66.25' along a chain link fence found for the Northwest B.L. of this tract to this POINT OF BEGINNING. This tract contains 8,616 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943403



I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August 2009.

Witness my hand and seal November 12, 2009.

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
LICENSED
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999861727 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS X-11 & C-21. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

SCALE 1"=30'

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

NOTE

THE BOUNDARY OF LHAAP-66 IS DEFINED BY THE CHAIN LINK FENCE SHOWN ON THIS PLAT.

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cableflynx.com

LHAAP-66
(8,616 SQUARE FEET)
(CONTAINS AN ELECTRIC POWER SUBSTATION)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	E.PTS E.LEG
NOV. 12, 2009	0908074C.DWG	DRAWN BY JTJ

LHAAP-67, 67-1

LUCs FROM FINAL REMEDIAL DESIGN

September 14, 2015

FINAL
REMEDIAL DESIGN
LHAAP-35B (37), CHEMICAL LABORATORY AND LHAAP-67, ABOVEGROUND STORAGE TANK FARM
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS



Prepared by

U.S. Army Corps of Engineers
Tulsa District
1645 South 101st East Avenue
Tulsa, Oklahoma

August 1, 2011

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4.0 Land Use Controls for the Site

The LUCs to be implemented by the Army or its representatives for LHAAP-35B(37) and LHAAP-67 to prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health include:

- Ensure no withdrawal or use of groundwater beneath the sites for anything other than environmental monitoring and testing until cleanup goals are met

Notification of the groundwater use restriction will accompany all transfer documents and will be recorded at the Harrison County Courthouse in accordance with Texas Administrative Code (TAC) Title 30, §335.566.The LUC addresses the areas of LHAAP-35B(37) and LHAAP-67 that include groundwater plumes at LHAAP-35B(37) and LHAAP-67 with levels of contamination that require implementation of a remedy (see **Section 2.0**). The U.S. Army is responsible for implementing, maintaining, monitoring, reporting on, and enforcing the LUC.

U.S. Army and regulators will consult to determine appropriate enforcement actions should there be a failure of an LUC objective at this site after it has transferred. U.S. Army shall obtain USEPA and TCEQ concurrence prior to termination or significant modification of the LUC, or implementation of a change in land use inconsistent with the LUC objectives and use assumptions of the remedy. Although not a remedy, the land use assumption for LHAAP-35B(37) and LHAAP-67 forms the basis for the remedy. The reasonably anticipated future use of the site as part of a national wildlife refuge is consistent with an industrial risk exposure scenario. Notification of the land use assumption of this site will be made in transfer documentation, will be recorded in the Harrison County Courthouse in accordance with TAC Title 30, §335.566 and compliance with the use assumption will be documented in the Five-Year Review reports.

6.2 Land Use Control Implementation Actions

The Army or its representatives will be responsible for LUC implementation and certification, reporting and enforcement. The Army shall address LUC problems within its control that are likely to impact remedy integrity and shall address problems as soon as practicable.

As a condition of property transfer, the Army may require the transferee to assume responsibility for various implementation actions, as indicated below. Although the Army may transfer responsibility for various implementation actions, the Army shall retain its responsibility for remedy integrity. This means that the Army is responsible for addressing substantive violations of performance objectives that would undermine the Army's CERCLA remedy. The Army also will be responsible for: 1) incorporating RD information and outlining the transferee's LUC obligations into property transfer documentation; 2) recording groundwater use restriction and survey plat at the Harrison County Courthouse; and 3) notifying Texas Department of Licensing and Regulation of the groundwater restriction which includes the prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval from the Army, the USEPA, and the TCEQ. The following LUC implementation actions shall be undertaken by the Army in order to ensure that the aforementioned LUC performance objectives for LHAAP-35B(37) and LHAAP-67 are met and maintained:

6.2.1 Comprehensive Land Use Control Management Plan

Within 30 days of receiving USEPA and TCEQ approval of this RD, the Army will incorporate this document into the Comprehensive LUC Management Plan. The Comprehensive LUC Management Plan consists of LHAAP RD documents and a survey plat showing the locations where LUCs being implemented at LHAAP are applied. The purpose of this Comprehensive LUC Management Plan is to ensure all site specific LUCs are compiled into one comprehensive location for both pre-transfer use by the installation and for post-transfer use by the transferee. This document is also accessible to regulators, the local government and the public. The Comprehensive LUC Management Plan is located in the Marshall Public Library to accompany LHAAP's Administrative Record. As LUC RD documents for additional environmental sites are approved by USEPA and TCEQ, the Army shall likewise add those documents and survey plats to the Comprehensive LUC Management Plan as well as update the previous copy of the plan placed in the Marshall Public Library.

6.2.2 Site Certifications and Reporting

Beginning with finalization of this RD, the Army will undertake annual certifications to confirm continued compliance with the LUC objectives. The Army will retain the annual LUC Compliance Certification documents in the project files for incorporation into the Five-Year Review Reports, and these documents will be made available to USEPA and TCEQ upon request. The certification form will be consistent with the form attached as **Appendix B**. In addition, should any violations be found during the annual certification, the Army will provide to USEPA and TCEQ along with the document, a separate written explanation indicating the specific violations found and what efforts or measures have or will be taken to correct those violations**.** Upon transfer, such responsibilities may shift to the transferee via

appropriate provisions placed in the Environmental Condition of Property (ECP) or other environmental transfer document. The need to continue annual certifications will be revisited at Five-Year Reviews.

6.2.3 Notice of Planned Property Conveyances

The Army shall provide notice to USEPA and TCEQ of plans to convey LHAAP-35B(37) and LHAAP-67 acreage. The notice shall describe the mechanism by which LUCs will continue to be implemented, maintained, inspected, reported, and enforced.

6.2.4 Opportunity to Review Text of Intended Land Use Controls

Army will provide a copy of the groundwater use restriction notification to TCEQ for review and approval prior to its recordation in Harrison County. In addition, the Army will produce an ECP or other environmental document for transfer of LHAAP-35B(37) and LHAAP-67, but before executing transfer, the Army will provide USEPA and TCEQ with a draft copy of the ECP or other environmental document for transfer so that they may have reasonable opportunity, before document execution, to review all LUC-related provisions.

6.2.5 Notification Should Action(s) Which Interfere with Land Use Control Effectiveness Be Discovered Subsequent to Conveyance

Should the Army discover after conveyance of the site any activity on the property inconsistent with the LUC performance objectives, the Army shall notify USEPA and TCEQ within 72 hours of such discovery. Consistent with **Section 6.2.6** below, the Army will then work with USEPA, TCEQ and the transferee to correct the problem(s) discovered. This reporting requirement does not preclude the Army from taking immediate action pursuant to its CERCLA authorities to prevent any perceived risk(s) to human health or the environment.

6.2.6 Land Use Control Enforcement

Should the LUC remedy reflected in this LUC RD fail, the Army will coordinate with USEPA and TCEQ to ensure that appropriate actions are taken to reestablish its protectiveness. These actions may range from informal resolutions with the owner or violator, to the institution of judicial action under the auspices of Texas property law or CERCLA. Alternatively, should the circumstances warrant such, the Army could choose to exercise its response authorities under CERCLA, and then seek cost recovery after the fact from the person(s) or entity(ies) who violated a given LUC. Should the Army become aware that any future owner or user of the property has violated any LUC requirement over which a local agency may have independent jurisdiction, the Army will notify these agencies of such violation(s) and work cooperatively with them to re-achieve owner/user compliance with the LUCs.

6.2.7 Modification or Termination of Land Use Controls

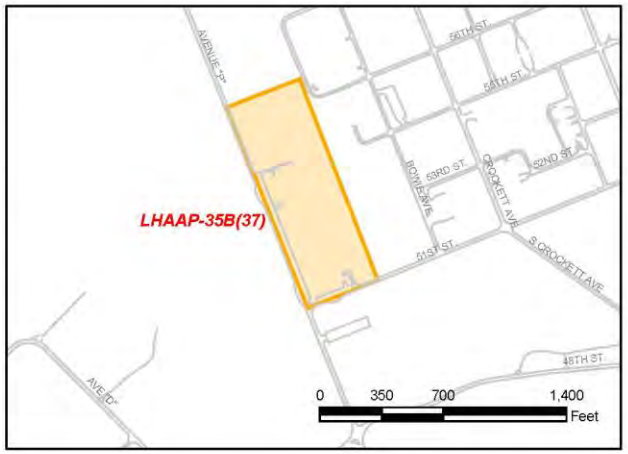
The Army shall not, without USEPA and TCEQ concurrence, make a significant modification to, or terminate a LUC, or make a land use change inconsistent with the LUC objectives and use assumptions of the selected remedy. Likewise, the Army shall seek prior USEPA and TCEQ concurrence before commencing actions that may impact remedy integrity. In the case of an emergency action, the Army shall obtain prior USEPA and TCEQ concurrence as appropriate to the exigencies of the situation.

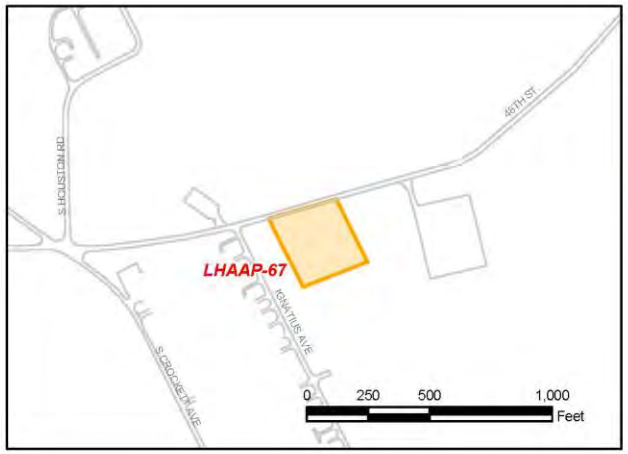
The LUCs shall remain in effect until such time as the Army, TCEQ and USEPA agree that the concentrations of COCs have met cleanup levels. When this occurs, the LUCs will be terminated as needed. The decision to terminate LUCs will be documented consistent with the NCP process for post-ROD changes, potentially including an explanation of significant differences or a remedial action completion report. If the property has been transferred and a determination by the Army, TCEQ and USEPA has been made to terminate one or more of the LUCs, the Army shall provide to the owner of the property an appropriate release for recordation pertaining to the site and will also timely advise other local stakeholders of the action.

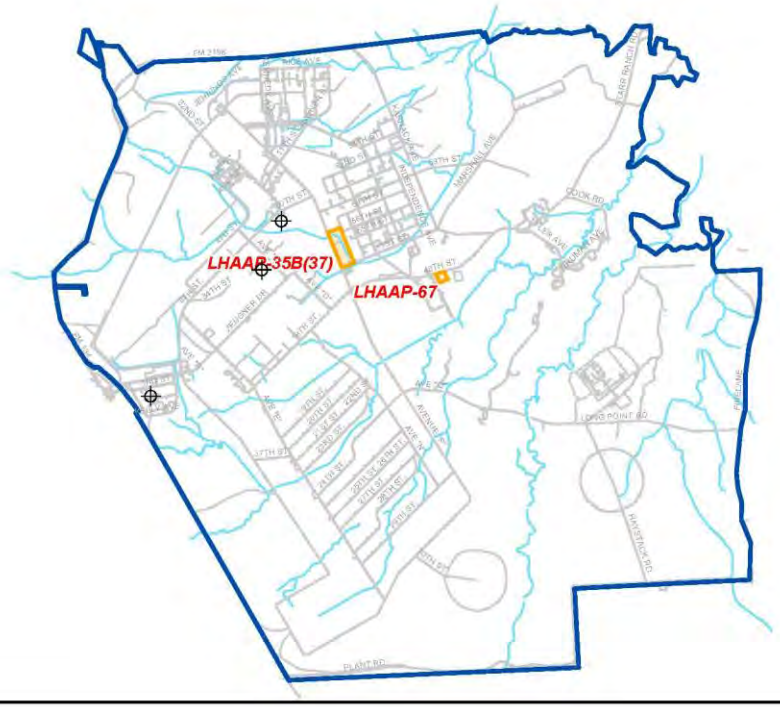
6.3 Monitored Natural Attenuation Implementation Actions

Implementation actions include installation of additional monitoring wells, plugging and abandonment of monitoring wells not designated for long-term monitoring, implementation of a groundwater monitoring plan, monitoring, and reporting. The project schedule and cost summary for implementation actions are provided in **Appendix H**. Groundwater monitoring will be conducted to monitor the effectiveness of MNA in reducing contaminant concentrations over time. Monitoring will also be conducted to evaluate plume migration and ensure that chlorinated solvents-contaminated groundwater does not impact nearby surface water at unacceptable levels. Surface water sampling will be conducted to confirm contaminated groundwater is not migrating to surface water. The Groundwater Monitoring Plan, attached as **Appendix A**, describes the wells, their locations, analytical parameters, the frequency of the monitoring, surface water sampling, and presents a list of the monitored constituents and their respective MCLs. Groundwater monitoring and surface water sampling conducted at LHAAP-35B(37) and LHAAP-67 will follow the Health and Safety Plan (**Appendix E**), the Contractor Quality Control Plan (**Appendix F**), the Chemical Data Acquisition Plan (**Appendix G**), Field Activities (**Appendix C**) and Field Procedures (**Appendix D**) as contained in the appendices of the Remedial Design LHAAP-35B(37) and LHAAP-67.

Annual reports will be prepared for any year in which sampling occurs to document the monitoring program. The first year's annual report will include a review of the first four quarters of data, which include natural attenuation parameters and provide an evaluation for the evidence of MNA as a remedial method and a review of the first year's surface water sample data. The TCEQ provides guidance for MNA as a remedial action in *Monitored Natural Attenuation Demonstrations* (Texas Natural Resource Conservation Commission [TNRCC], RG-366/TRRP-33, October 2001). Although LHAAP is being addressed under the Risk Reduction Standards rather than Texas Risk Reduction Program (TRRP), this guidance is comparable to USEPA guidance and may be used as a guideline for the evaluation of the groundwater data. TRRP guidance specifies recommended lines of evidence to document the occurrence of natural attenuation at a site. For the first annual report, primary and secondary lines of evidence will be evaluated to document that attenuation is occurring at LHAAP-35B(37) and LHAAP-67. The primary line







LEGEND

- Approximate LHAAP Boundary
- Road
- Stream
- Site
- LHAAP Water Supply Well

LEGEND

- Road
- Stream
- Site
- Approximate LHAAP Boundary
- LHAAP Water Supply Well

OFFICE	DRAWN BY	CHECKED BY	APPROVED BY	FILE PATH
Houston, TX	B. Lu 10/12/07	N. Olson 10/31/07	P. Srivastav 10/31/07	T:\GIS\Longhorn\MXD\ST35B67\ROD\SiteLocs.mxd

Shaw

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

FIGURE 2-2
SITE LOCATION MAP
REMEDIAL DESIGN
LHAAP-35B(37) AND LHAAP-67, GROUP 4
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

LHAAP-67, 67-2

NOTICE OF LAND USE CONTROLS AND NONRESIDENTIAL LAND USE AT LHAAP-67 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2014-000013308

*****DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT*****

NOTICE

8 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 12/09/2014 10:42 AM **Document Number:** 2014-000013308 **Receipt No:** 1415412 **Amount:** $ 50.00 **By:** Pam Rockwell, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

AECOM
ATTN: AMANDA LAGARDE (FEDEX ENV)
112 E PECAN ST., SUITE 400
SAN ANTONIO, TX 78205

STATE OF TEXAS HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF LAND USE CONTROL AT LHAAP-67

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 in a former industrial area, located on the Former Longhorn Army Ammunition Plant (LHAAP) and is designated as LHAAP-67 (Underground Storage Tank Farm Area). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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-67 were performed in accordance with the FFA requirements.

The LHAAP-67 site, when operational, consisted of seven aboveground storage tanks used for storage of No. 2 fuel oil, kerosene, and solvents. The tanks were surrounded by earthen dikes designed to contain potential spills. A Record of Decision (ROD) for LHAAP-67 was signed by the U.S. Army and USEPA with TCEQ concurrence in 2010 establishing the final remedy which consists of a land use control (LUC) in conjunction with monitored natural attenuation (MNA). The site was not remediated to levels suitable for unrestricted use. The LUC at LHAAP-67 is required to prevent human exposure to contaminated groundwater. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the Marshall Public

Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-67 parcel is a 4 acre tract, 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. Within the LHAAP-67 parcel is designated a LUC boundary which is a 6.088-acre tract, more or less, as described in Exhibit A. The LUC boundary is 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 purposes of this certification, residential use includes, but is not limited to, single family or multifamily residences; child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.The United States Department of the Army has undertaken careful environmental study of the LHAAP-67 site and concluded that the LUC set forth below is required to ensure protection of human health and the environment.

(1) Groundwater Restriction. The groundwater use restriction boundary consists of the 6.088-acre tract, more or less. Groundwater underlying this land is contaminated with trichloroethene (TCE), 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), 1,1,1-trichloroethane (1,1,1-TCA), and 1,1,2-trichloroethane (1,1,2-TCA), and other volatile organic compounds (VOCs) and shall not be accessed or used for any purpose without the prior written approval of the U.S. Army, the USEPA, and the TCEQ. A LUC restricting the use of groundwater has been established for the protection of human health. The U.S. Army will notify the Texas Department of Licensing and Regulation of the groundwater restriction which includes prohibition of water well installation for any purpose other than environmental monitoring and testing without prior approval by the U.S. Army, the USEPA, and the TCEQ. A restriction against the residential use of groundwater will remain in effect until the levels of the COCs in groundwater and soil allow unrestricted use and unlimited exposure (UUUE).

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 20 th day of November, 2014.

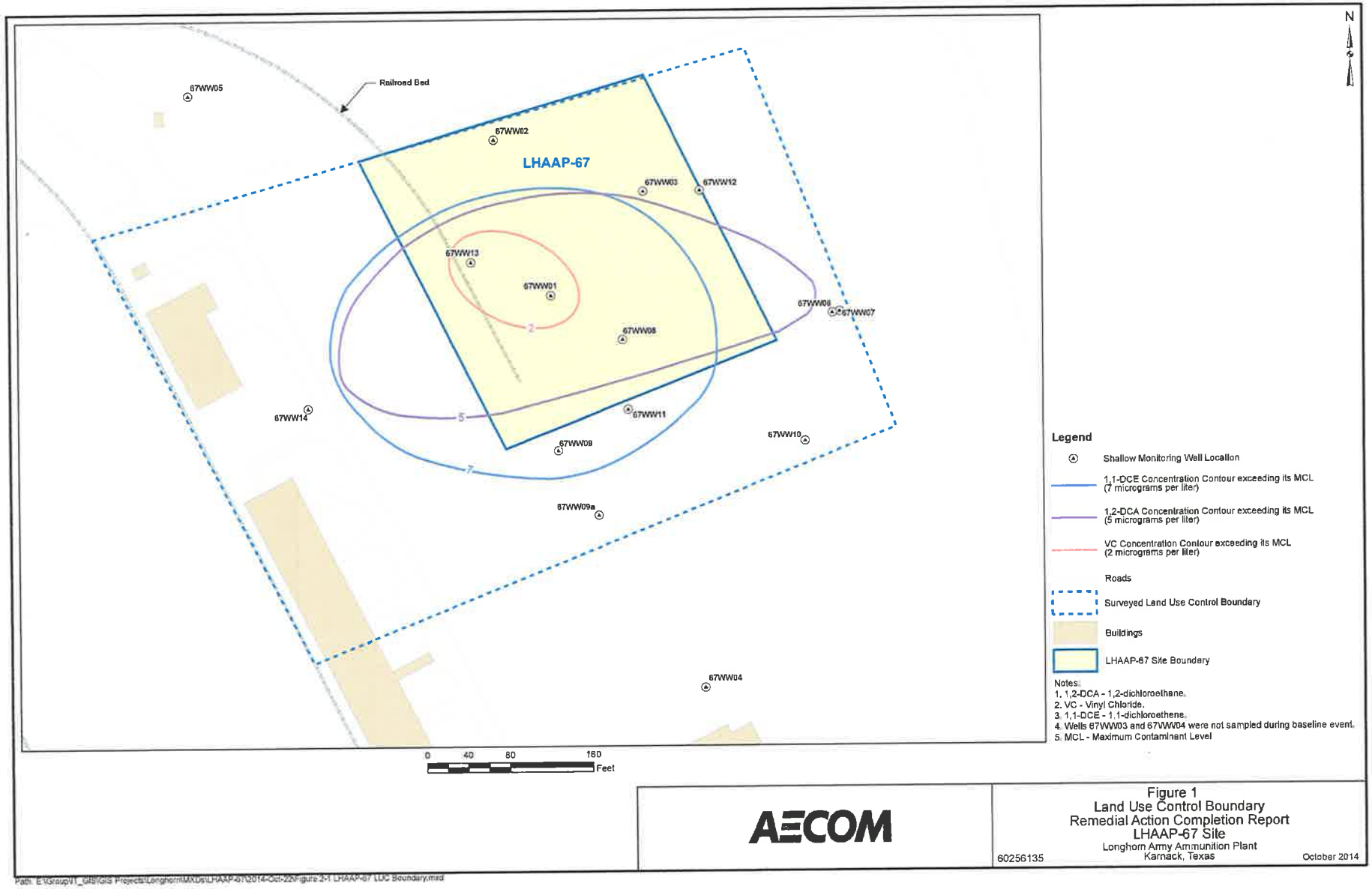
BEFORE ME, on this the 20 th day of November, personally appeared Rose M. Zeiler, of United States Army, United States Department of Defense, known to me to be the person and agent of said agency whose name is subscribed to the foregoing instrument, and she acknowledged to me that she executed the same for the purposes and in the capacity therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the 20 day of November, 2014.

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

ANGELA HUMPHRIES
Notary Public State of Texas
COMM. EXP. 03-17-2015

EXHIBIT A
SURVEY PLAT



AECOM

Figure 1
Land Use Control Boundary
Remedial Action Completion Report
LHAAP-67 Site
Longhorn Army Ammunition Plant
Karnack, Texas

60256135 October 2014

Path: E:\Group\1_GIS\GIS Projects\Longhorn\MXDs\LHAAP-67\2014-Oct-22\Figure 2-1 LHAAP-67 LUC Boundary.mxd

COUNTY CLERK'S MEMO
PORTIONS OF THIS
DOCUMENT NOT
REPRODUCIBLE
WHEN RECORDED

FIELD NOTES DESCRIPTION OF
"LHAAP-67" LAND USE CONTROL AREA
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, "LHAAP-67" Land Use Control Area being 6.088 acres of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), "LHAAP-67" Land Use Control Area being more particularly described as follows :

Surveyor's Note: All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9998636625, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "IGNATIUS-1" (N=6957090.304 feet E=3311081.788 feet) and "IGNATIUS-2" (N=6955582.752 feet E=3311851.704 feet). Said traverse indicates a surface distance of 1693.005 feet between said monuments. The computed land area is based on grid distances. As used herein, the abbreviation I.R.O.P.C. indicates 1/2" iron rebar with orange plastic cap engraved "Fidler" & "RPLS 3940" .

Commencing at monument "IGNATIUS-1" referenced above,

THENCE S 32deg49'15"W 145.39' to an I.R.O.P.C. set for the N.W.C. of this tract and this POINT OF BEGINNING,

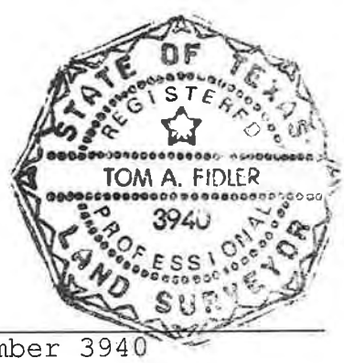
THENCE N 74deg08'33"E 654.97' along the N.B.L. of this tract to an I.R.O.P.C. set for this tract's N.E.C. ,

THENCE S 21deg34'17"E 390.25' along the E.B.L. of this tract to an I.R.O.P.C. set for this tract's S.E.C. ,

THENCE S 68deg21'49"W 605.17' along the S.B.L. of this tract to an I.R.O.P.C. set for this tract's S.W.C., from which monument "IGNATIUS-2" referenced above bears S 33deg05'59"E 1167.80' ,

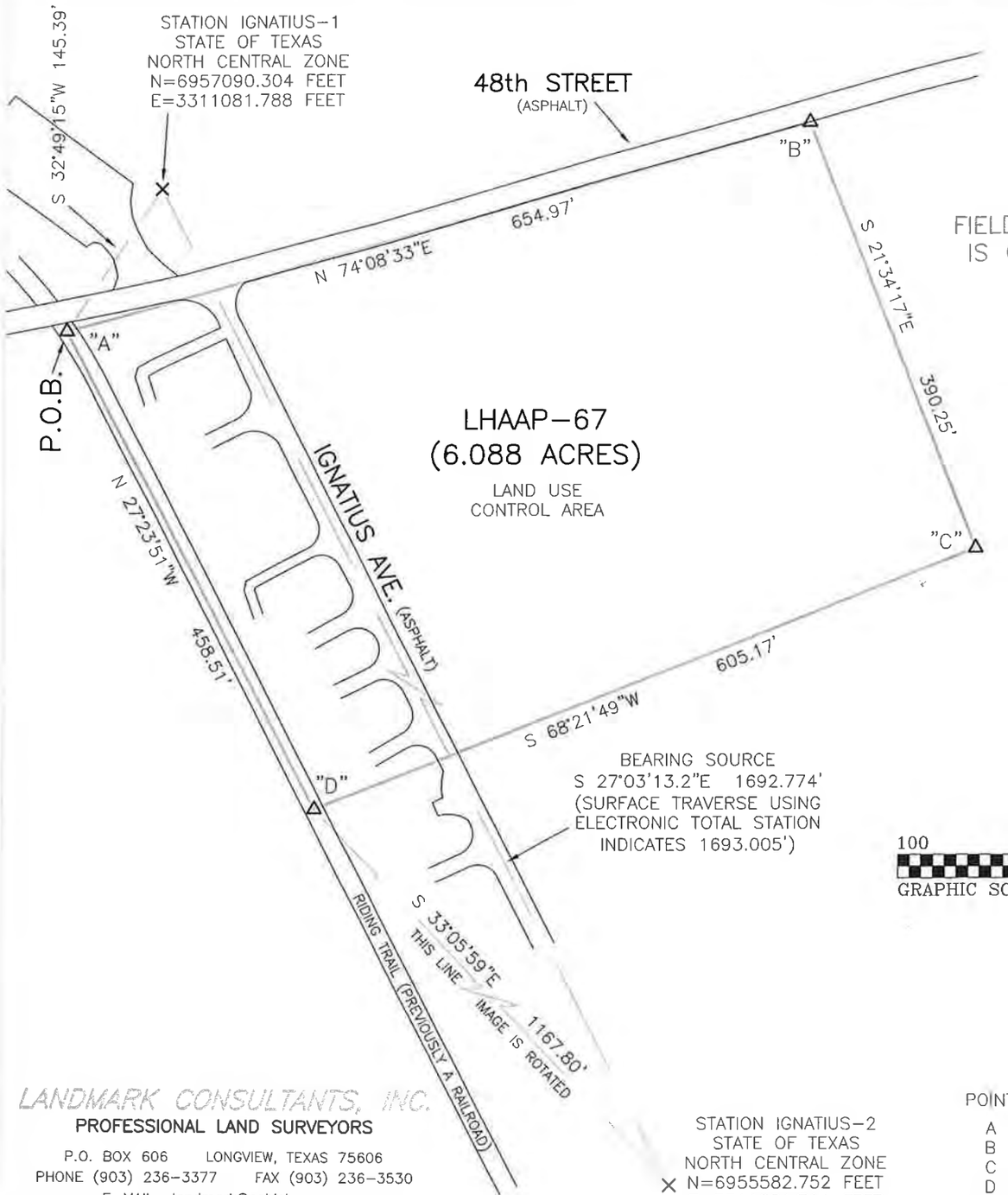
THENCE N 27deg23'51"W 458.51' along the W.B.L. of this tract to this POINT OF BEGINNING, containing 6.088 acres, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

00943420



I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in October, 2014.

Witness my hand and seal this the 16th day of October, 2014.

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEET

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998636625 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS IGNATIUS-1 & IGNATIUS-2. THE COMPUTED LAND AREA IS BASED ON GRID DISTANCES.

SCALE 1"=100'

100 0 100 200 300

GRAPHIC SCALE - FEET

LEGEND

- X TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- O CONCRETE NAIL IN BOTTLE CAP (SET IN ASPHALT)
- △ 1/2" IRON REBAR WITH ORANGE PLASTIC CAP ENGRAVED "FIDLER" & "RPLS 3940" (SET)
- BOUNDARY LINE OF LAND USE CONTROL AREA

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

STATION IGNATIUS-2
STATE OF TEXAS
NORTH CENTRAL ZONE
X N=6955582.752 FEET
E=3311851.704 FEET

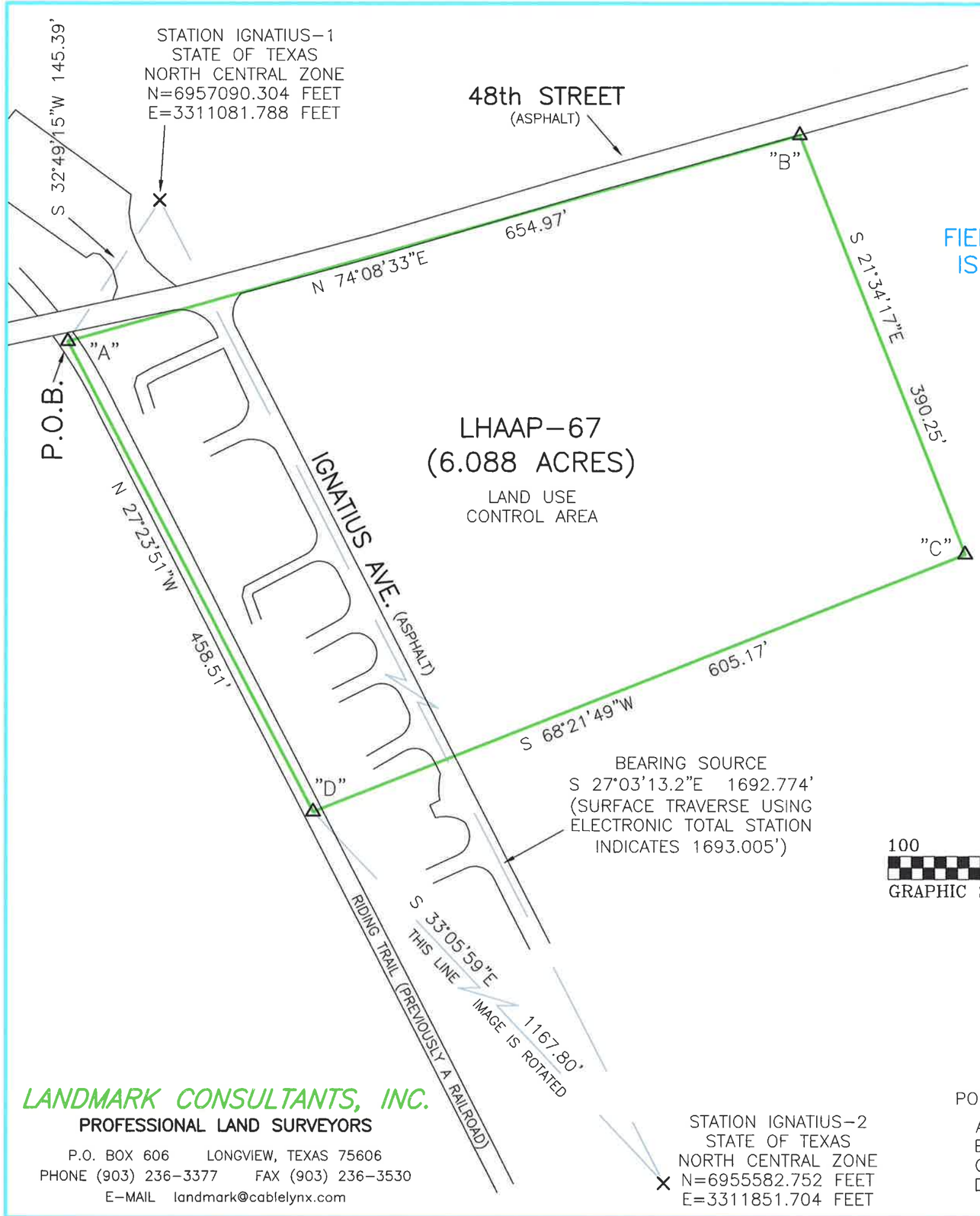
COORDINATE TABLE

POINT	NORTH	EAST
A	6956968.123	3311002.985
B	6957147.091	3311633.031
C	6956784.178	3311776.509
D	6956561.041	3311213.974

LHAAP-67 L.U.C.A.
(6.088 ACRES)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	H.PTS H.LEG
10/16/2014	0605063H.DWG	DRAWN BY JTJ

00943421



I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in October, 2014.

Witness my hand and seal this the 16th day of October, 2014.

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEET

STATE OF TEXAS
REGISTERED
TOM A. FIDLER
3940
PROFESSIONAL
LAND SURVEYOR

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

SCALE 1"=100'

100 0 100 200 300
GRAPHIC SCALE - FEET

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.9998636625 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS IGNATIUS-1 & IGNATIUS-2. THE COMPUTED LAND AREA IS BASED ON GRID DISTANCES.

LEGEND

- X TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
- o CONCRETE NAIL IN BOTTLE CAP (SET IN ASPHALT)
- △ 1/2" IRON REBAR WITH ORANGE PLASTIC CAP ENGRAVED "FIDLER" & "RPLS 3940" (SET)
- BOUNDARY LINE OF LAND USE CONTROL AREA

COORDINATE TABLE

POINT	NORTH	EAST
A	6956968.123	3311002.985
B	6957147.091	3311633.031
C	6956784.178	3311776.509
D	6956561.041	3311213.974

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

LHAAP-67 L.U.C.A.
(6.088 ACRES)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	H.PTS H.LEG
10/16/2014	0605063H.DWG	DRAWN BY JTJ

LHAAP-67, 67-3

LAND USE CONTROL COMPLIANCE INSPECTION FORM

September 14, 2015

Sample Annual Land Use Control Compliance Certification Documentation

In accordance with the Remedial Design dated 8/1/11 for LHAAP-67, a certification of site was conducted by _____ [indicate transferee] on _____.

A summary of land use control mechanisms is as follows:

- Groundwater restriction - A restriction against use of groundwater will remain in effect until the levels of the COCs in groundwater and soil allow unrestricted use and unlimited exposure (UUUE). [Indicate whether groundwater restrictions are still required at LHAAP-67]

A summary of compliance with land use and restriction covenants is as follows:

- No use of groundwater, installation of new groundwater wells, or tampering with existing wells at LHAAP-67.

I, the undersigned, do document that the certification was performed as indicated above, and that the above information is true and correct to the best of my knowledge, information, and belief.

Date: _____

Name/Title: _____

Signature: _____

Annual compliance certification forms shall be completed no later than March 1 of each year for the previous calendar year.

LHAAP-68

NOTICE OF NONRESIDENTIAL LAND USE AT LHAAP-68 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2010-000005560

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

7 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 04/27/2010 04:08 PM **Document Number:** 2010-000005560 **Receipt No:** 1006195 **Amount:** $ 36.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT
COUNTY OF HARRISON, 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.

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW E & I
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. The site, LHAAP-68, is located near the service station in the maintenance shops and power area of the former Longhorn Army Ammunition Plant (LHAAP). LHAAP-68 consisted of two mobile 600-gallon storage tanks on trucks that were parked on the asphalt surface at the service station of the maintenance complex. LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and 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. Although there are many sites at LHAAP that are specifically NPL listed, LHAAP-68 is not itself considered an NPL site. Environmental activities at LHAAP-68 progressed through the site investigation, at which point it was agreed by the Army and the TCEQ as the lead regulatory agency that no significant releases had occurred and the site could be closed under Texas Administrative Code (TAC) Risk Reduction Rule Standard 2.

LHAAP-68 is located at the maintenance complex next to the service station. Two mobile 600-gallon storage tanks on trucks were parked on the asphalt surface with no curb or other containment present. The mobile storage tanks contained No. 2 diesel and gasoline fuel. In 2006, six soil samples were collected, two from each of three borings that were installed at the site, and analyzed for semi volatile organic compounds, volatile organic compounds, and total petroleum hydrocarbons. 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, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday

through Friday 8:00 a.m. to 5:00 p.m. or the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The LHAAP-68 parcel is 426 square foot, more or less, or 0.00977 acre tract 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 United States Department of the Army has undertaken careful environmental study of the LHAAP-68 site and USEPA and TCEQ concluded that no further investigation or action is required for LHAAP-68. Contaminants in soil samples from LHAAP-68 meet non-residential soil criteria in accordance with 30TAC§335.560(b).

Limited monitoring of LHAAP-68 will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of LHAAP-68 is consistent with the non-residential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; and nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951
or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-BDO (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 10 th day of March, 2010.

BEFORE ME, on this the 10 th day of March, personally appeared Rose M. Zeiler, of 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 10 day of March, 2010.

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

ANGELA HUMPHRIES
Notary Public State of Texas
COMM. EXP. 3-17-2011

FIELD NOTES DESCRIPTION OF
"LHAAP-68" TRACT
CADDO LAKE NATIONAL WILDLIFE REFUGE
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, tract "LHAAP-68" being located within the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract "LHAAP-68" being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.999861727, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "X-11" (N=6960733.698 feet E=3304750.367 feet) and "C-21" (N=6956579.781 feet E=3308499.969 feet). Said traverse indicates a surface distance of 5596.714 feet between said monuments. The computed land area is based on surface distances.

Commencing at monument "X-11" referenced above,

THENCE S 42deg04'17.4"E 428.46' to a point, from which point monument "C-21" referenced above bears S 42deg04'17.4"E 5167.48',

THENCE S 47deg55'43"W 686.07' to a concrete nail (with head dimple) set in asphalt for the Northmost corner of this tract and this description's POINT OF BEGINNING,

THENCE S 44deg35'24"E 41.58' along the Northeast B.L. of this tract to an "X" set (chisled in concrete) for this tract's Eastmost corner,

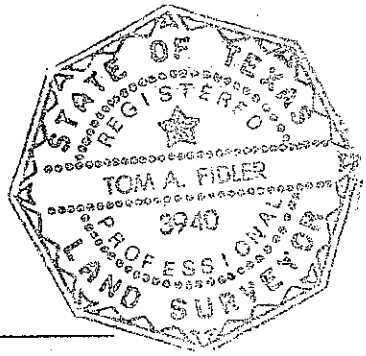
THENCE S 41deg38'18"W 9.34' along the Southeast B.L. of this tract to an "X" set (chisled in concrete) for this tract's Southmost corner,

THENCE N 46deg59'28"W 41.90' along the Southwest B.L. of this tract to a concrete nail (with head dimple) set in asphalt for this tract's Westmost corner,

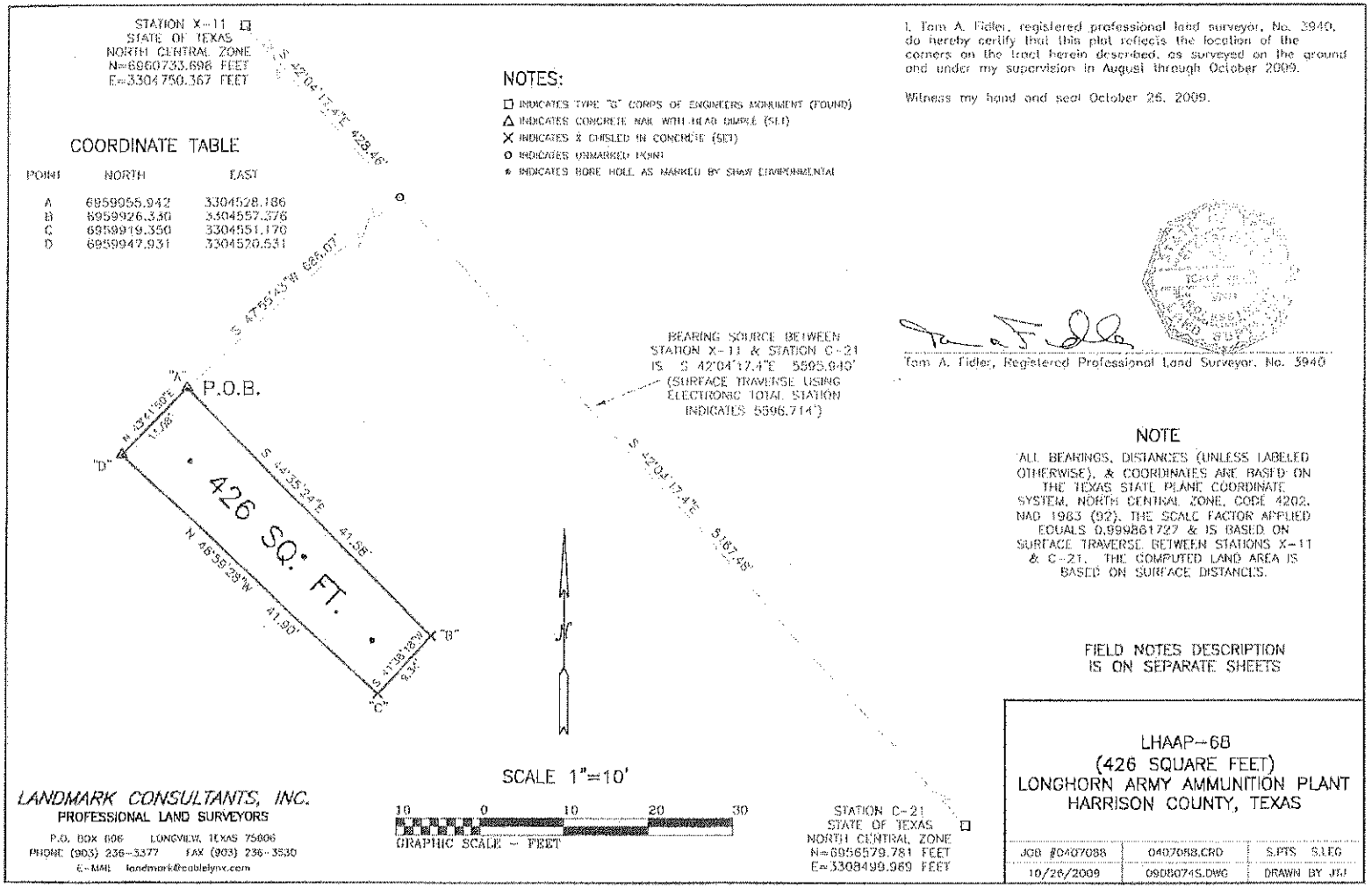
THENCE N 43deg41'50"E 11.08' along the Northwest B.L. of this

tract to this POINT OF BEGINNING. This tract contains 426 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940



COORDINATE TABLE

POINT	NORTH	EAST
A	6959955.942	3304528.186
B	6959926.330	3304557.376
C	6959919.350	3304551.170
D	6959947.931	3304520.531

NOTES:

- □ INDICATES TYPE "B" CORPS OF ENGINEERS MONUMENT (FOUND)
- △ INDICATES CONCRETE NAIL WITH LEAD DIMPLE (SET)
- X INDICATES X CHISLED IN CONCRETE (SET)
- O INDICATES UNMARKED POINT
- * INDICATES BORE HOLE AS MARKED BY SHAW ENVIRONMENTAL

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in August through October 2009.

Witness my hand and seal October 26, 2009.

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999861727 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS X-11 & C-21. THE COMPUTED LAND AREA IS BASED ON SURFACE DISTANCES.

FIELD NOTES DESCRIPTION
IS ON SEPARATE SHEETS

LANDMARK CONSULTANTS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-5377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

LHAAP-68
(426 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #0407088	0407088.CRD	S.PTS S.LEG
10/26/2009	09080745.DWG	DRAWN BY JTF

PISTOL RANGE

NOTICE OF NONRESIDENTIAL LAND USE AT PISTOL RANGE FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

September 14, 2015

2012-000000705

DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT

MISCELLANEOUS

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 01/19/2012 10:41 AM **Document Number:** 2012-000000705 **Receipt No:** 1200645 **Amount:** $ 32.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

SHAW ENVIRONMENTAL & INFRASTRUCTION GROUP
1401 ENCLAVE PARKWAY, SUITE 250

HOUSTON, TX 77077

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF NONRESIDENTIAL LAND USE

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 a remediation of the land described herein. The site, the former Pistol Range is located at the former Longhorn Army Ammunition Plant (LHAAP). LHAAP was placed on the National Priorities List (NPL) during August 1990. After its listing on the NPL, the U.S. Army, United States Environmental Protection Agency (USEPA), and TCEQ (formerly known as 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. The former Pistol Range is an NPL site and a removal action was performed in 2009 in accordance with the FFA requirements. As a result of the removal action, the lead agency has determined that no further CERCLA action is necessary at the former Pistol Range to protect public health, welfare or the environment.

The former Pistol Range is located in the southeastern portion of LHAAP, approximately 280 feet south of Avenue Q at the end of Robert Avenue. The site is the eastern portion of a rectangular field and is approximately 110 feet north to south by 150 feet east to west. The former Pistol Range was known to have been used by LHAAP security personnel for small arms target qualification and recertification. The former Pistol Range was established in the 1950s and was used intermittently through 2004. A no further action Record of Decision for the former Pistol Range was signed by USEPA in 2010

establishing no remedy was required. Further information may be found in the Notice of Registration No. 30990 files, which are available for inspection upon request at TCEQ, Central File Room Customer Service Center, Building E, 12100 Park 35 Circle, Austin, Texas, 78753, (512) 239-2900, Monday through Friday 8:00 a.m. to 5:00 p.m. or in the Administrative Record available at the Marshall Public Library, 300 S. Alamo Blvd, Marshall, Texas 75670, (903) 935-4465, Monday through Thursday 10:00 a.m. to 8 p.m., Friday and Saturday 10:00 a.m. to 5:30 p.m.

The TCEQ requires certain persons to provide recordation in the real property records to notify the public of 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

The former Pistol Range is a 0.3879 acre tract 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 United States Department of the Army has undertaken careful environmental study of the former Pistol Range and USEPA and TCEQ concluded that no further investigation or action is required.

Limited monitoring of the former Pistol Range will take place in the form of Letters of Certification from the Army or the Transferee to TCEQ every five years to document that the use of the former Pistol Range is consistent with the nonresidential use scenarios evaluated in the risk assessment. Future use of the parcel is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences; child care facilities; nursing home or assisted living facilities; and any type of educational purpose for children/young adults in grades kindergarten through 12.

III

The owner of the site is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post Office Box 220
Ratcliff, AR 72951

or

Assistant Chief of Staff for Installation Management
ATTN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington D.C. 20310-0600

Rose M. Zeiler
Longhorn AAP Site Manager

EXECUTED this the 21 th day of July, 2011.

BEFORE ME, on this the 21 th day of July, 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 21 day of July, 2011.

ANGELA HUMPHRIES
Notary Public State of Texas
COMM. EXP. 03-17-2015

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

FIELD NOTES DESCRIPTION OF
FORMER PISTOL RANGE
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

The herein described tract of land is located in Harrison County, Texas, near the town of Karnack, being 16,897 square feet of land out of the Longhorn Ordance Works Reservation (also known as the Longhorn Army Ammunition Plant, Karnack, Texas), said tract being more particularly described as follows :

Surveyor's Note : All bearings and distances herein (unless labeled surface distance) are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92). The scale factor applied equals 0.9999146277, and is based on surface traverse using electronic total station between type "G" Corps of Engineers monuments "C-19-2" (N=6952844.320 feet E=3312839.019 feet) and "3-95" (N=6952411.298 feet E=3314136.438 feet). Said traverse indicates a surface distance of 1367.890 feet between said monuments. The computed land area is based on grid (State Plane) distances.

Commencing at monument "3-95" referenced above,

(As used herein, the abbreviation I.R.C. indicates 1/2" iron rod with R.P.L.S. #3940 orange plastic cap)

THENCE S 45deg51'27"E 855.98' to an I.R.C. set for the S.W.C. of this tract and this POINT OF BEGINNING,

THENCE N 00deg00'20"W 107.99' along the W.B.L. of this tract to an I.R.C. set for this tract's N.W.C. ,

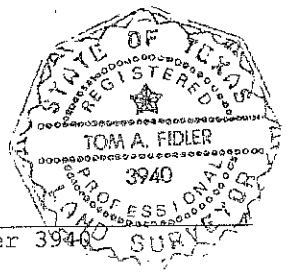
THENCE N 89deg59'47"E 155.96' along the N.B.L. of this tract to an I.R.C. set for this tract's N.E.C. ,

THENCE S 00deg32'56"E 107.99' along the E.B.L. of this tract to an I.R.C. set for this tract's S.E.C. ,

THENCE S 89deg59'43"W 156.98' along the S.B.L. of this tract to this POINT OF BEGINNING.

This tract contains 16,897 square feet, more or less.

I, Tom A. Fidler, registered professional land surveyor No. 3940 in the State of Texas, do hereby certify that this field notes description is the result of a survey made on the ground and under my supervision.



Tom A. Fidler, R.P.L.S. Number 3940

STATION C-19-2
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6952844.320 FEET
E=3312839.019 FEET

BEARING SOURCE BETWEEN STATION C-19-2 & STATION 3-95 IS S 71°32'35.6"E 1367.773' (SURFACE TRAVERSE USING ELECTRONIC TOTAL STATION INDICATES 1367.890')

STATION 3-95
STATE OF TEXAS
NORTH CENTRAL ZONE
N=6952411.298 FEET
E=3314136.438 FEET

S 45°51'27"E 855.98'

COORDINATE TABLE

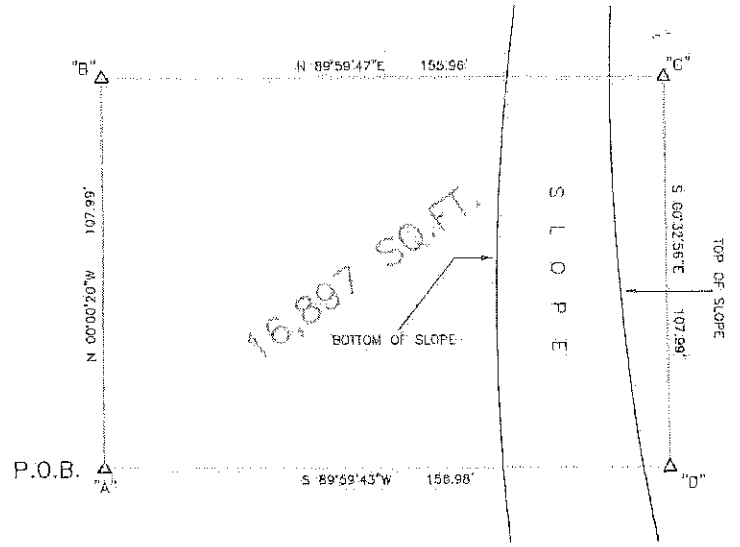
POINT	NORTH	EAST
A	6951923.143	3314750.686
B	6951815.153	3314750.697
C	6951815.166	3314907.681
D	6951923.153	3314906.647

LEGEND

□ INDICATES TYPE "G" CORPS OF ENGINEERS MONUMENT (FOUND)
△ INDICATES 1/2" IRON ROD WITH R.P.L.S. #3940 CAP (SET)

NOTE

ALL BEARINGS, DISTANCES (UNLESS LABELED OTHERWISE), & COORDINATES ARE BASED ON THE TEXAS STATE PLANE COORDINATE SYSTEM, NORTH CENTRAL ZONE, CODE 4202, NAD 1983 (92). THE SCALE FACTOR APPLIED EQUALS 0.999914277 & IS BASED ON SURFACE TRAVERSE BETWEEN STATIONS C-19-2 AND 3-95. THE COMPUTED LAND AREA IS BASED ON GRID DISTANCES.



LANDMARK SURVEYS, INC.
PROFESSIONAL LAND SURVEYORS
P.O. BOX 606 LONGVIEW, TEXAS 75606
PHONE (903) 236-3377 FAX (903) 236-3530
E-MAIL landmark@cablelynx.com

I, Tom A. Fidler, registered professional land surveyor, No. 3940, do hereby certify that this plat reflects the location of the corners on the tract herein described, as surveyed on the ground and under my supervision in April 2011.

Witness my hand and seal May 2, 2011.

Tom A. Fidler, Registered Professional Land Surveyor, No. 3940



SCALE 1"=30'

30 0 30 60 90
GRAPHIC SCALE - FEET

FIELD NOTES DESCRIPTION IS ON SEPARATE SHEETS

FORMER PISTOL RANGE
(16,897 SQUARE FEET)
LONGHORN ARMY AMMUNITION PLANT
HARRISON COUNTY, TEXAS

JOB #1104040	0407088.CRD	L.PTS L.LEG
MAY 2, 2011	1103025L.DWG	DRAWN BY JTJ

LHAAP-001-R-01/LHAAP-003-R-01South Test Area (LHAAP-001-R-01) and Ground Signal Test Area (LHAAP-003-R-01), MMRP-1

LONG TERM MANAGEMENT INSPECTION AND MAINTENANCE CHECKLIST

October 15, 2018

LTM Inspection and Maintenance Checklist

General Information	
Project Name	LTM Inspection and Maintenance, LHAAP-001-R and LHAAP-003-R MMRP, 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 rain event ☐ Other_____

Description		Yes	No	N/A	**Comments** (Attach photos/location sketches)	**Corrective Action** (Attach photos)
A. Perimeter Signage						
A.1	Are there any damaged signs?					
A.2	Are there any missing signs?					
A.3	Are all signs legible?					
A.4	Is perimeter boundary mowed?					

A.5	Are signs visible from one sign to the next sign?					
B. LUC Boundary						
B.1	Is the LUC Boundary identifiable?					
C. Dig and Intrusive Activities restriction						
C.1	Any observed digging activities or similar intrusive activities within the site boundaries?					

Note: Annual compliance inspections shall be conducted no later than March 1 of each year for the previous calendar year and filed onsite.

LHAAP-001-R-01/LHAAP-003-R-01
South Test Area (LHAAP-001-R-01) and Ground Signal Test Area (LHAAP-003-R-01), MMRP-2
LUCs FROM FINAL REMEDIAL DESIGN

October 15, 2018

FINAL
LAND USE CONTROL REMEDIAL DESIGN/ REMEDIAL ACTION CONSTRUCTION REPORT LHAAP-001-R-01 AND LHAAP-003-R-01 LONGHORN ARMY AMMUNITION PLANT

May 2018

Contract Number: W9128F-13-D-0012
Task Order Number: W912BV17F0150

Performance Based Remediation (PBR)
Longhorn Army Ammunition Plant
Karnack, Texas

Prepared For:

Longhorn Army Ammunition Plant
Karnack, Texas

Under Contract To:

U.S. Army Corps of Engineers
Tulsa District
Tulsa, Oklahoma

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Figure 1-1 LHAAP Site Map
Figure 1-2 LHAAP-001-R and LHAAP-003-R Site Location Map with LUC Boundaries
Figure 3-1 Danger UXO Warning Sign

Attachment

Attachment 1 - Initial Notice of Land Use Controls Including 2008 LUC Boundary Maps for LHAAP-001-R and LHAAP-003-R
Attachment 2 - Initial Notice of Land Use Controls for Four Environmental Sites at Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas Transmittal Letters

Attachment 3 - Notice of Land Use Controls Including Final LUC Boundary Maps for LHAAP-001-R and LHAAP-003-R
Attachment 4 - Notice of Land Use Controls for Two Environmental Sites at Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas Transmittal Letters

Appendices

Appendix A LTM Inspection and Maintenance Checklist
Appendix B LUC Compliance Certification Form
Appendix C Recordation of Land Use Controls for LHAAP-001-R and LHAAP-003-R

ACRONYMS AND ABBREVIATIONS

ARAR	Applicable or Relevant and Appropriate Requirement
bgs	below ground surface
BIP	Blow-in-place
CD	Cultural debris
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CTT	Closed, Transferring, and Transferred
DNT	Dinitrotoluene
DoD	Department of Defense
ECP	Environmental Condition of Property
EE/CA	Engineering Evaluation/Cost Analysis
e2M	Engineering-Environmental Management
FFA	Federal Facility Agreement
GW-Ind	Groundwater-Industrial
HMX	1,3,5,7-Tetranitro-1,3,5,7-tetrazocane
IRP	Installation Restoration Program
LHAAP	Longhorn Army Ammunition Plant
LUC	Land use control
µg/kg	Micrograms per kilogram
µg/L	Micrograms per liter
MC	Munitions constituent
MCL	Maximum Contaminant Level
MD	Munitions debris
MEC	Munitions and Explosives of Concern
mm	Millimeter
MMRP	Military Munitions Response Program
MOA	Memorandum of Agreement
MPPEH	Material potentially presenting explosive hazard
MRS	Munitions response site
MSC	Medium Specific Concentration
NCP	National Contingency Plan
NFA	No Further Action
NPL	National Priorities List
OB/OD	Open burn/open detonation
O&M	Operation and maintenance
PCL	Protective Concentration Level
RACR	Remedial Action Completion Report
RAO	Remedial action objective
RD	Remedial design
RDX	1,3,5-Trinitro-1,3,5-triazinane
ROD	Record of Decision

SARA	Superfund Amendments and Reauthorization Act
§	Section
SI	Site Inspection
STEP	Solutions to Environmental Problems
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TNT	Trinitrotoluene
TRRP	Texas Risk Reduction Program
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UU/UE	Unlimited Use/Unlimited Exposure
UXO	Unexploded Ordnance
WP	White phosphorus

3 LAND USE CONTROL REMEDIAL DESIGN/REMEDIAL ACTION CONSTRUCTION

The remedial action objective for LHAAP-001-R and LHAAP-003-R is protection of human health and safety from explosive hazards that may have remained at the sites after the MEC removal action. The duration for the LUCs specified in the MEC ROD for this purpose must remain in place until it is demonstrated that the MEC no longer presents a threat to public/human safety.

This section describes the LUC RD/RAC for LHAAP-001-R and LHAAP-003-R. Per the Final ROD, the LUCs' performance objectives are to:

- Prohibit the development and use of the property for residential housing, elementary and secondary schools, child care facilities, and playgrounds.
- Restrict land use to nonresidential
- Prohibit intrusive activities such as digging or any other activity which could result in explosive safety risk.
- Maintain existing MEC warning signs at the perimeter of each site to physically demarcate controlled areas.

The implementation, maintenance, and inspection requirements associated with each of the performance objectives that comprise this LUC RD/RAC are described below. The actions taken to implement the LUC objectives during the remedial action phase, as well as ongoing maintenance, monitoring, and reporting requirements are presented in Section 3.1 below. Upon regulatory review and concurrence with the final LUC RD/RACR, it will be distributed as part of the Comprehensive LUC Management Plan.

For portions of LHAAP-001-R and LHAAP-003-R subject to LUCs that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of LUCs, and coordinate with federal, state, and local governments and owners and occupants of properties subject to LUCs. The Army remains responsible for ensuring that the remedy remains protective of human health and safety.

3.1 LUC Implementation (Completed)

The actions required to implement the LUCs for LHAAP-001-R and LHAAP-003-R are described below. An initial notice of LUCs, was completed on December 8, 2016 (**Attachments 1 and 2**), within 90 days of ROD signature as required. The notice of LUCs including the final LUC boundary maps and description of the LUCs were completed on May 9, 2018 (**Attachments 3 and 4**). The preliminary LUC boundaries presented in the initial notice are considered the final LUC boundaries presented in the notice of final LUCs and are presented on **Figure 1-2.** The following actions were undertaken to implement LUCs for LHAAP-001-R and LHAAP-003-R:

- Finalize the boundaries of the LUCs as part of the remedial action (completed). The preliminary LUC boundaries are considered the final LUC boundaries, as referenced on **Figure 1-2**.
- Survey the LUC boundaries (completed). The boundaries were finalized based on USEPA and TCEQ concurrence, and the LUC boundaries were surveyed by a State of Texas licensed surveyor. A legal description of the surveyed area accompanies the survey plat.
- Record the LUCs in Harrison County. The LUC plats and legal descriptions and LUC restriction language was recorded in the Harrison County Courthouse in accordance with Title 30 TAC §335.566 on April 19, 2018 (**Appendix C**).
- Provide notice of LUCs with finalization of the RD/RACR (completed).
    - Prepare the notice of land use restrictions including prohibiting development/use for residential housing, elementary and secondary schools, child care facilities and play grounds; prohibit intrusive activities, and maintenance of existing MEC warning signs along the perimeter of each site to physically demarcate controlled areas. The notice consists of a brief description of the LUCs and a figure depicting the LUC boundaries.
    - Transmit the notice to federal, state, and local governments involved at LHAAP-001-R and LHAAP-003-R and owners and occupants of the property subject to restrictions and LUCs. The notices have been sent to federal, state, and local officials including: State Representatives, the Harrison County Judge, Harrison County Historical Courthouse, the City of Uncertain Mayor, and Caddo Lake and Leigh Water Supply Corporations' Presidents. Notice has also been sent to the Caddo Lake National Wildlife Refuge Manager, as a representative of the USFWS, the future transferee of the property.

3.2 Maintenance and Monitoring

Components of the final remedy at LHAAP-001-R and LHAAP-003-R require repair and maintenance and those activities are described in this section, along with other routine maintenance activities. The following subsections present the maintenance and monitoring requirements of the final remedy.

3.2.1 Maintenance of Existing MEC Warning Signs

MEC warning signs have been installed at the perimeter of LHAAP-001-R and LHAAP-003-R (64 signs at each site), that serve as a physical demarcation of the controlled areas. The signs have visibility from one sign to the next with a maximum spacing of 100 feet. The signs include warning of potential presence of MEC and state the restriction against intrusive activities.

These signs will be visually inspected annually, or as needed, to ensure they remain intact, undamaged, and visible from one sign to the next. Maintenance will be conducted, as needed, and may include the following activities:

- Mowing and brush clearing around MEC warning signs to ensure that they are visible from one sign location to the next sign location.
- Rehanging/affixing MEC warning signs or replacing MEC warning sign(s), if they become damaged or illegible. Figure 3-1 presents an example of the Unexploded Ordnance (UXO) Danger signs that are required. The specifications for sign replacement are found in Appendix N of the MEC Removal Action report (EODT, 2009).
- Repairing existing MEC warning sign posts, which may require the reestablishment of the concrete base or post replacement.

The Inspection and Maintenance Checklist is provided in **Appendix A.** Repairs will also be documented via photographs and field notes.

3.2.2 Administrative Maintenance

Administrative maintenance required to ensure LUCs remain in place and effective include:

- Annual field inspections of LHAAP-001-R and LHAAP-003-R 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-001-R and LHAAP-003-R conditions and use are consistent with the LUCs. The Annual LUC Compliance Certification Form is presented in **Appendix B**.
- Periodic transmittal of a LUC Notice to federal, State, and local authorities and to owners and occupants of LHAAP-001-R and LHAAP-003-R. 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 RD/RACR will be added to the Comprehensive LUC Management Plan and the plan will be provided to the owner or occupant of LHAAP-001-R and LHAAP-003-R. This update to the Comprehensive LUC Management Plan will be completed during the next annual update, which will be in the fourth quarter of 2018.

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.

3.3 Reporting of LUC Inspection and Monitoring

Beginning with finalization of this RD/RACR and approval of the Inspection and Maintenance forms and the Annual Certification Form, the U.S. Army will undertake inspections and certify continued compliance with the LUC objectives. The U.S. Army, or the transferee after transfer, will retain the LUC Inspection and Certification documents in the project files for incorporation into the Five Year Review reports, and these documents will be made available to USEPA and TCEQ upon request. In addition, should any violations be found during the certification, the U.S. Army will provide to USEPA and TCEQ, along with the document, a separate written explanation indicating the specific violations found and what efforts or measures have or will be taken to correct those violations. The need to continue inspections and certifications will be revisited during each Five Year Review.

3.3.1 Notice of Planned Property Conveyances

Upon transfer of Army-owned property, the Army will provide written notice of the LUCs to the transferee of the potential presence of MEC and any land use restrictions referenced in the ROD. Within 15 days of transfer, the U.S. Army will provide written notice to USEPA and TCEQ of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD/RACR. The notice will describe the mechanism by which the LUC will continue to be implemented, maintained, inspected, reported, and enforced. Upon transfer, such responsibilities may shift to the transferee via appropriate provisions placed in the Environmental Condition of Property (ECP) or other environmental document for transfer. Although the U.S. Army may transfer responsibility for various implementation actions, the U.S. Army will also retain ultimate responsibility for the remedy integrity. This means that the U.S. Army is responsible for addressing substantive violations of the LUC performance objectives that would undermine the U.S. Army's CERCLA remedy. The U.S. Army also will be responsible for incorporating RD information and outlining the transferee's LUC obligations into property transfer documentation. In the event property is transferred out of Federal control, the LUCs relating to property restrictions shall be recorded in the deed and shall be enforceable by the U.S. and the state of Texas.

3.3.2 Opportunity to Review Text of Intended LUCs

The U.S. Army provided a copy of the land use restriction notification to TCEQ for review and approval prior to its recordation in Harrison County. The USEPA also received a copy for review. The U.S. Army will produce an ECP or other environmental document for transfer of LHAAP-001-R and LHAAP-003-R, but before executing transfer, the U.S. Army will provide the USEPA and TCEQ with a copy of the ECP or other environmental document for transfer so that they may have reasonable opportunity, before transfer, to review all LUC-related provisions.

3.3.3 Notification Should Action(s) which Interfere with LUC Effectiveness be Discovered Subsequent to Conveyance

Should the U.S. Army discover, after conveyance of the site, any activity on the property inconsistent with the LUC performance objectives, the U.S. Army shall notify the USEPA and TCEQ within 72 hours of such discovery. Consistent with Section 4.3.4 below, the U.S. Army will then work with the USEPA, TCEQ, and the transferee to correct the problem(s) discovered. This reporting requirement does not preclude the U.S. Army from taking immediate action pursuant to its CERCLA authorities to prevent any perceived risk(s) to human health and safety.

3.3.4 LUC Enforcement

Should the LUC remedy reflected in this LUC RD/RACR fail, the U.S. Army will coordinate with the USEPA and TCEQ to ensure that appropriate actions are taken to reestablish its protectiveness. These actions may range from informal resolutions with the USFWS or its lessee, to the institution of judicial action against non-federal third parties. Alternatively, should the circumstances warrant such, the U.S. Army could choose to exercise its response authorities under CERCLA. Should the U.S. Army become aware that any future owner or user of the property has violated any LUC requirement over which a local agency may have independent jurisdiction, the U.S. Army may notify those agencies of such violation(s) and work cooperatively with them to re-achieve owner/user compliance with the LUC.

3.3.5 Modification or Termination of LUCs

The LUCs shall remain in effect until such time as the U.S. Army and USEPA agree that it has been demonstrated that MEC no longer presents a threat to public/human safety, allowing unrestricted property use. When this occurs, the LUCs will be terminated, as needed. The decision to terminate the LUC will be documented consistent with the National Contingency Plan (NCP) process for post-ROD changes, potentially including an explanation of significant differences or a RACR. If the property has been transferred and a determination by the U.S. Army and USEPA has been made to terminate the LUC, the U.S. Army shall provide to the owner of the property an appropriate release for recordation pertaining to the site and will also timely advise other local stakeholders of the action.

SOUTH TEST AREA (LHAAP-001-R-01) AND GROUND SIGNAL TEST AREA (LHAAP-003-R-01), MMRP-3
NOTICE OF LAND USE CONTROLS AND NONRESIDENTIAL LAND USE AT LHAAP-001-R-01 AND LHAAP-003-R-01 FILED IN PUBLIC RECORDS OF HARRISON COUNTY, TEXAS (INCLUDING SURVEY PLAT)

Date October 4, 2019

DATE

DAIM-ODB-LO

John Doe
1234 Any Street
Anywhere, TX 56789

Re: Notice of Land Use Controls for two environmental sites at Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas

The final Land Use Control (LUC) Remedial Design (RD)/Remedial Action Construction Report (RACR) for two sites at LHAAP was completed in 2018. The two sites are: LHAAP-001-R South Test Area/South Bomb Area and LHAAP-003-R Ground Signal Test Area.

The attached information is provided to fulfill a requirement of the LUC RD/RACR to give notice of the groundwater and soil (surface and subsurface) contamination and any land use restrictions referenced in the ROD. The selected remedy of land use controls has been implemented at both sites. The notices are being sent to federal, state and local governments involved at these sites and the owners and occupants of the properties 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

Three Enclosures
Copies furnished:
R. Mayer, USEPA Region 6, Dallas, TX
A. Palmie, TCEQ, Austin, TX
Administrative Record

EXAMPLE

2018-000004040

*****DO NOT REMOVE THIS PAGE – IT IS A PART OF THIS INSTRUMENT*****

NOTICE

6 Pages

FILED AND RECORDED – OPR	CLERKS NOTES
On: 04/19/2018 02:27 PM **Document Number:** 2018-000004040 **Receipt No:** 1804258 **Amount:** $ 42.00 **By:** Ann Turner, **Deputy** **Patsy Cox, County Clerk** **Harrison County, Texas**	

COUNTY COURT COUNTY OF HARRISON, 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.

Patsy Cox

Patsy Cox, Harrison County Clerk

Record and Return To:

KIM NEMMERS
4085 ASPEN LANE

EVERGREEN, CO 80439

STATE OF TEXAS

HARRISON COUNTY

INDUSTRIAL SOLID WASTE
NOTICE OF LAND USE CONTROLS

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 a removal of munitions and explosives of concern on the land described herein. Longhorn Army Ammunition Plant (LHAAP) Munition Response Sites (MRSs) LHAAP-001-R (South Test Area/Bomb Test Area) and LHAAP-003-R (Ground Signal Test Area) are former military test areas located in the southern and southeastern portions of LHAAP, respectively. 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 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. MRSs LHAAP-001-R and LHAAP-003-R are co-located with NPL sites LHAAP-27 and LHAAP-54, respectively and are also considered NPL sites. Remedial activities at these sites were performed in accordance with the FFA requirements.

MRS LHAAP-01-R was constructed in 1954 and was used for testing photoflash bombs produced at the facility until approximately 1956. During the late 1950s, illuminating signal devises were also demilitarized within pits excavated in the vicinity of the test pad. During the 1960s, leaking production items may have been demilitarized by detonation. LHAAP-001-R was identified as an MRS based on the visual confirmation of MEC.

MRS LHAAP-003-R was used intermittently in April 1963 for aerial and on-ground testing and destruction of a variety of devices, including pyrotechnic signal devices, red phosphorus smoke wedges, infrared flares, illuminating mortar shells and cartridges, button bombs and various types of explosive simulators. The site was used intermittently over a 20-year period for testing and burn-out of rocket motors. From late 1988 through 1991, the site was used for the burn-out of Pershing missile rocket motors and, occasionally, leaking white phosphorus munitions were burned at the site as a demilitarization activity. LHAAP-003-R was identified as an MRS based on the reported presence of MEC.

Non-time critical removal actions (NTCRAs) for MEC removal were conducted at both sites in 2008. A Final Record of Decision (ROD) for LHAAP-001-R and LHAAP-003-R was issued in August 2016, which documents the final selected remedy for the sites, including the implementation of Land Use Controls (LUCs) designed to promote ongoing protection of human safety against potential explosive hazards that may have remained at the sites following the MEC removal actions. The LUCs' performance objectives are to prohibit residential use, to restrict land use to non-residential, and to prohibit intrusive activities such as digging or any other activity which could result in explosive safety risks.

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, (903) 935-4465, Monday, Tuesday and Thursday 9:30AM – 7:30PM, Wednesday and Friday 9:30AM – 5:30PM, and Saturday 9:30AM – 3:30PM.

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

MRS LHAAP-001-R covers an area of approximately 72.14 acre-tract, 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 entire LHAAP-001-R parcel is within a LUC boundary which is described in **Exhibit A**.

MRS LHAAP-003-R covers an area of approximately 79.53 acre-tract, 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 B**. The entire LHAAP-003-R parcel is within a LUC boundary which is described in **Exhibit B**.

The United States Department of the Army has undertaken careful environmental study of MRSs LHAAP-001-R and LHAAP-003-R and the USEPA and TCEQ concluded that LUCs should remain in place until it is demonstrated that MEC no longer presents an explosive hazard.

Future use of these sites is intended as a national wildlife refuge consistent with industrial or recreational activities and not for residential purposes. The LUCs placed on the property to ensure appropriate future use include:

(1) Use must remain non-residential as described above. For purposes of this certification, residential use includes, but is not limited to, single family or multi-family residences, child care facilities, nursing home or assisted living facilities, and any type of educational purpose for children/young adults in grades kindergarten through 12. This LUC will remain in place until it is demonstrated that the MEC no longer present a threat to human safety/health.

(2) No intrusive activity shall be permitted, which includes digging or any other activity which could result in explosive safety risks, without prior consent. This LUC will remain in place until it is demonstrated that the MEC no longer present an explosive hazard. Intrusive subsurface activities may occur provided that the Army and the EPA approve such intrusive subsurface activities before they are commenced and provided that they are undertaken by qualified personnel who are trained in explosives safety measures.

III

The owner of these sites is the Department of the Army, and its address where more specific information may be obtained is as follows:

ATTN: DAIM-ODB-LO (R. Zeiler)
Post office Box 220
Ratcliff, AR 72951
Or
Assistant Chief of Staff for Installation Management
ATN: DAIM-ODB (T. Lederle)
600 Army Pentagon
Washington, D.C. 20310-0600

Rose M. Zeiler
Longhorn AP Site Manager

EXECUTED this the 19th day of April, 2018.

BEFORE ME, on this 19th day of April 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 19th day of April, 2018.

JENNIFER LESTER
Notary Public State of Texas
COMM. EXP. 1/3/2019
NO. 128484987

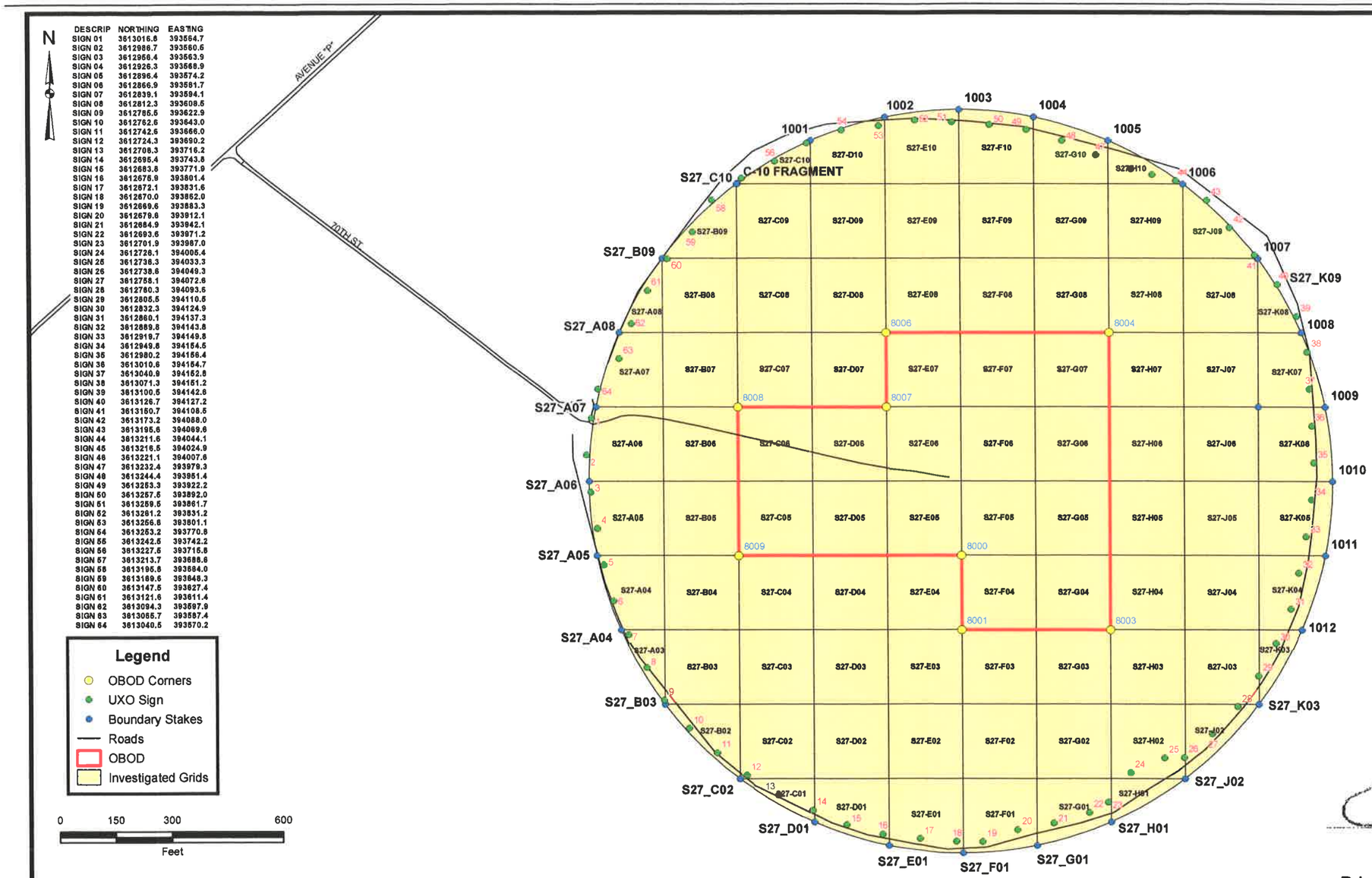
Notary Public in and for the State of Texas,
County of Harrison

Exhibit A
LHAAP-001-R, South Test Area/South Bomb Area
Longhorn Army Ammunition Plant, Karnack, Texas

DESCRIP	NORTHING	EASTING
SIGN 01	3613016.8	393564.7
SIGN 02	3612986.7	393560.5
SIGN 03	3612956.4	393563.9
SIGN 04	3612926.3	393568.9
SIGN 05	3612896.4	393574.2
SIGN 06	3612866.9	393581.7
SIGN 07	3612839.1	393594.1
SIGN 08	3612812.3	393608.5
SIGN 09	3612785.6	393622.9
SIGN 10	3612762.6	393643.0
SIGN 11	3612742.6	393666.0
SIGN 12	3612724.3	393690.2
SIGN 13	3612708.3	393716.2
SIGN 14	3612695.4	393743.6
SIGN 15	3612683.8	393771.9
SIGN 16	3612676.9	393801.4
SIGN 17	3612672.1	393831.6
SIGN 18	3612670.0	393862.0
SIGN 19	3612669.6	393893.3
SIGN 20	3612679.6	393912.1
SIGN 21	3612684.9	393942.1
SIGN 22	3612693.6	393971.2
SIGN 23	3612701.9	393987.0
SIGN 24	3612726.1	394005.4
SIGN 26	3612736.3	394033.3
SIGN 26	3612738.6	394049.3
SIGN 27	3612758.1	394072.6
SIGN 28	3612780.3	394093.5
SIGN 29	3612805.5	394110.5
SIGN 30	3612832.3	394124.9
SIGN 31	3612860.1	394137.3
SIGN 32	3612889.8	394143.8
SIGN 33	3612918.7	394149.8
SIGN 34	3612949.8	394154.5
SIGN 35	3612980.2	394156.4
SIGN 36	3613010.6	394154.7
SIGN 37	3613040.9	394152.8
SIGN 38	3613071.3	394151.2
SIGN 39	3613100.5	394142.6
SIGN 40	3613126.7	394127.2
SIGN 41	3613150.7	394108.5
SIGN 42	3613173.2	394088.0
SIGN 43	3613195.6	394069.6
SIGN 44	3613211.6	394044.1
SIGN 45	3613216.5	394024.9
SIGN 46	3613221.1	394007.6
SIGN 47	3613232.4	393979.3
SIGN 48	3613244.4	393951.4
SIGN 49	3613253.3	393922.2
SIGN 50	3613257.5	393892.0
SIGN 51	3613259.5	393861.7
SIGN 52	3613261.2	393831.2
SIGN 53	3613256.6	393801.1
SIGN 54	3613253.2	393770.8
SIGN 55	3613242.5	393742.2
SIGN 56	3613227.5	393715.6
SIGN 57	3613213.7	393688.6
SIGN 58	3613195.8	393664.0
SIGN 59	3613189.5	393648.3
SIGN 60	3613147.5	393627.4
SIGN 61	3613121.6	393611.4
SIGN 62	3613094.3	393597.9
SIGN 63	3613065.7	393587.4
SIGN 64	3613040.5	393570.2

DESCRIP	NORTHING	EASTING
8000	3612904.2	393867.3
8001	3612843.2	393867.3
8003	3612843.2	393989.2
8004	3613087.0	393989.2
8006	3613087.1	393806.4
8007	3613026.1	393806.4
8008	3613026.1	393684.4
8009	3612904.2	393684.4

DESCRIP	NORTHING	EASTING
1001	393745.4	3613244.5
1002	393806.4	3613263.8
1003	393867.3	3613269.9
1004	393928.3	3613263.8
1005	393989.2	3613244.5
1006	394050.1	3613209.0
1007	394111.0	3613148.0
1008	394146.5	3613087.0
1009	394165.8	3613026.1
1010	394171.9	3612965.1
1011	394165.8	3612904.2
1012	394146.5	3612843.2
C-10 FRAGMENT	393685.2	3613209.4
S27_A04	393568.0	3612843.2
S27_A05	393568.7	3612904.2
S27_A06	393562.5	3612965.1
S27_A07	393568.6	3613026.1
S27_A08	393687.9	3613087.1
S27_B03	393623.8	3612782.3
S27_B09	393623.8	3613148.0
S27_C02	393684.6	3612721.3
S27_C10	393684.4	3613209.0
S27_D01	393745.4	3612885.9
S27_E01	393806.4	3612666.6
S27_F01	393867.3	3612660.5
S27_G01	393928.3	3612666.7
S27_H01	393989.3	3612886.0
S27_J02	394049.9	3612721.3
S27_K03	394110.9	3612782.3
S27_K07	394111.2	3613026.1
S27_K09	394111.2	3613147.9



Legend

- OBOD Corners
- UXO Sign
- Boundary Stakes
- Roads
- OBOD
- Investigated Grids

0 150 300 600
Feet

Datum: NAD83 UTM
Monument: Longhorn Army Ammunition Plant
Monument BG-1 with coordinates
NORTHING-3614801.46,
EASTING-395385.09

STATE OF TEXAS
REGISTERED
DAVID R COLLINS
1954
PROFESSIONAL
LAND SURVEYOR

I, David R. Collins, Registered Professional Land Surveyor No. 1954, do hereby certify that this plat correctly represents the results of a survey made under my supervision August 4 through September 23, 2008.

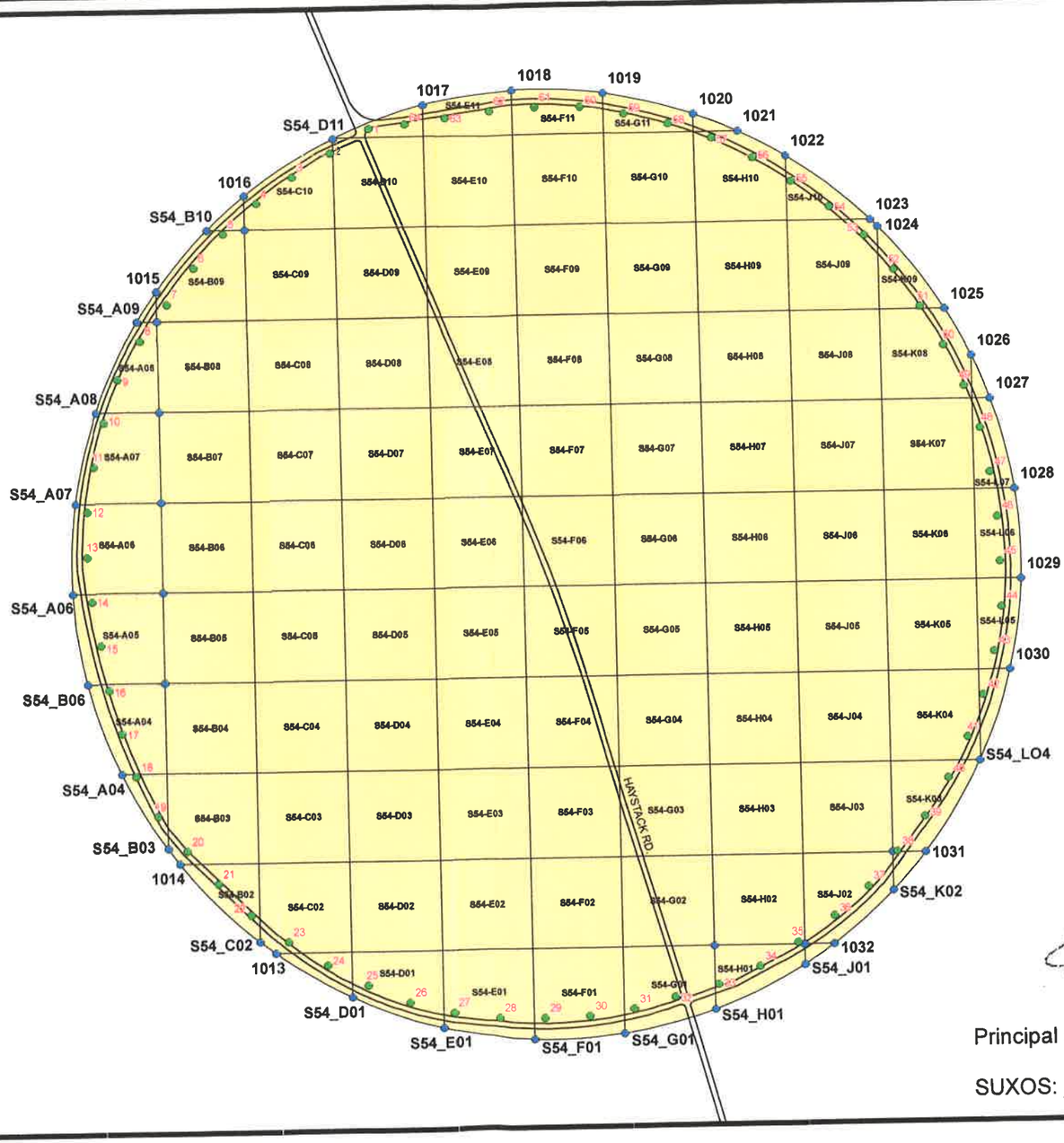
Principal of the firm: _____

SUXOS: _____

Exhibit B
LHAAP-003-R, Ground Signal Test Area
Longhorn Army Ammunition Plant, Karnack, Texas

DESCRIP	NORTH	EAST
SIGN 1	3614179.4	395143.2
SIGN 10	3613984.2	394959.8
SIGN 11	3613954.6	394952.4
SIGN 12	3613924.6	394947.4
SIGN 13	3613894.1	394947
SIGN 14	3613863.7	394949.6
SIGN 15	3613833.8	394956.1
SIGN 16	3613803.8	394959.8
SIGN 17	3613774.4	394967.8
SIGN 18	3613745.2	394976.7
SIGN 19	3613718.3	394991.2
SIGN 2	3614163.4	395117.3
SIGN 20	3613694.6	396010.3
SIGN 21	3613672.4	396031.1
SIGN 22	3613651.1	396052.8
SIGN 23	3613632.6	395077
SIGN 24	3613616.8	396103.1
SIGN 25	3613602.8	395130
SIGN 26	3613591	395158.1
SIGN 27	3613583.5	395187.5
SIGN 28	3613579.1	395217.8
SIGN 29	3613578.7	396248.2
SIGN 3	3614147.8	395091.2
SIGN 30	3613579.8	396278.7
SIGN 31	3613584.2	395308.8
SIGN 32	3613591.4	395336.3
SIGN 33	3613599.6	395365.6
SIGN 34	3613611	395393.8
SIGN 35	3613626.8	395419.8
SIGN 36	3613644.2	395444.8
SIGN 37	3613663.5	395469.2
SIGN 38	3613686.5	395488.2
SIGN 39	3613710.2	395507.8
SIGN 4	3614130.2	395066.2
SIGN 40	3613735.9	395523.8
SIGN 41	3613763	395537.5
SIGN 42	3613791.2	395546.8
SIGN 43	3613820.6	395556.7
SIGN 44	3613850.5	395562.3
SIGN 45	3613880.9	395562.2
SIGN 46	3613911.3	395561
SIGN 47	3613941.4	395556.7
SIGN 48	3613971.3	395550.8
SIGN 49	3613999.9	395540.6
SIGN 5	3614110.1	395043.4
SIGN 50	3614027.4	395527.6
SIGN 51	3614053.7	395512.2
SIGN 52	3614076.9	395498.2
SIGN 53	3614102.3	395478.8
SIGN 54	3614122	395452.6
SIGN 55	3614139.3	395427.5
SIGN 56	3614155.8	395401.9
SIGN 57	3614169.5	395374.8
SIGN 58	3614179.6	395346
SIGN 59	3614186.8	395316.6
SIGN 6	3614087.5	395022.9
SIGN 60	3614191.9	395286.4
SIGN 61	3614192.1	395255.9
SIGN 62	3614190.3	395226.5
SIGN 63	3614186.9	395195.4
SIGN 64	3614182	395167.9
SIGN 7	3614063.3	395004.4
SIGN 8	3614039.1	394988.8
SIGN 9	3614013.1	394969.9

DESCRIP	NORTHIN	EASTING
1013	395068.8	3613625.2
1014	395005.1	3613686.2
1015	394997.4	3614072.1
1016	395058.4	3614135.6
1017	395180.3	3614195.0
1018	395241.3	3614203.9
1019	395302.2	3614200.9
1020	395363.2	3614185.9
1021	395392.4	3614173.9
1022	395424.1	3614156.7
1023	395480.2	3614112.9
1024	395485.1	3614108.0
1025	395528.9	3614061.9
1026	395546.1	3614020.2
1027	395558.0	3613991.0
1028	395573.1	3613930.0
1029	395576.0	3613869.1
1030	395567.2	3613808.1
1031	395507.7	3613686.2
1032	395444.2	3613625.2
S54_A04	394967.3	3613747.1
S54_A06	394936.8	3613869.1
S54_A07	394939.8	3613930.0
S54_A08	394954.8	3613991.0
S54_A09	394983.9	3614051.9
S54_B03	394997.4	3613998.4
S54_B06	394997.4	3613808.1
S54_B06	394997.4	3613869.1
S54_B07	394997.4	3613930.0
S54_B08	394997.4	3613991.0
S54_B09	394997.4	3614051.9
S54_B10	395032.6	3614112.9
S54_C02	395068.4	3613633.0
S54_C10	395058.4	3614112.9
S54_D01	395119.3	3613696.1
S54_D11	395119.4	3614173.3
S54_E01	395180.3	3613573.5
S54_F01	395241.3	3613564.6
S54_G01	395302.2	3613567.6
S54_H01	395363.2	3613582.6
S54_H02	395363.1	3613625.2
S54_J01	395424.1	3613611.8
S54_J02	395424.1	3613625.2
S54_K02	395485.1	3613680.5
S54_K03	395485.1	3613686.2
S54_LO4	395545.5	3613747.1



Legend
- UXO Signs
- Boundary Stakes
- Roads
- Investigated Grids

0 150 300 600
Feet

Datum: NAD83 UTM
Monument: Longhorn Army Ammunition Plant
Monument BG-1 with coordinates
NORTHING-3614801.46,
EASTING-395385.09

STATE OF TEXAS
REGISTERED
DAVID R COLLINS
1954
PROFESSIONAL
LAND SURVEYOR

I, David R. Collins, Registered Professional Land Surveyor No. 1954, do hereby certify that this plat correctly represents the results of a survey made under my supervision August 4 through September 28, 2008.

Principal of the firm: _____

SUXOS: _____

South Test Area (LHAAP-001-R-01) and Ground Signal Test Area (LHAAP-003-R-01), MMRP-4

LAND USE CONTROL COMPLIANCE INSPECTION FORM

October 15, 2018

LAND USE CONTROL COMPLIANCE CERTIFICATION FORM

In accordance with the LUC Plan dated _____ for LHAAP-001-R and LHAAP-003-R, an inspection of the sites was conducted by _____ on _____.

A summary of land use control mechanisms is as follows:

- Land use restrictions - restrict land use to non-residential.
- Integrity of LUC signage by ensuring signs are present, legible and have visibility from one sign to the next.

A summary of compliance with land use and restriction covenants is as follows:

- The posted signs are properly maintained at LHAAP-001-R and LHAAP-003-R.
- No digging or intrusive activities have taken place within the boundaries identified for LHAAP-001-R and LHAAP-003-R.
- No land use other than non-residential.
- Pamphlets and safety awareness video are being used to educate visitors.

I, the undersigned, do document that the inspections were performed as indicated above, and that the above information is true and correct to the best of my knowledge, information, and belief.

Date: _____

Name: _____

Signature: _____

Completed annual compliance inspections shall be conducted no later than March 1 of each year for the previous calendar year and filed on site.

APPENDIX A

GSA TRANSFER LETTERS

GSA Public Buildings Service
Tel: (817) 978-3856
Fax: (817) 978-2063
melvin.freeman@gsa.gov

February 21, 2014

Mr. Thomas E. Lederle
Chief, ACSIM BRAC Division
600 Army Pentagon
Washington D.C. 20310-0600

Dear Mr. Lederle:

Your report of excess dated July 29, 2002, covered 8,492.02 acres of land (later corrected to 8,416 acres), more or less, and improvements at the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. GSA Control No. 7-D-TX-0692.

As set forth in the enclosed letter, an additional 50.54 acres of land, more or less, of the LHAAP property known as Tract No. 7 – Landfill 12 Area, described in Attachment 1 of the transfer letter has been transferred without reimbursement to the U.S. Department of the Interior, Fish and Wildlife Service (FWS) under the authority of 16 U.S.C. 667b. Additional transfers will be made when approvals are obtained from the Army on lands currently not suitable for transfer. Future requests for transfers will identify requested land by legal description or map overlay.

Upon finalization of transfer of the total land requested by FWS, a complete boundary legal description will be provided by FWS identifying all former Army land that had been transferred. Any map overlays used in the interim to identify previously transferred land will be voided for use to identify former Army land at LHAAP subsequently controlled by FWS.

Custody and accountability of the property identified by legal description in Attachment 1 to the transfer letter, together with any necessary documentation, should be transferred to FWS by your agency as soon as practicable. We will appreciate your prompt advice as to the date such action is accomplished. We understand that the FWS, Region 2 Acting Regional Director, Ms. Joy Nicholopoulos, P.O. Box 1306, Albuquerque, NM 87103 will represent the FWS in this matter.

Please acknowledge receipt of this communication in the space provided on the enclosed copy of this letter and return it to this office. You may contact Veronica Capron Vorva, Realty Specialist at telephone 817-978-4246 if there are questions.

U.S. General Services Administration
Real Property Utilization and Disposal
Division (7PZ)
819 Taylor Street, Room 11A30
Fort Worth, TX 76102-6112

Sincerely,

Melvin E. Freeman, Director
Real Property Utilization and Disposal
Division (7PZ)

Enclosures

Receipt acknowledged:

Name THOMAS E LEDERLE

Title Chief, ACSIM BRAC DIV

Date 03/07/2014

cc: Ms. Joy Nicholopoulos, Acting Regional Director
U.S. Fish and Wildlife Service, Region 2
Division of Realty
P.O. Box 1306
Albuquerque, NM 87103-1306

GSA Public Buildings Service
Tel (817) 978-3856
Fax (817) 978-2063
melvin.freeman@gsa.gov

February 21, 2014

Joy Nicholopoulos, Acting Regional Director
U.S. Fish and Wildlife Service, Region 2
Division of Realty
P.O. Box 1306
Albuquerque, NM 87103-1306

RE: Transfer of 50.54 acres of land at the Longhorn Army Ammunition Plant, Harrison County, Texas

Dear Ms. Nicholopoulos:

Your letter of April 27, 2004, requested transfer to the U.S. Department of the Interior, Fish and Wildlife Service (FWS), under the authority of P.L. 80-537, 16 U.S.C. 667b, a total of 8,404 acres of land (later corrected to 8,416 acres, more or less), at the Longhorn Army Ammunition Plant (LHAAP), City of Karnack, Harrison County, State of Texas, together with all the improvements found on the real estate, and all related personal property located thereon (hereinafter referred to as the "Property"), reported July 29, 2002, as excess to the needs of the U.S. Army. The first transfer of 5,031.75 acres was accepted into primary jurisdiction by FWS on April 30, 2004. It was agreed that as parcels met the specifications of transfer, additional parcels would be transferred by means of a letter request, a map, and a legal description to GSA.

All the rights to be transferred herein have heretofore been declared excess to the needs of the United States Department of the Army. The respective interests to be transferred hereby have been reported to the General Services Administration (GSA) and have been determined to be excess for disposal pursuant to P.L. 107-217, (40 U.S.C. §§550, et. seq.) as amended.

In accordance with your subsequent letter of February 4, 2014, an additional 50.54 acres, more or less, known as Tract No. 7 – Landfill 12 Area (hereinafter referred to as the "Property") are now suitable for transfer to add to the 6,364.35 acres, more or less, previously transferred on nine separate occasions. A true and complete legal description of Tract No. 7 – Landfill 12 Area is included in **Attachment 1**.

Accordingly, pursuant to 40 U.S.C. 501, et seq. and Public Law 80-537, 16 U.S.C. 667b, and acting under authority delegated to me, I hereby transfer 50.54 acres, more

U.S. General Services Administration
Real Property Utilization and Disposal
Division (7PZ)
819 Taylor Street, Room 11A30
Fort Worth, TX 76102-6112

or less, as described in **Attachment 1** to the custody and accountability of the U.S. Department of Interior, Fish and Wildlife Service.

Additional transfers covering the remainder of the real estate comprising the LHAAP will be made when approvals are obtained from the Army on lands currently not suitable for transfer. Future requests for other transfers will specifically identify such requested land by legal description and/or map overlay.

This transfer is expressly made subject to all environmental notices, exceptions, restrictions, agreements, and covenants affecting the Property identified in the Environmental Condition of Property V, Longhorn Army Ammunition Plant, Karnack, Texas, dated September 2007 and revised December 6, 2013, (hereinafter referred to as the "ECOP V") which is incorporated herein by reference and amends the "ECOP" previously described in and made a part of the original transfer of April 26, 2004, and subsequent transfers, and the "ECOP II" dated October 2004, "ECOP III" dated August 2005, and "ECOP IV" dated March 2007 to the extent and only to the extent the same are valid and affect the Property conveyed herein. FWS covenants and agrees that the Property is hereby transferred subject to the use restrictions and covenants which run with the land as identified in Attachment 2 of the ECOP V previously described. FWS further covenants and agrees that in the event that the Property, or any part thereof, is sold, conveyed, transferred, leased, or otherwise disposed of, the following notices, covenants, and restrictions shall be inserted in any instrument of conveyance.

Upon finalization of transfer of the total land requested by FWS, a complete boundary legal description will be provided by FWS identifying all former Army land that had been transferred. Any map overlays used in the interim to identify previously transferred land will be voided for use to identify former Army land at LHAAP subsequently controlled by FWS.

The property transferred is subject to compliance by the FWS with the provisions of the National Environmental Policy Act of 1969, as amended, including the preparation of an environmental impact statement if required. The Property is transferred subject to compliance by the FWS with Section 106 of the National Historic Preservation Act of 1966, and Executive Order 11593.

Mr. Thomas E. Lederle, Chief, ACSIM BRAC Division, U.S. Army, 600 Army Pentagon, Washington D.C. 20310 will act for the U.S. Army in arranging for the transfer of custody and accountability of the Property and in other matters related to the transfer.

A copy of our letter of same date to the U.S. Army is enclosed for your information. It is requested that you acknowledge receipt of this communication on the enclosed copy of this letter in the space provided, return it to this office, and that such steps as necessary be taken by your Agency to consummate the transaction.

Sincerely,

Melvin E. Freeman

Melvin E. Freeman, Director
Real Property Utilization and Disposal
Division (7PZ)

Enclosures

Receipt acknowledged:

Name Kristy R. Amer

Title Realty Officer

Date 3-3-2014

cc: Mr. Thomas E. Lederle
Chief, ACSIM BRAC Division
600 Army Pentagon
Washington D.C. 20310-0600

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
DIVISION OF REALTY

TRACT REPORT

OF THE

UNITED STAES OF AMERICA

TRACT (100q)

CONTAINING 50.54 ACRES

CADDO LAKE NATIONAL WILDLIFE REFUGE

HARRRISON COUNTY, TEXAS

Report Prepared By

Louis J. duBois, Jr.
Land Surveyor

January 2014

Tract Description of the
United States of America Tract (100q)
Caddo Lake National Wildlife Refuge
Harrison County, Texas

The hereinafter described tract of land is located in Harrison County, Texas, near the town of Karnack, tract (100q) being 50.54 acres of land out of the Longhorn Ordnance Works Reservation, also known as the Longhorn Army Ammunition Plant, Karnack, Texas, said 50.54 acres of land being that certain 50.54 acre tract described as Parcel No. 7 – Landfill 12 Area excepted from United States of America tract (100a) as surveyed by Entz Engineering and Associates, Inc. & Huffman Surveying Company, A Joint Venture, of Muskogee, Oklahoma, delineated on a map tracing designated "United States of America Tracts (100a,b)" bearing the date of May, 2004, of record in the files of the United States Department of the Interior, Fish and Wildlife Service, Region 2, Albuquerque, New Mexico, said tract (100q) being more particularly described by metes and bounds as follows:

SURVEYOR'S NOTE:

All bearings and distances are based on the Texas State Plane Coordinate System, North Central Zone, Code 4202, NAD 1983 (92), Survey Feet. The average Combined Scale Factor applied equals 0.99988410; Convergence equals 02° 21' 53". The computed land area is based on surface distances.

Parcel No. 7 - Landfill 12 Area

BEGINNING at the southwest corner of the Landfill 12 Area, described as Parcel No. 7, said point being described as "Landfill 12 Area Point No. 1" and having a coordinate value of N=6953300.238, E=3311087.540;

THENCE, along the boundary line of said Parcel No. 7,

N. 03°15'36" W., 1741.41 feet

to a point for a corner of this tract, said point being described as "Landfill 12 Area Point No. 2";

THENCE, along the boundary line of said Parcel No. 7,

N. 62°03'32" E., 1151.75 feet

to a point for a corner of this tract, said point being described as "Landfill 12 Area Point No. 3";

THENCE, along the boundary line of said Parcel No. 7,

S. 15°55'59" E., 1311.85 feet

to a point for a corner of this tract, said point being described as "Landfill 12 Area Point No. 4";

THENCE, along the boundary line of said Parcel No. 7,

S. 35°09'33" W., 1306.48 feet

to a point for a corner of this tract, said point being described as "Landfill 12 Area Point No. 5";

THENCE, along the boundary line of said Parcel No. 7,

N. 84°25'54" W., 528.74 feet

to the **POINT OF BEGINNING**, and containing 50.54 acres, more or less.

Bounded on the north, east, south and west by USA tract (100a).

The hereinbefore-described tract of land is delineated on a plat designated "United States of America Tract (100q)" bearing the date of January 15, 2014, of record in the files of the United States Department of the Interior, Fish and Wildlife Service.

GSA Public Buildings Service
Tel: (817) 978-3856
Fax: (817) 978-2063
melvin.freeman@gsa.gov

January 29, 2015

Mr. Thomas E. Lederle
Chief, ACSIM BRAC Division
600 Army Pentagon
Washington D.C. 20310-0600

Dear Mr. Lederle:

Your report of excess dated July 29, 2002, covered 8,492.02 acres of land (later corrected to 8,416 acres), more or less, and improvements at the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. GSA Control No. 7-D-TX-0692.

As set forth in the enclosed letter, an additional 109.91 acres of land, more or less, in five parcels of the LHAAP property, described in Attachment 1 and Attachment 2 of the transfer letter, including: three portions of the "Production Area Parcel," consisting of Tract 100r, containing 31.73 acres in and around the Former Acid Storage Area, Tract 100s, containing 18.80 acres in and around the Former TNT Waste Disposal Plant, and Tract 100t, containing 3.82 acres in and around the Former Sewage Treatment Plant; the "Y-Area Parcel," Tract 100u, containing 17.24 acres; and a portion of the 40.37 acre "Static Test Area Parcel," Tract 100v, containing 38.32 acres, have been transferred without reimbursement to the U.S. Department of the Interior, Fish and Wildlife Service (FWS) under the authority of 16 U.S.C. 667b. Additional transfers will be made when approvals are obtained from the Army on lands currently not suitable for transfer. Future requests for transfers will identify requested land by legal description or map overlay.

Upon finalization of transfer of the total land requested by FWS, a complete boundary legal description will be provided by FWS identifying all former Army land that had been transferred. Any map overlays used in the interim to identify previously transferred land will be voided for use to identify former Army land at LHAAP subsequently controlled by FWS.

Custody and accountability of the property identified by legal description in Attachment 1 and Attachment 2 to the transfer letter, together with any necessary documentation, should be transferred to FWS by your agency as soon as practicable. We will appreciate your prompt advice as to the date such action is accomplished. We understand that the FWS, Region 2 Acting Regional Director, Ms. Joy Nicholopoulos, P.O. Box 1306, Albuquerque, NM 87103 will represent the FWS in this matter.

U.S. General Services Administration
Real Property Utilization and Disposal Division (7PZ)
819 Taylor Street, Room 11A30
Fort Worth, TX 76102-6112

Please acknowledge receipt of this communication in the space provided on the enclosed copy of this letter and return it to this office. You may contact Veronica Vorva, Realty Specialist, at telephone 817-978-4246 if there are questions.

Sincerely,

Melvin E. Freeman

Melvin E. Freeman, Director
Real Property Utilization and Disposal
Division (7PZ)

Enclosures

Receipt acknowledged:

Name THOMAS E LEDERLE

Title Chief, ACSIM BRAC DIV

Date 20 APR 2015

cc: Ms. Joy Nicholopoulos, Acting Regional Director
U.S. Fish and Wildlife Service, Region 2
Division of Realty
P.O. Box 1306
Albuquerque, NM 87103-1306



GSA Public Buildings Service
Tel: (817) 978-3856
Fax: (817) 978-2063
melvin.freeman@gsa.gov

January 29, 2015

Joy Nicholopoulos, Acting Regional Director
U.S. Fish and Wildlife Service, Region 2
Division of Realty
P.O. Box 1306
Albuquerque, NM 87103-1306

RE: Transfer of 109.91 acres of land at the Longhorn Army Ammunition Plant, Karnack, Harrison County, Texas

Dear Ms. Nicholopoulos:

Your letter of April 27, 2004, requested transfer to the U.S. Department of the Interior, Fish and Wildlife Service (FWS), under the authority of P.L. 80-537, 16 U.S.C. 667b, a total of 8,404 acres of land (later corrected to 8,416 acres, more or less), at the Longhorn Army Ammunition Plant (LHAAP), City of Karnack, Harrison County, State of Texas, together with all the improvements found on the real estate, and all related personal property located thereon (hereinafter referred to as the "Property"), reported July 29, 2002, as excess to the needs of the U.S. Army. The first transfer of 5,031.75 acres was accepted into primary jurisdiction by FWS on April 30, 2004. It was agreed that as parcels met the specifications of transfer, additional parcels would be transferred by means of a letter request, a map, and a legal description to GSA.

All the rights to be transferred herein have heretofore been declared excess to the needs of the United States Department of the Army. The respective interests to be transferred hereby have been reported to the General Services Administration (GSA) and have been determined to be excess for disposal pursuant to P.L. 107-217, (40 U.S.C. §§550, et. seq.) as amended.

In accordance with your subsequent letter of December 2, 2014, an additional 109.91 acres, more or less, in five parcels of the LHAAP property including: three portions of the "Production Area Parcel," consisting of Tract 100r, containing 31.73 acres in and around the Former Acid Storage Area, Tract 100s, containing 18.80 acres in and around the Former TNT Waste Disposal Plant, and Tract 100t, containing 3.82 acres in and around the Former Sewage Treatment Plant; the "Y-Area Parcel," Tract 100u, containing 17.24 acres; and a portion of the 40.37 acre "Static Test Area Parcel," Tract 100v, containing 38.32 acres (hereinafter referred to as the "Properties") is now suitable

U.S. General Services Administration
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Fort Worth, TX 76102-6112

for transfer to add to the 6,414.89 acres, more or less, previously transferred on ten separate occasions. True and complete legal descriptions of the Properties are included in **Attachment 1** and **Attachment 2**.

Accordingly, pursuant to 40 U.S.C. 501, et seq. and Public Law 80-537, 16 U.S.C. 667b, and acting under authority delegated to me, I hereby transfer 109.91 acres, more or less, as described in **Attachment 1** and **Attachment 2** to the custody and accountability of the U.S. Department of Interior, Fish and Wildlife Service.

Additional transfers covering the remainder of the real estate comprising the LHAAP will be made when approvals are obtained from the Army on lands currently not suitable for transfer. Future requests for other transfers will specifically identify such requested land by legal description and/or map overlay.

This transfer is expressly made subject to all environmental notices, exceptions, restrictions, agreements, and covenants affecting the Property identified in the Environmental Condition of Property VI, Longhorn Army Ammunition Plant, Karnack, Texas, dated January 2014, (hereinafter referred to as the "ECOP VI") which is incorporated herein by reference and amends the "ECOP" previously described in and made a part of the original transfer of April 26, 2004, and subsequent transfers, and the "ECOP II" dated October 2004, "ECOP III" dated August 2005, "ECOP IV" dated March 2007, and "ECOP V" dated September 2007 and revised December 6, 2013 to the extent and only to the extent the same are valid and affect the Property conveyed herein. FWS covenants and agrees that the Property is hereby transferred subject to the use restrictions and covenants which run with the land as identified in Attachment 3 of the ECOP VI previously described. FWS further covenants and agrees that in the event that the Property, or any part thereof, is sold, conveyed, transferred, leased, or otherwise disposed of, the following notices, covenants, and restrictions shall be inserted in any instrument of conveyance.

Upon finalization of transfer of the total land requested by FWS, a complete boundary legal description will be provided by FWS identifying all former Army land that had been transferred. Any map overlays used in the interim to identify previously transferred land will be voided for use to identify former Army land at LHAAP subsequently controlled by FWS.

The property transferred is subject to compliance by the FWS with the provisions of the National Environmental Policy Act of 1969, as amended, including the preparation of an environmental impact statement if required. The Property is transferred subject to compliance by the FWS with Section 106 of the National Historic Preservation Act of 1966, and Executive Order 11593.

Mr. Thomas E. Lederle, Chief, ACSIM BRAC Division, U.S. Army, 600 Army Pentagon, Washington D.C. 20310 will act for the U.S. Army in arranging for the transfer of custody and accountability of the Property and in other matters related to the transfer.

A copy of our letter of same date to the U.S. Army is enclosed for your information. It is requested that you acknowledge receipt of this communication on the enclosed copy of this letter in the space provided, return it to this office, and that such steps as necessary be taken by your Agency to consummate the transaction.

Sincerely,

Melvin E. Freeman, Director
Real Property Utilization and Disposal
Division (7PZ)

Enclosures

Receipt acknowledged:

Name David Allard

Title Realty Specialist

Date 2/2/2015

cc: Mr. Thomas E. Lederle
Chief, ACSIM BRAC Division
600 Army Pentagon
Washington D.C. 20310-0600

Subject:	**Final Minutes, Monthly Managers' Meeting (MMM), Longhorn Army Ammunition Plant (LHAAP)**
Location of Meeting:	**LHAAP Site Trailer**
Date of Meeting:	**23 October 2019– 10:30 AM Central Daylight Time (CDT)**

Attendees:

Army BRAC:	Rose M. Zeiler (RMZ)
USEPA:	Rich Mayer (RM), Dorelle Harrison and Kent Becher (KB)-USGS Liaison
AEC:	Troy Darr (TD) and Amanda Sherman (AS)
TCEQ:	April Palmie (AP)
USFWS:	Paul Bruckwicki (PB)
USACE:	Aaron Williams (AW) – on the phone
Bhate:	Kim Nemmers (KN) and Scott Beesinger (SB)
APTIM:	Bill Foss (BF), Praveen Srivastav (PS), and Greg Jones

Action Items

Bhate/APTIM: Line to 18WW17 Line Replacement - KN stated that the replacement would occur the first full week in November 2019. KN stated that the line would be double-walled. SB stated that approximately 350 feet of line would be replaced.

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

RM stated that Ms. Caroline Baier-Anderson from the U.S. Environmental Protection Agency (USEPA) Headquarters would be at LHAAP during the first full week of November to see field work. RM wondered if HDR, Inc. (HDR) might be out doing the additional investigation at LHAAP-47. RMZ stated that HDR might be out then.

KN explained that the Groundwater Treatment Plant (GWTP) is currently being run in a batch fashion since the blower broke. KN stated that a sample is collected between the ion exchange vessels for rush turn around for volatile organic compounds. KN stated that the results are compared to the maximum contaminant levels or protective concentration limits prior to discharge. KN stated that only compounds being detected are trichloroethene (TCE); cis-1,2-dichloroethene (DCE); and trichloroethane. KN stated that the water is then treated by the second ion exchange vessel prior to discharge to the INF Pond. KN stated that the blower is going to be shipped on November 8, 2019. KN stated that a crane will need to be delivered to move the blower into place. RMZ asked if the data for the effluent was in the MMM data package or if it had yet to be validated. KN confirmed that the data was not validated. RM asked where the water was being discharged. KN and SB stated that the treated groundwater was being discharged to the INF Pond. SB stated that the INF Pond has sufficient volume.

PS provided a field work update. PS explained that the original excavation extent planned for LHAAP-17 was mostly dug and that the site is secured and signs are up. PS stated that soil piles onsite were covered up. PS confirmed that sufficient backfill sources have been identified and that backfilling was planned for the week of November 4, 2019. PS stated that installation of the extraction system above ground, without invasive activities, is being evaluated. PS stated that David Poole, with APTIM Federal Services, Inc. (APTIM), is coming out to LHAAP-17 to evaluate how to build the system above ground. RMZ asked PS about the freeze plan to which PS stated will be part of the evaluation by Mr. Pool when he arrives. BF explained that flexible tubing is planned to be used for much of the piping and that the system may be shut down when freezing temperatures are

expected. BF explained that hard lines near the power drop at the road would be covered with heat tape. PS explained that the area needs to be brush cleared. BF stated that it needs to be determined if anything planned is considered intrusive. AW stated that a detailed plan needed to be prepared so that the Ordnance and Explosives Safety Specialist could review. RMZ asked if the EPA and TCEQ needed to review to which RM stated that the EPA wanted to have a copy. PS stated that he did not think a work plan would be necessary to which BF and RMZ concurred that the document would be more like a drawing showing the plan.

SB explained that the Sherriff's office does a weekly spot on the radio and Sherriff Tom McCool said that a large number of calls came in the day that the first blown in place (BIP) was done. TD asked about the process in place. SB explained that the Sheriff was called and then the Sheriff called the explosive ordnance disposal (EOD) folks. AS asked if information about the BIPs completed (e.g. dates or date range for BIPs) could be placed on the website in a ticker. RMZ said that maybe the website could be updated to state that the BIPs were done and when. AP asked if alerts could be sent out from the website to the public. RMZ said that a public mailing list is available. PS said that he would need to check with his Information Technology Group. TD explained that there are services available free to send group emails if the list is small, to which AP suggested the use of MailChimp. RMZ stated that BIPs sometimes have to occur quickly so post-BIP notification will need to be done. RM stated that the suggestion box might be used in the case that people wanted to be added to a mailing list. PB cautioned notifying of BIPs in advance because it could draw people to come out. RM asked if any of the rounds were considered live. RMZ stated that the EOD personnel were looking for an additive charge or a sulfur smell. RMZ stated that none of the items had these characteristics with the exception of the last item BIP that had an added charge. RMZ explained that the EOD personnel always consider the munitions to be live when they come out. AP asked if the piles of soil onsite were going to be sieved. AW explained that he is scoping the acquisition for sifting of the soil and removal and recycling of the two drums with munitions and explosives of concern (MEC) onsite. AW explained that Ordnance and Explosives Safety Specialist (OESS) personnel were not available so the work had to be contracted out. AS asked when the award date was expected. AW stated February 2020 award.

Action Item: Explore adding a sign-up for updates on the LHAAP website.

PS discussed that excavation to the limits at LHAAP-03 was completed. PS stated that a soil sample was collected at 03WW01 from 6-7 feet depth, which was clean. Area C (original contaminant source) was excavated to 8 feet deep. PS stated that the floor sample was below the cleanup level. However, the composite of the walls was over the limits for arsenic so an additional 1-foot was excavated. A composite sample of the walls was again collected but that was also elevated. PS explained that an additional 2 feet will be excavated but that each wall will be sampled to determine if the elevated metals detections is from one particular wall. PS stated that there is water in the excavation so no digging was completed today.

PS discussed that all injection work was completed at LHAAP-16, except for recirculation of the Mid-Plume and Biobarrier 2. PS stated that bromide was just above baseline in 16EW05 and similar to the baseline results in 16EW07. So, PS explained that a second, 3 day recirculation is occurring. RMZ asked where the issues were at the Biobarrier 1. PS stated that emulsified vegetable oil (EVO) was observed coming up at the tree roots but reducing the injection pressure stopped the issue. PS stated that Biobarrier 3 injections were able to be completed in one day.

PS explained that the direct push technology (DPT) rig was moved to LHAAP-04, which has been slow due to the shallow injections and the requirement of 1,400 gallons in each point. BF stated that the injection pressures were backed down to 5 pounds per square inch. BF stated that EVO was

coming up from one of the steel wells. BF explained that the expandable cap was not good so this became the path of least resistance. After fixing the cap, PS explained that the area is now taking the EVO. PS said that once LHAAP-04 is done, the DPT rig will be demobilized and the injection trailer will be brought back to finish LHAAP-16. BF stated that Mike Martinez took dissolved oxygen (DO) readings in the creek on Tuesday, 10/22/19, and that no issues were identified. PS stated that performance monitoring along the Bayou Biobarrier was just started and SB collected those samples for analysis the day before (October 22, 2019).

PS stated that Remedial Action Operation (RA[O]) sampling is occurring in November 2019 at sites LHAA-67, LHAAP-50, and LHAAP-37. PS asked about moving the groundwater sampling at LHAAP-67 to October. RM and AP concurred. SB stated that RA(O) sampling at LHAAP-50 and LHAAP-37 is tentatively planned for the week of November 18, 2019.

Upon RMZ's request, KN discussed the issue with regard to documenting the depth of pump placement on field forms while collecting groundwater samples. KN explained that SB collects the data on a hard copy for the data to be entered into the database. During this process, an error within the system occurred so that the printed sampling forms showed the wrong depth of the pump inlet. KN asked if the preference was to provide a memorandum for the Administrative Record (AR) that explained the errors and provided the corrected forms or if the revised forms should be provided in the next report with an explanation. AP suggested that both of these occur with an errata to explain the issue and then have the report reference the errata and revised forms in the next report. BF explained that a field tablet was used for some of the past sampling events to record field data. The field tablet had pre-populated screen interval from the database but Bhate Environmental Associates, Inc. (Bhate)/APTIM found that the screen interval from the database was not always correct when compared to screen interval in well construction diagrams and reports. RMZ asked where the pump was placed during sampling when this occurred. SB stated that he always checks the screen interval against his spreadsheet and tables provided by task leads and makes corrections as needed on the forms and in pump placement depth. He always places the pump mid-screen if the water level is above the screen or mid-way between the water level and the bottom of the screen if the water is below the top of the screen (*Note: APTIM's lead sampler Michael Martinez confirmed that he used the spreadsheet/tables to cross-check data in field tablets*). Another issue was that some of the sampling forms printed from the database was showing depth to water in the space for Sample Interval, which would otherwise be the pump inlet depth. SB added that the revised sampling form now contains a spot for pump inlet. PS stated that no tablets will be used going forward and only paper forms will be used, with screen interval space blank so it can be filled in by field staff based on the tables provided by task leads. RMZ stated that this came about because she noticed during the review of the Remedial Action Work Plan (RAWP) for LHAAP-50 that concentrations had significantly decreased in certain wells and the Army wanted to make sure that the same intervals are being sampled. She also noticed that some of the LHAAP-58 Year 4 RAO sampling forms did not have a location to record the pump placement. KN clarified that the forms were revised to include pump placement following comments from the USEPA in October 2018. So, the forms for LHAAP-58 did not have pump placement information until December 2018.

RMZ pointed out that LHAAP-17 had this issue in the original hot spot. SB stated that LHAAP-46, Well 05 had this issue also. RM requested a memorandum to document the issues and then the reports will also discuss the issues. The group then discussed the sampling process based upon the variability of concentrations in some wells depending upon the depth of the pump inlet. RMZ stated that she would like to stop low flow sampling because the samples are not representative of the full 10-foot screened interval. AP agreed. KB then stated that he had completed a pump study at Longhorn which showed increasing concentrations at depth, in particular at MW-14 at LHAAP-18/24. RMZ stated

that low flow was being used due to turbidity issues and we should begin looking at alternatives and include that requirement in the next environmental contract PWS.

BF asked everyone to refer to the Document and Issues Tracking Table dated October 23, 2019.

- **Task 1** (Project Management) - KN stated that the September 2019 MMM minutes were issued final on October 9, 2019. KN stated that the July 2019 Restoration Advisory Board (RAB) minutes would be finalized after the October 2019 meeting later in the day. KN discussed that a new co-chair would be elected at the RAB meeting. RMZ asked if KN had forms for the voting of the new co-chair. KN stated that she did not but that she would get some made before the meeting.
- **Task 3** (LHAAP-03) – PS stated that no documents were in progress but that soil excavation was underway as previously discussed.
- **Task 4** (LHAAP-04) – PS stated that there are no documents in progress but that in-situ bioremediation injections had begun as previously discussed.
- **Task 5** (LHAAP-12) – PS stated that the next RA(O) sampling event would be completed in December 2019 and will include the new well installed in August 2019. PS stated that the data would be available for the February 2020 MMM.
- **Task 6** (LHAAP-16) – PS stated that the baseline sampling data would be provided for the November 2019 MMM and that the initial performance samples for Bayou Biobarrier were collected per the RAWP. BF stated that the Remedial Action Completion Report (RACR) will be prepared following the in-situ bioremediation field work.
- **Task 7** (LHAAP-17) – PS stated that the soil backfilling is planned for the week of November 4, 2019, as previously discussed. BF asked about the RACR for this site. RMZ stated that the RACR discussion needed AW input. AP asked about what document will be provided to the Regulators and recommended that the soil excavation be broken away from the groundwater treatment for the RACR. PS stated that the contracted scope of work includes a RACR. AP stated that once the piping is in for the groundwater extraction system that a RACR should be prepared. RMZ pointed out that the issue is that the RACR approval signifies construction complete, which cannot be obtained for the soils. The team discussed preparing a technical memorandum or separate report for the soil portion. RMZ asked RM whether the EPA could approve remedy construction complete for just groundwater, to which RM concurred. AP stated that there are portions of the soil excavation that can be considered complete also. RMZ stated that PS was preparing documentation for the soil removal for the USACE. AW asked if there could be two separate RACRs under one cover sheet but RMZ pointed out that was not in the contract. RMZ stated that the report could be RACR for Groundwater and progress or status report for soil removal or similar but that AW was working on this documentation requirement.
- **Task 9** (LHAAP-37) – PS stated that the Year 2, 4th quarter validated data, from the August 2019 sampling event, was provided for the October 2019 MMM. PS stated that the next sampling event will be completed in November 2019 and then again in May 2020 because groundwater sampling will become semi-annual going forward.
- **Task 10** (LHAAP-46) – PS stated that the validated data from groundwater sampling completed in August 2019 was provided with the October 2019 data package. PS stated that sampling will become annual with the November 2019 sampling event. RMZ stated that the Operating Properly and Successfully (OPS) Report will not be prepared this year because the dry well (LHSMW20) replaced to the northeast (LHSMW21) had elevated TCE and cis-1,2-DCE. RMZ stated that she was hoping that the well would be reclassified to intermediate. BF stated that the well is slightly deeper but is still considered shallow. BF

said that LHSMW20 was bounding the plume to the north and so the plume is no longer bounded based upon the results for LHSMW21.

- **Task 11** (LHAAP-50) – PS stated that the Draft RAWP/Remedial Design (RD) is planned for distribution to the Regulators in October 2019 with the last set of Army comments currently being addressed. PS stated that the Year 5 RA(O) Report is being prepared and should be delivered to the Regulators in December 2019 following Army Review. PS stated that the annual RA(O) sampling is scheduled for November 2019 with the validated data to be provided at the January 2020 MMM.
- **Task 12** (LHAAP-58) – KN stated that the Year 5 RA(O) Report was still planned for delivery to the Regulators in October 2019. KN stated that the quarterly RA(O) sampling completed in September 2019 was provided with the October 2019 MMM data package.
- **Task 13** (LHAAP-67) – PS stated that the draft Year 5 RA(O) Report was being prepared for Army review. PS asked if the annual RA(O) sampling schedule for November 2019 could be moved up to October 2019 to help with scheduling given the field work underway particularly in November. KN clarified that RA(O) sampling for LHAAP-67 had been completed in October the previous year. RMZ stated that the idea is to obtain samples at approximately the same time (plus or minus 2 weeks) each year so this schedule met those goals. AP, RM, RMZ, and AW concurred with moving the schedule for LHAAP-67 sampling to the last week in October 2019.
- **Task 14** (LHAAP-001-R and –003-R) - KN stated that the Annual Long Term Monitoring Report was submitted to the Regulators on September 23, 2019, and that comments or concurrence had been received. KN asked how the document should be issued. RMZ stated that RM had a comment so the document should be issued as draft final with the comment addressed.
- **Task 16** (GWTP) **–** KN indicated that the 2nd Quarter 2019 GWTP was under Army review and that the 3rd Quarter 2019 GWTP Report was being prepared.
- **Task 17** (LHAAP-18/24) – KN stated that the 2nd Quarter 2019 GWTP Report would have the June and July 2019 groundwater data for LHAAP-18/24.
- **Task 18** (Surface Water) – KN stated that no new surface water data had been collected due to lack of flow.
- **Task 19** (LUC Management Plan) – KN stated that the LUC Management Plan Update was issued to the regulators on October 4, 2019. RMZ discussed how the plan gets signed, and it was determined that the USEPA, Texas Commission on Environmental Quality (TCEQ), and Army would sign in person to avoid the electronic signature. All agreed that the signed page would be discarded if comments were identified by the USEPA or TCEQ.
- **Administrative Record –** PS stated that the next AR update is being prepared with a cutoff of April 1 through June 30, 2019. PS stated that the list would be sent to the Army for review.

Update on other DERP Sites:

- **LHAAP 18/24** – AW stated that the Record of Decision (ROD) review time was extended for the regulators until October 30, 2019. AW stated that the Proposed Plan (PP) was being placed into the AR.
- **LHAAP-29** – AW stated that the PP was being included in the AR. AW stated that the ROD notification was placed in the Marshall News Messenger and Shreveport Times. RMZ explained that no contract will be in place to prepare the RAWP/RD so the requirement to be in the field within 180 days following the ROD will not be able to be done. AP pointed out that this was explained in RMZ's letter.

- **LHAAP-47** – AW stated that the 1st Post-Screening Investigation (PSI) Addendum would be included in the next AR update. AW stated that the 2nd Addendum to the PSI Report was issued to the regulators and that Responses to Comments (RTCs) were underway. AW stated that the draft Work Plan for 10 DPT points around MW25R was issued to the regulators on October 11, 2019. AW stated that the 1,4-dioxane method will be changed, and two intervals will also be sampled at 47WW25R with one of the intervals for dense non-aqueous phase liquids. AW established that the field work is planned for November 4, 2019. AW pointed out that with the field work being completed in early November that issuing a draft Addendum to the PSI Report was too tight and that the schedule for submittal to the regulators needed to be revised. RMZ stated that the report was a secondary document and that a letter would probably not be needed for the schedule revision since none of the submittal dates for the subsequent primary documents would change. However, RMZ stated that she would verify what the Federal Facilities Agreement stated.
- **Five Year Review (FYR)** – AW stated that the FYR was ready to post to the AR. BF asked if a link needs to be placed on the website for the FYR. RMZ concurred that the FYR should be posted with a link. RM asked if documents are missing by sites to which BF concurred. AW said he did not recall the LHAAP Installation Action Plan (IAP) being approved. TD stated that the IAP is a public document that needs to be posted onto the website, but the Community Involvement Plan is not public. TD stated that the IAP is also posted to the AEC website. TD stated that AEC was not able to review all of the IAPs and that this review must be completed prior to putting the IAP on the website.
- **New Contact Update** - LHAAP-18/24, 29, and 47 and continued maintenance for LHAAP-19 landfill and the pipe at LHAAP-46 is being scoped. AW stated that he is trying to see if the additional soil excavation for LHAAP-17 should be included in the new contract scope. RMZ wondered whether it might be called just a MEC action and not an investigation to reduce the process documents and shorten the timeframe. AW stated that the anomalies would be investigated and then the additional soil would be removed. AW asked if the data was available for what remains to assist with scoping of this work. AP stated that this was a good reason to split the documentation of the soil from the groundwater. RMZ stated that this discussion would be taken offline. AS asked if the fill stand at LHAAP-46 would be included in the scope of work also. AW stated that it would be included in the new contract also. AS asked if the munitions debris would be included in the new contract scope and AW concurred. RMZ stated that LHAAP-47 is holding up the contract but that it needs to be wrapped into the contract.

  For LHAAP-46, RMZ said that one of the buildings identified with potential fill pipes had a fire suppression system because of explosives handling. RMZ stated that the site would have had a toluene tank. SB stated that he didn't remember toluene storage and that the tank would have held methylene chloride (MC). RMZ said that she meant MC. PB and SB concurred that the boxes could have contained electrical conduits. RMZ confirmed with PB that the transfer of the site would be held up due to an unresolved issue with the stand pipes to which PB concurred. PB said that he can point out where the fill stands are located. RMZ asked if there was any update on the transfer of the Environmental Condition of Property VII parcels or to the surface water transfer, to which PB stated that there was nothing to report. AW dropped off the call.

USFWS

KN stated that the area had been seeded with a blue stem mixture last spring following application of a herbicide last fall. SB stated that he had discussed LHAAP-19 with Vanessa Neace from Texas

Park and Wildlife and that she had visited the site. SB stated that Vanessa indicated that the site had good cover but that the native grasses we are looking for are not present in sufficient amount. SB stated that Vanessa indicated that grass restoration takes a period of time but that she recommended burning the site in the spring. SB stated that there is no magical number for how long it will take for the grass restoration. SB stated that Vanessa told him that the site was very burnable. RMZ asked if there was any information about the new growth. SB stated that new stuff is growing including a little bit of blue stem, but that there is still too much bahia grass. SB stated that the site was sprayed for bahia grass. RMZ wondered why big blue stem grass is found at site LHAAP-18/24 but not at LHAAP-19. SB stated that the backfill/cap soils used at LHAAP-19 was not topsoil making growth of this type of vegetation difficult. PB concurred that USFWS will complete the burning LHAAP-19 in the spring.

Schedule Next Managers' Meeting

The next MMM will be held on Wednesday, November 20, 2019, at 1:00 pm Central Standard Time (CST) via conference call.

Meeting concluded at 12:45 pm CDT.

ACRONYM LIST

AEC	Army Environmental Command
AP	April Palmie
APTIM	APTIM Federal Services, LLC
AR	Administrative Record
AS	Amanda Sherman
AW	Aaron Williams
BF	Bill Foss
Bhate	Bhate Environmental Associates, Inc.
BIP	Blown in place
BRAC	Base Realignment and Closure
CDT	Central Daylight Time
CST	Central Standard Time
DCE	Dichloroethelene
DERP	Defense Environmental Restoration Program
DO	Dissolved Oxygen
DPT	Direct push technology
EOD	Explosive ordnance disposal
EVO	Emulsified vegetable oil
FYR	Five Year Review
GWTP	Groundwater Treatment Plant
HDR	HDR, Inc.
IAP	Installation Action Plan
KB	Kent Becher
KN	Kim Nemmers
LHAAP	Longhorn Army Ammunition Plant
MC	Methylene chloride
MEC	Munitions and explosives of concern
MMM	Monthly Managers' Meeting
MMRP	Military Munitions Response Program
OESS	Ordnance and Explosives Safety Specialist
OPS	Operating Properly and Successfully

PB	Paul Bruckwicki
PBR	Performance-Based Remediation
PP	Proposed Plan
PS	Praveen Srivastav
PSI	Post-Screening Investigation
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RA(O)	Remedial Action – Operation
RAWP	Remedial Action Work Plan
RD	Remedial Design
RM	Rich Mayer
RMZ	Rose M. Zeiler
ROD	Record of Decision
RTC	Response to Comment
SB	Scott Beesinger
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
TD	Troy Darr
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

LHAAP Data Validated
October MMM Validated Data

GWTP Effluent	*Weekly Perchlorate Sampling – September 2019* Perchlorate (6850)
GWTP Effluent	*Weekly, Bi-Weekly, and Monthly Sampling – September 2019* Ammonia (350.3) Ortho-Phosphate (365.3) Total Organic Carbon (SM5310C) VOC (8260C) Metals (6020A) Hexavalent Chromium (7196A) 1,4-Dioxane (8270D-SIM) Anions (9056)
GWTP Influent	*Monthly Sampling – September 2019* Metals (6020A) Perchlorate (6850) Hexavalent Chromium (7196A)
GWTP Quarterly	*Influent and Effluent – September 2019* Oil and Grease (1664A) Perchlorate (6850) Metals (6020A) 1,4-Dioxane (8270D-SIM) Chemical Oxygen Demand (410.4) VOC (8260C) Anions (9056)
LHAAP-35B(37)	*Year 2 Quarter 4 Remedial Action Operation Sampling - August 2019* VOCs (SW8260)
LHAAP-46	*Year 5 Semiannual Remedial Action Operation Sampling Event #2 - August-September 2019* VOCs (SW8260)
LHAAP-58	*West Plume Quarterly Sampling Event– September 2019* Anions (9056) VOC (8260C) Total Organic Carbon (SM5310C) Metabolic Acids (HPLC-METACIDS) Dechlorinating Bacteria (CENSUS) Dissolved Gases (RSK-175)

GWTP Weekly/Effluent Perchlorate Sampling -September 2019

Location ID: Sample Date:	Units	Daily Maximum Conc	LH18/24-SP650_090419_AIX 9/4/19	LH18/24-SP650_091019_ AIX 9/10/19	LH18/24-SP650_091019_AIX 9/10/19	LH18/24-SP650_091719_AIX 9/17/19	LH18/24-SP650_092419_AIX 9/24/19	LH18/24-SP650_092419_AIX 9/24/19
Location Description			**Collected from a spigot on the discharge of effluent TK-650.**					
			Weekly	Monthly EFF	Weekly	Weekly	Weekly	Quarterly EFF
Perchlorate (6850)								
Perchlorate	µg/L	589	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U

µg/L - micrograms per liter

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

AIX - after ion exchange

GWTP Weekly Sampling - September 2019

Location ID: Sample Date:	Units	Daily Maximum Conc	LH18/24-SP650_090419 9/4/19	LH18/24-SP650_091019 9/10/19	LH18/24-SP650_091719 9/17/19	LH18/24-SP650_092419 9/24/19
Location Description			**GWTP–Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.**			
Ammonia as N (350.3)						
Ammonia as N	mg/L	NV	**7.9**	**9.1**	**6.1**	**10**
Ortho-Phosphate (365.3)						
Ortho-Phosphate	mg/L	NV	**3.03**	**2.83**	**1.9**	**2.23**
Organic Carbon (415.1)						
Total Organic Carbon (TOC)	mg/L	NV	**0.81**	**1.5**	**1.14**	**1.64 J**

mg/L - milligrams per liter

NV - No Value

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

GWTP Bi-Weekly Sampling - September 2019

Location ID: / Sample Date:	Units	Daily Maximum Conc	LH18/24-SP650_090419 9/4/19	LH18/24-SP650_091719 9/17/19
Location Description			**GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Biweekly.**	
Volatile Organic Compounds (8260C)				
1,1,1-Trichloroethane	µg/L	7,230	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	216.9	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	14,032	< 0.5 U	< 0.5 U
1,1-Dichloroethene	µg/L	253	< 0.5 U	< 0.5 U
1,2-Dichloroethane	µg/L	181	**0.51 J**	< 0.5 U
1,2-Dichloropropane	µg/L	5	< 0.5 U	< 0.5 U
Acetone	µg/L	2,395	< 1.0 U	< 1.0 U
Benzene	µg/L	181	< 0.5 U	< 0.5 U
Carbon tetrachloride	µg/L	181	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	47,180	< 0.5 U	< 0.5 U
Chloroform	µg/L	3,615	< 0.5 U	< 0.5 U
Ethylbenzene	µg/L	57,025	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	83.6	< 1.0 U	< 1.0 U
Methylene chloride	µg/L	1,699	< 1.0 U	< 1.0 U
o-Xylene	µg/L	83.6	< 0.5 U	< 0.5 U
Styrene	µg/L	5,987	< 0.5 U	< 0.5 U
Tetrachloroethene	µg/L	180.7	< 0.5 U	< 0.5 U
Toluene	µg/L	4,189	< 0.5 U	< 0.5 U
Trichloroethene	µg/L	181	**1.2**	**1.0**
Vinyl chloride	µg/L	72	< 0.5 U	< 0.5 U
Anions (9056)				
Chloride	mg/L	NV	**557**	**606**
Sulfate	mg/L	NV	**113**	**214**

µg/L - micrograms per liter

mg/L - milligrams per liter

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

NV - No Value

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

GWTP Monthly Effluent Sampling - September 2019

Location ID: Sample Date:	Units	Daily Maximum Conc	LH18/24-SP650_091019 9/10/19
Location Description			GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled monthly
Volatile Organic Compounds (8260C)			
1,1,1-Trichloroethane	µg/L	7,230	< 0.5 U
1,1,2-Trichloroethane	µg/L	216.9	< 0.5 U
1,1-Dichloroethane	µg/L	14,032	< 0.5 U
1,1-Dichloroethene	µg/L	253	< 0.5 U
1,2-Dichloroethane	µg/L	181	< 0.5 U
1,2-Dichloropropane	µg/L	5	< 0.5 U
Acetone	µg/L	2,395	< 1.0 U
Benzene	µg/L	181	< 0.5 U
Carbon tetrachloride	µg/L	181	< 0.5 U
Chlorobenzene	µg/L	47,180	< 0.5 U
Chloroform	µg/L	3,615	< 0.5 U
Ethylbenzene	µg/L	57,025	< 0.5 U
m,p-Xylene	µg/L	83.6	< 1.0 U
Methylene chloride	µg/L	1,699	< 1.0 U
o-Xylene	µg/L	83.6	< 0.5 U
Styrene	µg/L	5,987	< 0.5 U
Tetrachloroethene	µg/L	180.7	< 0.5 U
Toluene	µg/L	4,189	< 0.5 U
Trichloroethene	µg/L	181	**1.1**
Vinyl chloride	µg/L	72	< 0.5 U
Metals (6020A)			
Barium	mg/L	2	**0.155**
Lead	mg/L	0.0046	< 0.00100 U
Selenium	mg/L	0.012	< 0.00250 U
Silver	mg/L	0.003	< 0.000500 U
Hexavalent Chromium (7196A)			
Hexavalent Chromium	mg/L	0.1244	< 0.0100 U
Semi-Volatile Organic Compounds (8270D SIM)			
1,4-Dioxane	µg/L	134.2	**13**

µg/L - micrograms per liter

mg/L - milligrams per liter

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

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

GWTP Monthly Influent Sampling - September 2019

Location ID: Sample Date:	Units	LH18/24-SP140_091019 9/10/19
Location Description		**GWTP – Collected from a spigot on the influent to TK-140. Sampled Monthly.**
Metals (6020A)		
Selenium	mg/L	< 0.00250 U
Silver	mg/L	< 0.00050 U
Hexavalent Chromium (7196A)		
Hexavalent Chromium	mg/L	< 0.0100 U
Perchlorate (6850)		
Perchlorate	µg/L	**4,900**

mg/L - milligrams per liter

µg/L - micrograms per liter

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

GWTP Quarterly Effluent Sampling - September 2019

Location ID: / Sample Date:	Units	Daily Maximum Conc	LH18/24-SP650_092419 9/24/19
Location Description			**GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Quarterly.**
Oil and Grease (1664A)			
Oil & Grease	mg/L	15	< 1.00 U
Chemical Oxygen Demand (410.4)			
Chemical Oxygen Demand	mg/L	200	**6.0 J**
Volatile Organic Compounds (8260C)			
1,1,1-Trichloroethane	µg/L	7,230	< 0.5 U
1,1,2-Trichloroethane	µg/L	216.9	< 0.5 U
1,1-Dichloroethane	µg/L	14,032	< 0.5 U
1,1-Dichloroethene	µg/L	253	< 0.5 U
1,2-Dichloroethane	µg/L	181	< 0.5 U
1,2-Dichloropropane	µg/L	5	< 0.5 U
Acetone	µg/L	2,395	< 2.0 U
Benzene	µg/L	181	< 0.5 U
Carbon tetrachloride	µg/L	181	< 0.5 U
Chlorobenzene	µg/L	47,180	< 0.5 U
Chloroform	µg/L	3,615	< 0.5 U
Ethylbenzene	µg/L	57,025	< 0.5 U
m,p-Xylene	µg/L	83.6	< 1.0 U
Methylene chloride	µg/L	1,699	< 0.5 U
o-Xylene	µg/L	83.6	< 0.5 U
Styrene	µg/L	5,987	< 0.5 U
Tetrachloroethene	µg/L	180.7	< 0.5 U
Toluene	µg/L	4,189	< 0.5 U
Trichloroethene	µg/L	181	**1.0**
Vinyl chloride	µg/L	72	< 0.5 U
Metals (6020A)			
Aluminum	mg/L	1.644	**0.0117**
Antimony	mg/L	NV	**0.00251**
Arsenic	mg/L	0.722	**0.000691 J**
Barium	mg/L	2	**0.104**
Beryllium	mg/L	NV	< 0.00100 U
Cadmium	mg/L	0.0034	< 0.00100 U
Calcium	mg/L	NV	**6.84**
Chromium	mg/L	0.752	**0.000534 J**
Cobalt	mg/L	11.495	**0.000436 J**
Iron	mg/L	2.395	**0.0772 J**
Lead	mg/L	0.0046	< 0.00100 U
Magnesium	mg/L	NV	**20.4**
Manganese	mg/L	15.494	**0.0231**

Nickel	mg/L	0.184	**0.00102 J**
Potassium	mg/L	NV	**1.61**
Selenium	mg/L	0.012	< 0.00250 U
Silver	mg/L	0.003	< 0.00100 U
Sodium	mg/L	NV	**504**
Thallium	mg/L	NV	**0.000337 J**
Vanadium	mg/L	3.592	< 0.00100 U
Zinc	mg/L	0.31	**0.00863**
Mercury	mg/L	NV	< 0.000100 U
Anions (9056)			
Chloride	mg/L	NV	**538**
Sulfate	mg/L	NV	**172**
Semi-Volatile Organic Compounds (8270D SIM)			
1,4-Dioxane	µg/L	134.2	**12.0**

µg/L - micrograms per liter

mg/L - milligrams per liter

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

NV - No Value

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

GWTP Quarterly Influent Sampling - September 2019

Location ID: / Sample Date:	Units	LH18/24-SP140_092419 9/24/19
Location Description		**GWTP – Collected from a spigot on the influent to TK-140. Sampled Quarterly.**
Oil and Grease (1664A)		
Oil & Grease	mg/L	< 1.00 U
Chemical Oxygen Demand (410.4)		
Chemical Oxygen Demand	mg/L	**18**
Perchlorate (6850)		
Perchlorate	µg/L	**15,000**
Volatile Organic Compounds (8260C)		
1,1,1,2-Tetrachloroethane	µg/L	< 12 U
1,1,1-Trichloroethane	µg/L	< 12 U
1,1,2,2-Tetrachloroethane	µg/L	< 12 U
1,1,2-Trichloroethane	µg/L	< 12 U
1,1-Dichloroethane	µg/L	< 12 U
1,1-Dichloroethene	µg/L	< 12 U
1,1-Dichloropropene	µg/L	< 12 U
1,2,3-Trichlorobenzene	µg/L	< 12 U
1,2,3-Trichloropropane	µg/L	< 12 U
1,2,4-Trichlorobenzene	µg/L	< 12 U
1,2,4-Trimethylbenzene	µg/L	< 12 U
1,2-Dibromo-3-chloropropane	µg/L	< 12 U
1,2-Dibromoethane	µg/L	< 12 U
1,2-Dichlorobenzene	µg/L	< 12 U
1,2-Dichloroethane	µg/L	**53**
1,2-Dichloropropane	µg/L	< 12 U
1,3,5-Trimethylbenzene	µg/L	< 12 U
1,3-Dichlorobenzene	µg/L	< 12 U
1,3-Dichloropropane	µg/L	< 12 U
1,4-Dichlorobenzene	µg/L	< 12 U
2,2-Dichloropropane	µg/L	< 12 U
2-Butanone	µg/L	< 25 U
2-Chlorotoluene	µg/L	< 12 U
2-Hexanone	µg/L	< 25 U
4-Chlorotoluene	µg/L	< 12 U
4-Isopropyltoluene	µg/L	< 12 U
4-Methyl-2-pentanone	µg/L	< 25 U
Acetone	µg/L	< 25 U
Benzene	µg/L	< 12 U
Bromobenzene	µg/L	< 12 U
Bromochloromethane	µg/L	< 12 U
Bromodichloromethane	µg/L	< 12 U

Bromoform	µg/L	< 12 U
Bromomethane	µg/L	< 12 U
Carbon disulfide	µg/L	< 25 U
Carbon tetrachloride	µg/L	< 12 U
Chlorobenzene	µg/L	< 12 U
Chloroethane	µg/L	< 12 U
Chloroform	µg/L	< 12 U
Chloromethane	µg/L	< 12 U
cis-1,2-Dichloroethene	µg/L	**3,600**
cis-1,3-Dichloropropene	µg/L	< 12 U
Dibromochloromethane	µg/L	< 12 U
Dibromomethane	µg/L	< 12 U
Dichlorodifluoromethane	µg/L	< 12 U
Ethylbenzene	µg/L	< 12 U
Hexachlorobutadiene	µg/L	< 25 U
Isopropylbenzene	µg/L	< 12 U
m,p-Xylene	µg/L	< 25 U
Methylene chloride	µg/L	**10,000**
Naphthalene	µg/L	< 12 U
n-Butylbenzene	µg/L	< 12 U
n-Propylbenzene	µg/L	< 12 U
o-Xylene	µg/L	< 12 U
sec-Butylbenzene	µg/L	< 12 U
Styrene	µg/L	< 12 U
tert-Butylbenzene	µg/L	< 12 U
Tetrachloroethene	µg/L	**73**
Toluene	µg/L	< 12 U
trans-1,2-Dichloroethene	µg/L	**12 J**
trans-1,3-Dichloropropene	µg/L	< 12 U
Trichloroethene	µg/L	**8,900**
Trichlorofluoromethane	µg/L	< 12 U
Vinyl chloride	µg/L	**49**
Metals (6020A)		
Aluminum	mg/L	**0.0495**
Antimony	mg/L	**0.000427 J**
Arsenic	mg/L	**0.00102 J**
Barium	mg/L	**0.973**
Beryllium	mg/L	< 0.00100 U
Cadmium	mg/L	**0.000289 J**
Calcium	mg/L	**44.1**
Chromium	mg/L	**0.00146 J**
Cobalt	mg/L	**0.0120**
Iron	mg/L	**1.00**
Lead	mg/L	< 0.00100 U
Magnesium	mg/L	**35.3**
Manganese	mg/L	**0.714**

Nickel	mg/L	**0.0141**
Potassium	mg/L	**1.29**
Selenium	mg/L	< 0.00250 U
Silver	mg/L	< 0.00100 U
Sodium	mg/L	**223**
Thallium	mg/L	**0.000424 J**
Vanadium	mg/L	< 0.00100 U
Zinc	mg/L	**0.0354**
Mercury	mg/L	< 0.000100 U
Anions (9056)		
Chloride	mg/L	**439**
Sulfate	mg/L	**39.2**
Semi-Volatile Organic Compounds (8270D SIM)		
1,4-Dioxane	µg/L	**20**

µg/L - micrograms per liter

mg/L - milligrams per liter

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

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

LHAAP-37 Year 2 Quarter 4
August 2019

			Location Code	35BWW01				35BWW04		35BWW05	
			Sample ID	35BWW01-190805		35BWW01-190805-FD		35BWW04-190805		35BWW05-190806	
			Sample Date	8/5/2019		8/5/2019		8/5/2019		8/6/2019	
			Location Description	Shallow zone, unimpacted, within site boundary		Shallow zone, unimpacted, within site boundary		Shallow zone, impacted, within site boundary		Shallow zone, impacted, within site boundary	
Parameter	Units	MCL		Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs											
1,1-Dichloroethene	µg/L	7		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5		< 0.5	U	< 0.5	U	**7.9**		1.9	
Trichloroethene	µg/L	5		< 0.5	U	< 0.5	U	0.93	J	**8.6**	
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.

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

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

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

LHAAP-37 Year 2 Quarter 4
August 2019

			Location Code	35BWW07		35BWW08		35BWW09		35BWW10	
			Sample ID	35BWW07-190805		35BWW08-190805		35BWW09-190805		35BWW10-190806	
			Sample Date	8/5/2019		8/5/2019		8/5/2019		8/6/2019	
			Location Description	Shallow zone, unimpacted downgradient		Shallow zone, unimpacted, within site boundary		Shallow zone, impacted outside site boundary		Shallow, unimpacted, within site boundary	
Parameter	Units	MCL		Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs											
1,1-Dichloroethene	µg/L	7		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5		< 0.5	U	< 0.5	U	< 0.5	U	1.6	
Trichloroethene	µg/L	5		< 0.5	U	< 0.5	U	70	J	2.6	
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.

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

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

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

LHAAP-37 Year 2 Quarter 4
August 2019

			Location Code	35BWW11		35BWW12				35BWW13	
			Sample ID	35BWW11-190807		35BWW12-190805		35BWW12-190805-FD		35BWW13-190806	
			Sample Date	8/7/2019		8/5/2019		8/5/2019		8/6/2019	
			Location Description	Shallow zone, unimpacted, within site boundary		Shallow zone, impacted, within site boundary		Shallow zone, impacted, within site boundary		Shallow zone, unimpacted, crossgradient	
Parameter	Units	MCL		Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs											
1,1-Dichloroethene	µg/L	7		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5		< 0.5	U	5.8		6.3		< 0.5	U
Trichloroethene	µg/L	5		< 0.5	U	< 0.5	U	0.53	J	< 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.

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

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

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

LHAAP-37 Year 2 Quarter 4
August 2019

			Location Code	35BWW14		35BWW15		35BWW16		35BWW17	
			Sample ID	35BWW14-190806		35BWW15-190807		35BWW16-190807		35BWW17-190807	
			Sample Date	8/6/2019		8/7/2019		8/7/2019		8/7/2019	
			Location Description	Shallow zone, impacted, within site boundary		Shallow zone, impacted, within site boundary		Shallow zone, impacted, outside site boundary		Shallow zone, unimpacted, within site boundary	
Parameter	Units	MCL		Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs											
1,1-Dichloroethene	µg/L	7		4.2		1.1		0.79	J	< 0.5	UJ
cis-1,2-Dichloroethene	µg/L	70		1.3		0.39	J	< 0.5	U	< 0.5	UJ
Tetrachloroethene	µg/L	5		38		9.7		9.8		< 0.5	U
Trichloroethene	µg/L	5		15		7.6		3.5		< 0.5	UJ
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.

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

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

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

LHAAP-37 Year 2 Quarter 4
August 2019

		Location Code	35BWW18		35BWW19		35BWW20			
		Sample ID	35BWW18-190805		35BWW19-190805		35BWW20-190806		35BWW20-190806-FD	
		Sample Date	8/5/2019		8/5/2019		8/6/2019		8/6/2019	
		Location Description	Shallow zone, unimpacted, outside site boundary		Shallow zone, unimpacted, outside site boundary		Shallow zone, impacted, within site boundary		Shallow zone, impacted, within site boundary	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs										
1,1-Dichloroethene	µg/L	7	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5	< 0.5	U	< 0.5	U	**7.5**		**7.6**	
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	2.1		2	
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.

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

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

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

LHAAP-37 Year 2 Quarter 4
August 2019

			Location Code	35BWW23		35BWW24		35BWW25		35BWW26	
			Sample ID	35BWW23-190806		35BWW24-190807		35BWW25-190807		35BWW26-190806	
			Sample Date	8/6/2019		8/7/2019		8/7/2019		8/6/2019	
			Location Description	Shallow zone, unimpacted, outside site boundary		Shallow zone, unimpacted, outside site boundary		Shallow zone, impacted, outside site boundary		Shallow zone, unimpacted, within site boundary	
Parameter	Units	MCL		Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs											
1,1-Dichloroethene	µg/L	7		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70		< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Tetrachloroethene	µg/L	5		< 0.5	U	< 0.5	U	0.33	J	< 0.5	U
Trichloroethene	µg/L	5		< 0.5	U	1.7		**15**		< 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.

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

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

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

LHAAP-37 Year 2 Quarter 4
August 2019

			Location Code	LHSMW58
			Sample ID	LHSMW58-190807
			Sample Date	8/7/2019
			Location Description	Shallow zone, impacted, within site boundary
Parameter	Units	MCL	Result	Val Qual
VOCs				
1,1-Dichloroethene	µg/L	7	< 0.5	UJ
cis-1,2-Dichloroethene	µg/L	70	< 0.5	UJ
Tetrachloroethene	µg/L	5	6.8	
Trichloroethene	µg/L	5	0.59	J
Vinyl Chloride	µg/L	2	< 0.5	U

Notes:

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

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

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

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

LHAAP-46 Year 5 Semiannual Sampling Event #2
August-September 2019

			Location Code	46WW02		46WW03		46WW05		46WW06	
			Sample ID	46WW02-190812		46WW03-190812		46WW05-190813		46WW06-190813	
			Sample Date	8/12/2019		8/12/2019		8/13/2019		8/13/2019	
			Location Description:	Site 46 - Central, inside site boundary. Intermediate Zone.		Site 46 - Central, inside site boundary.		Site 46 - N, inside site boundary. Intermediate Zone.		Site 46 - W, inside site boundary. Intermediate Zone.	
Parameter	Units	MCL		Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs											
1,1-Dichloroethene	µg/L	7		1.5		< 0.5	U	5.3		< 0.5	U
cis-1,2-Dichloroethene	µg/L	70		1.1		< 0.5	U	4.8		< 0.5	U
Trichloroethene	µg/L	5		17		< 0.5	U	62		< 0.5	U
Vinyl chloride	µg/L	2		< 0.5	U	< 0.5	U	1.2		< 0.5	U

Notes:

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

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

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

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

LHAAP-46 Year 5 Semiannual Sampling Event #2
August-September 2019

		Location Code	46WW07		46WW08				46WW09	
		Sample ID	46WW07-190812		46WW08-190813		46WW08-190813-FD		46WW09-190812	
		Sample Date	8/12/2019		8/13/2019		8/13/2019		8/12/2019	
		Location Description:	Site 46 - N, inside site boundary. Intermediate Zone.		Site 46 - NNW, inside site boundary. Intermediate Zone.		Site 46 - NNW, inside site boundary. Intermediate Zone.		Site 46 - Central, within site boundary. Intermediate Zone.	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs										
1,1-Dichloroethene	µg/L	7	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U

Notes:

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

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

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

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

LHAAP-46 Year 5 Semiannual Sampling Event #2
August-September 2019

		Location Code	46WW11				46WW16		LHSMW19	
		Sample ID	46WW11-190812		46WW11-190812-FD		46WW16-190813		LHSMW19-190812	
		Sample Date	8/12/2019		8/12/2019		8/13/2019		8/12/2019	
		Location Description:	Site 46 - Central, within site boundary.		Site 46 - Central, within site boundary.		Site 46 - N, within site boundary. Intermediate Zone.		Site 46 - Central, within site boundary.	
Parameter	Units	MCL	Result	Val Qual	Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs										
1,1-Dichloroethene	µg/L	7	< 0.5	U	< 0.5	U	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70	< 0.5	U	< 0.5	U	< 0.5	U	4.2	
Trichloroethene	µg/L	5	24		24		< 0.5	U	13	
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.

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

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

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

LHAAP-46 Year 5 Semiannual Sampling Event #2
August-September 2019

			Location Code	LHSMW21		LHSMW23R		LHSMW25
			Sample ID	LHSMW21-190813		LHSMW23R-190903		LHSMW25-190812
			Sample Date	8/13/2019		9/3/2019		8/12/2019
			Location Description:	Site 46 - North Central, within site boundary. Shallow zone.		Site 46 - SE, within site boundary. Intermediate, Replacement for LHSMW23		Site 46 - E, within site boundary. Intermediate zone.
Parameter	Units	MCL		Result	Val Qual	Result	Val Qual	Result	Val Qual
VOCs									
1,1-Dichloroethene	µg/L	7		0.87	J	< 0.5	U	< 0.5	U
cis-1,2-Dichloroethene	µg/L	70		**170**		< 0.5	U	< 0.5	U
Trichloroethene	µg/L	5		**41**		< 0.5	U	< 0.5	U
Vinyl chloride	µg/L	2		0.97	J	< 0.5	U	< 0.5	U

Notes:

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

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

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

µg/L - micrograms per liter

FD - field duplicate

ID - identification

MCL - maximum contaminant limit

Val Qual - validation qualifier

VOCs - volatile organic compounds

LHAAP-58 Remedial Action Operation Validated Data - September 2019

Location ID: / Sample Date:	Units	MCL/MSC	35AWW06_091119 9/11/19	35AWW06_091119_a 9/11/19	35AWW11_091119 9/11/19	35AWW19_091119 9/11/19	35AWW20_091119 9/11/19	35AWW23_091119 9/11/19	LHSMW07_091119 9/11/19
Location Description			Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary. Duplicate	Site 58 - SE, inside site boundary.	Site 58 - S, outside site boundary.	Site 58 - SW, inside site boundary.	Downgradient Western Plume well	Site 58 - SW, outside site boundary.
Location Depth			Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Lab Package			HS19090511						
Total Organic Carbon (415.1/SM5310C)									
Total Organic Carbon	mg/L	NV	**84.9**	**83.8**	**28 J**	**1.19**	**15**	**108**	**3.42**
Volatile Organic Compounds (8260C)									
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**72**	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	10000	< 0.5 U	< 0.5 U	< 0.5 U	**0.92 J**	**550 J**	< 0.5 U	**11**
1,1-Dichloroethene	µg/L	7	**0.92 J**	**0.88 J**	< 0.5 U	**5.3**	**3,900**	**0.70 J**	**46**
1,1-Dichloropropene	µg/L	2.9	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromoethane	µg/L	0.05	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	µg/L	600	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**16**	< 0.5 U	< 0.5 U
1,2-Dichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	**1.2**	**19**	< 0.5 U	**0.67 J**
1,2-Dichloropropane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3,5-Trimethylbenzene	µg/L	5100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**0.95 J**	< 0.5 U	< 0.5 U
1,3-Dichloropropane	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	µg/L	75	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**2.9**	< 0.5 U	< 0.5 U
2,2-Dichloropropane	µg/L	42	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Butanone	µg/L	61000	**46**	**48**	**67**	< 1.0 U	< 1.0 U	**340**	< 1.0 U
2-Chlorotoluene	µg/L	2000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Hexanone	µg/L	6100	**1.6 J**	**1.5 J**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
4-Chlorotoluene	µg/L	2000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	µg/L	10000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Methyl-2-pentanone	µg/L	8200	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Acetone	µg/L	92000	**280**	**280**	**75**	< 1.0 U	< 1.0 U	**380**	< 1.0 U
Benzene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**8.3**	< 0.5 U	< 0.5 U
Bromobenzene	µg/L	2000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromochloromethane	µg/L	4100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromodichloromethane	µg/L	4.6	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromoform	µg/L	36	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromomethane	µg/L	140	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Carbon disulfide	µg/L	10000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**6.0**	< 1.0 U	< 1.0 U
Carbon tetrachloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroethane	µg/L	41000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroform	µg/L	1000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloromethane	µg/L	220	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,2-Dichloroethene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**110**	**7.8**	**1.1**
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromochloromethane	µg/L	34	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromomethane	µg/L	380	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dichlorodifluoromethane	µg/L	20000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	µg/L	700	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Hexachlorobutadiene	µg/L	20	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Isopropylbenzene	µg/L	10000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	10000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Methylene chloride	µg/L	5	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Naphthalene	µg/L	2000	**0.77 J**	**0.81 J**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Butylbenzene	µg/L	4100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Propylbenzene	µg/L	4100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	µg/L	10000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
sec-Butylbenzene	µg/L	4100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Styrene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
tert-Butylbenzene	µg/L	4100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Tetrachloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Toluene	µg/L	1000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**14**	< 0.5 U	< 0.5 U
trans-1,3-Dichloropropene	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**350**	**3.8**	**3.1**
Trichlorofluoromethane	µg/L	31000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Vinyl chloride		2	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**790**	< 0.5 U	**49**
Volatile Fatty Acids (HPLC-METACIDS)									
Acetic Acid	mg/L	NV	NA	**36**	**54**	< 2.0 U	< 2.0 U	**250**	< 2.0 U
Butyric Acid	mg/L	NV	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**180**	< 1.0 U
Lactic Acid	mg/L	NV	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 10 U	< 1.0 U
Propionic Acid	mg/L	51	NA	**170**	**31**	< 1.0 U	< 1.0 U	**1100**	< 1.0 U
Pyruvic Acid	mg/L	NV	NA	< 0.10 U	< 0.10 U	< 0.10 U	< 0.10 U	< 1.0 U	< 0.10 U
Anions (9056A)									
Chloride	mg/L	NV	**917**	**921**	**1,990**	**1,050**	**902**	**857**	**1,820**
Nitrate	mg/L	10	< 0.100 U	< 0.100 U	< 0.100 U	< 0.100 U	< 0.100 U	< 0.100 U	< 0.100 U
Nitrite	mg/L	1	< 0.100 U	< 0.100 U	< 0.100 U	< 0.100 U	< 0.100 U	< 0.100 U	< 0.100 U
Sulfate	mg/L	NV	**1.28 J**	**0.790 J**	**259**	**1,010**	**1,200**	**4.63**	**2,530**
Dissolved Gases (RSK-175)									
Carbon Dioxide	µg/L	NV	**320,000**	**350,000**	**690,000**	**230,000**	**290,000 J**	**590,000**	**340,000**
Ethane	µg/L	NV	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	**0.24 J**	< 0.47 U	**0.20 J**
Ethene	µg/L	NV	< 0.55 U	< 0.55 U	< 0.55 U	< 0.55 U	**5.9**	< 0.55 U	**6.1**
Methane	µg/L	NV	**2,900**	**3,300**	**1300**	**3.0**	**640 J**	**2,700**	**240**
Dechlorinating Bacteria									
BAV1 Vinyl Chloride Reductase	cells/mL	NV	**0.70 J**	NA	< 0.90 U	< 0.5 U	**10300**	**1.10 J**	< 0.5 U
Dehalobacter spp.	cells/mL	NV	< 25.6 U	NA	**115000**	**23600**	**386**	< 13.9 U	**1320**
Dehalococoides	cells/mL	NV	**28.6**	NA	**1240**	**18.4**	**16000**	**326**	**49.8**
tceA Reductase	cells/mL	NV	< 2.60 U	NA	< 0.90 U	**0.70**	< 0.5 U	**3.40**	**0.30 J**
Vinyl Chloride Reductase	cells/mL	NV	< 2.60 U	NA	**80.1**	**1.10**	< 0.5 U	**32.1**	**274**

Blue Highlighting Indicates concentrations above the MCL/MSC

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

NA - Not Analyzed

µg/L - micrograms per liter

mg/L - milligrams per liter

J - Estimated: Between the method detection limit and reporting limit and/or due to discrepancies in meeting certain analyte-specific quality control criteria.

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

NV - No Value

Subject: Draft Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting
Longhorn Army Ammunition Plant (LHAAP)
Location of Meeting: Karnack Community Center, Karnack, Texas
Date of Meeting: October 23, 2019, 6:00 PM Central Daylight Time (CDT)

Meeting Participants:

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

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

Welcome and Introduction

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

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

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

Defense Environmental Restoration

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

LHAAP-50

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

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

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

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

Overview of Sites

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

LHAAP-16

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

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

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

LHAAP-17

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

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

Look Ahead

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

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

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

Groundwater Treatment Plant

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

Surface Water Sampling

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

information is also provided in a handout.

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

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

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

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

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

Next RAB Meeting Schedule and Closing Remarks

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

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

Adjourn

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

October 2019 Meeting Attachments and Handouts:

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

Longhorn Army Ammunition Plant Quarterly Restoration Advisory Board Meeting

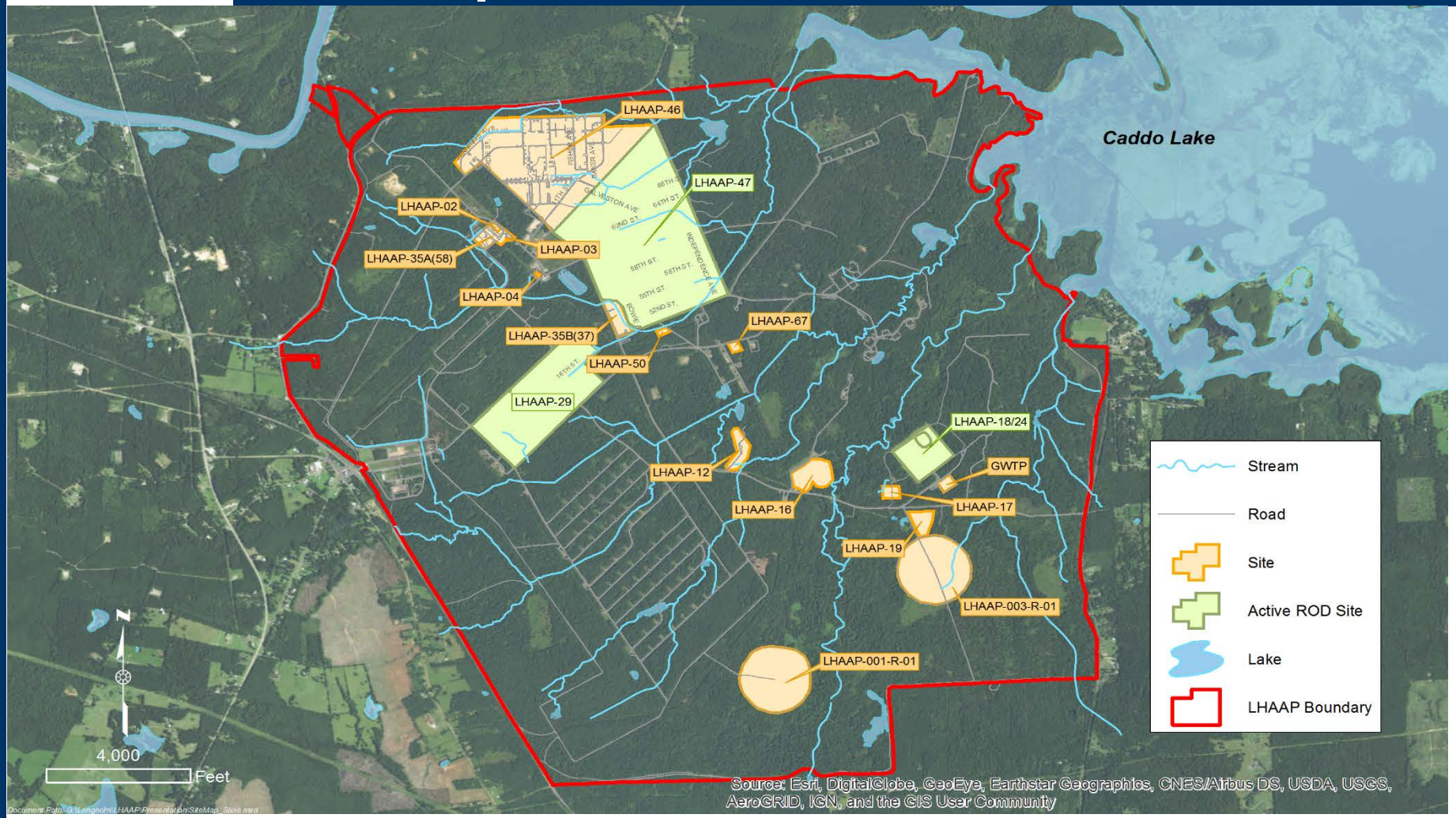
Karnack Community Center
October 23, 2019
6:00 PM CDT

APTIM

bhate

Restoration Advisory Board Meeting

Site Map



Abbreviations and Acronyms

µg/L	Micrograms per liter
DERP	Defense Environmental Restoration Program
DPT	Direct Push Technology
ESD	Explanation of Significant Differences
GPW	Goose Prairie Creek Water Sample
GW-Res	Residential Groundwater
GWTP	Groundwater Treatment Plant
HBW	Harrison Bayou Water Sample
ISB	In-situ bioremediation
LHAAP	Longhorn Army Ammunition Plant
MEC	Munitions and Explosives of Concern
MNA	Monitored natural attenuation
PCL	Protective Concentration Level
PSI	Pre-Screening Investigation
RAB	Restoration Advisory Board
RA(O)	Remedial Action Operation
RAWP	Remedial Action Work Plan
ROD	Record of Decision
TCE	Trichloroethylene
TCEQ	Texas Commission on Environmental Quality
TRRP	Texas Risk Reduction Program
USEPA	U.S. Environmental Protection Agency

Restoration Advisory Board Meeting

Agenda

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

Purpose of the RAB Meeting

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

The Army Wants You to be Informed

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

RAB Administrative Issues

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

Restoration Advisory Board Meeting

LHAAP-50 Contingency RAWP

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

Restoration Advisory Board Meeting

LHAAP-50 Contingency RAWP

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

Restoration Advisory Board Meeting

LHAAP-50 Contingency RAWP Continued

Contingency RAWP

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

Restoration Advisory Board Meeting

Completed Field Work Since Last RAB Meeting

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

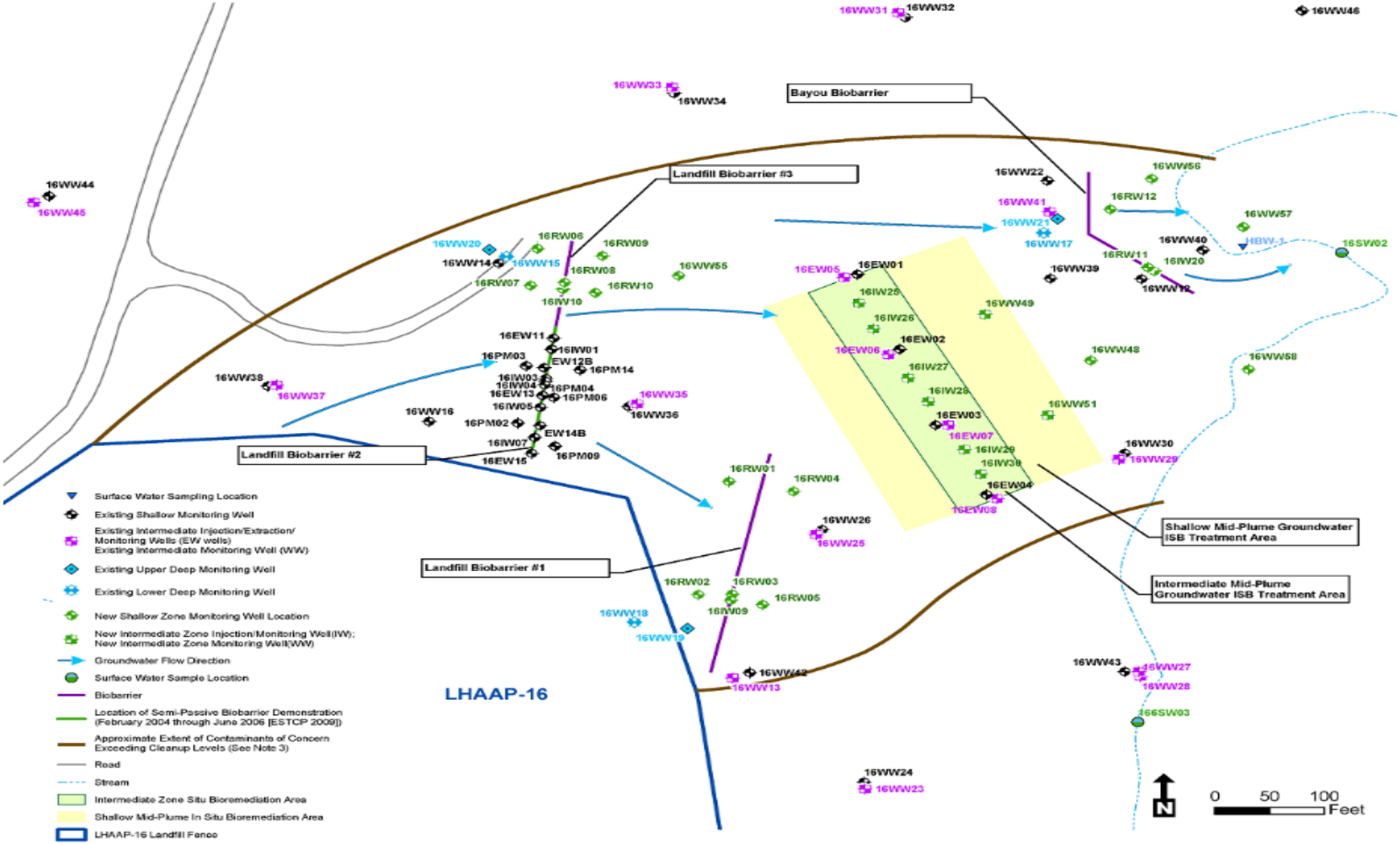
Restoration Advisory Board Meeting

LHAAP-16 Remedial Action Update

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

Restoration Advisory Board Meeting

LHAAP-16 Remedial Action Update



Restoration Advisory Board Meeting

LHAAP-17 Remedial Action Update

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

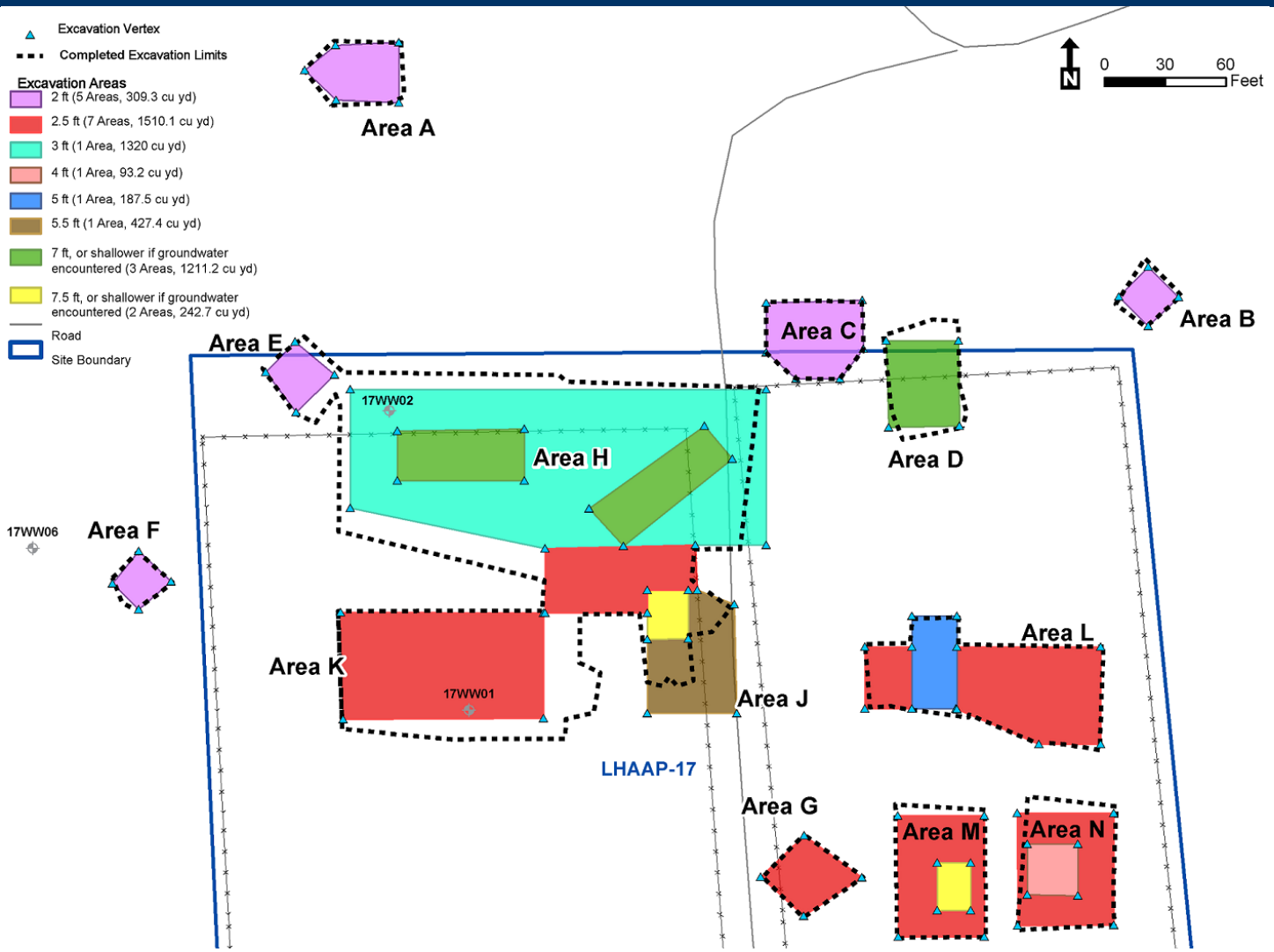
Restoration Advisory Board Meeting

LHAAP-17 Remedial Action Update

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

Restoration Advisory Board Meeting

LHAAP-17 Remedial Action Update



Restoration Advisory Board Meeting

Documents in Process

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

Restoration Advisory Board Meeting

3 Month Look Ahead - Field Work by Bhate Team

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

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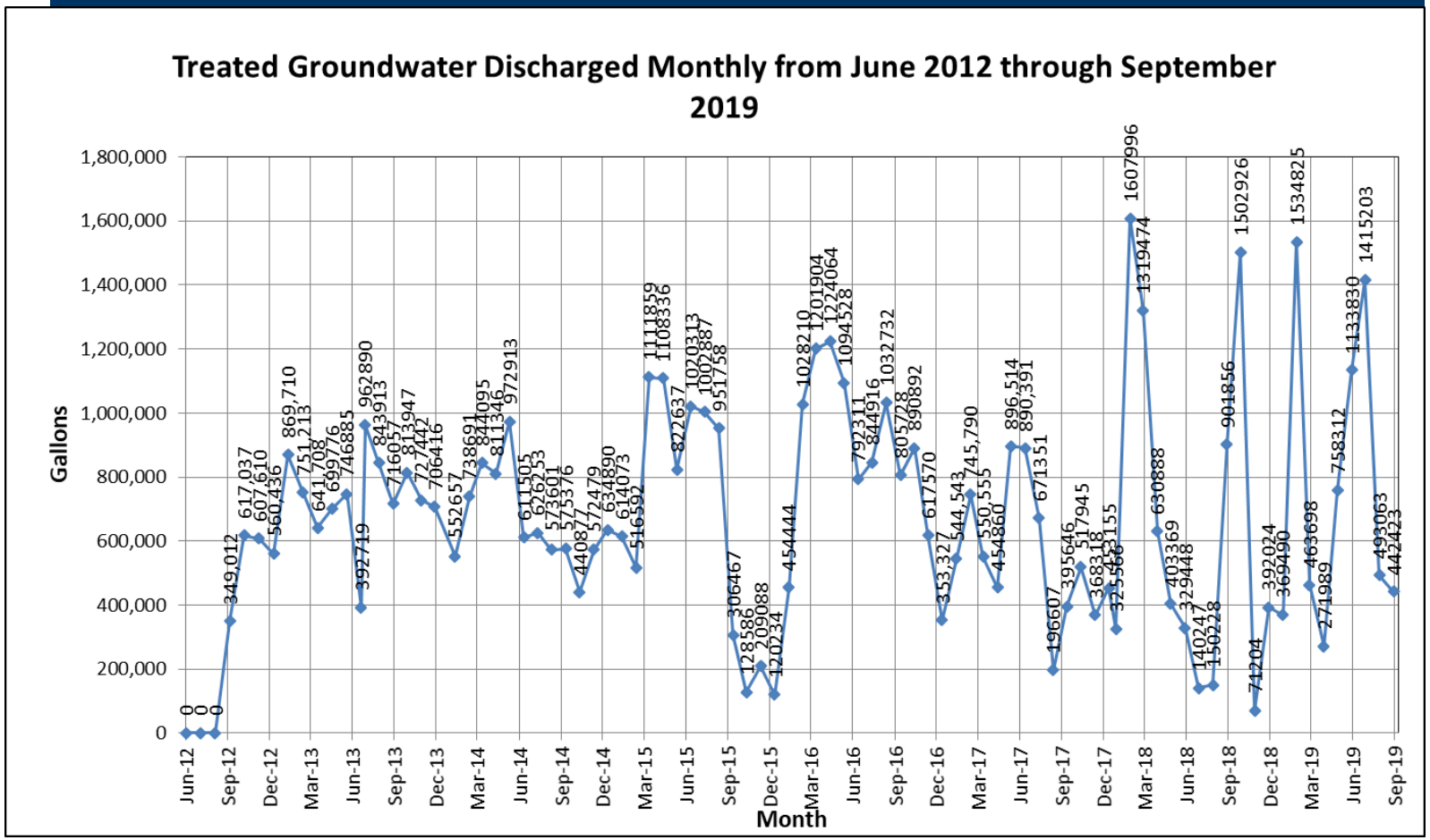
3 Month Look Ahead – Documents by Bhate Team

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

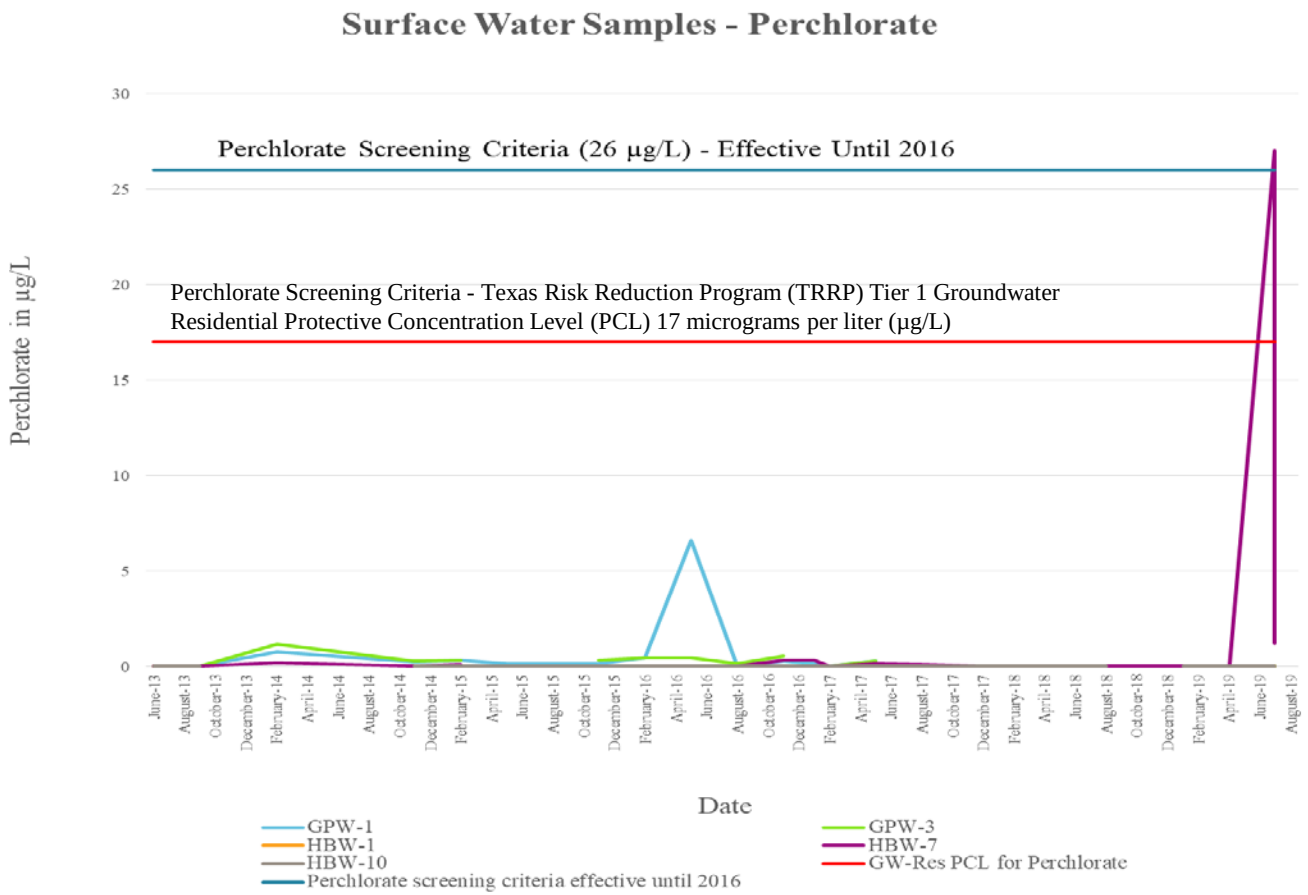
Restoration Advisory Board Meeting

GWTP Update



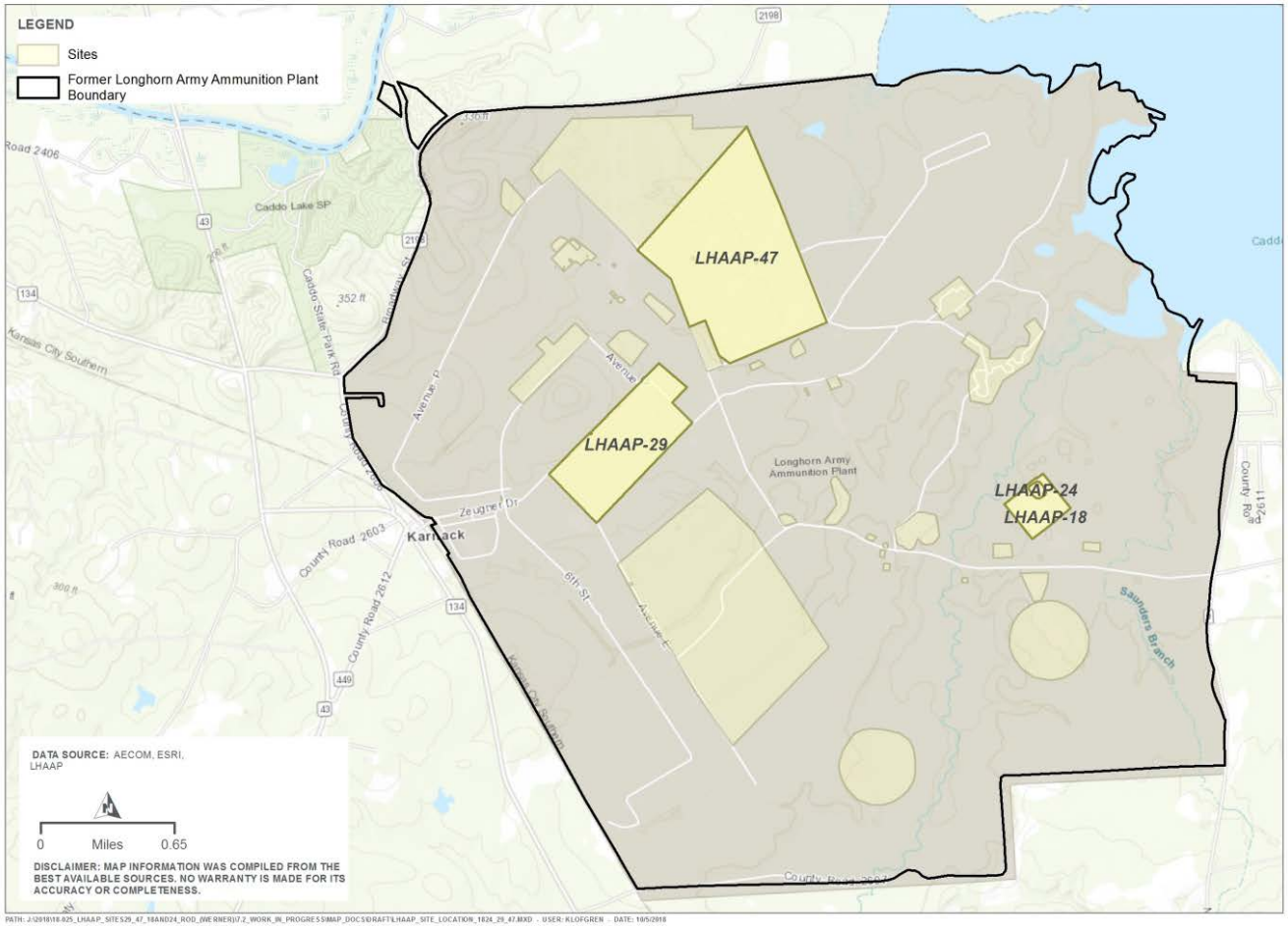
Restoration Advisory Board Meeting

Surface Water Sample Results



Note: Surface water at HBW-7 had a detection of 27 µg/L from a sample collected on 11 July 2019. Surface water at HBW-7 was resampled 19 days later (30 July 2019) with a detection of 1.2 J µg/L.

LHAAP-18/24, 29, 47 Status Update



LHAAP-18/24 & 29 Document Status

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

LHAAP-47 Field Work Plan

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

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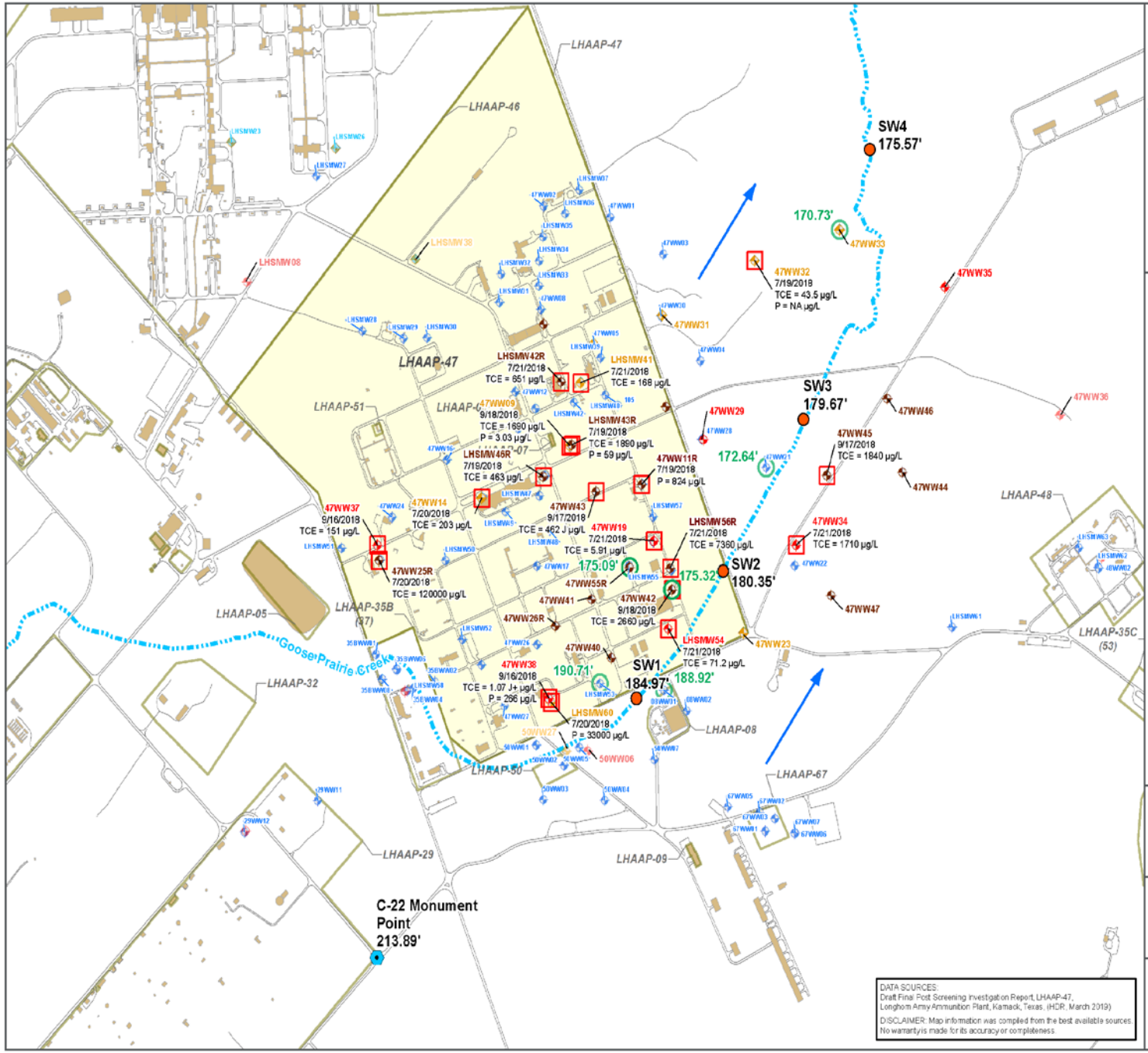
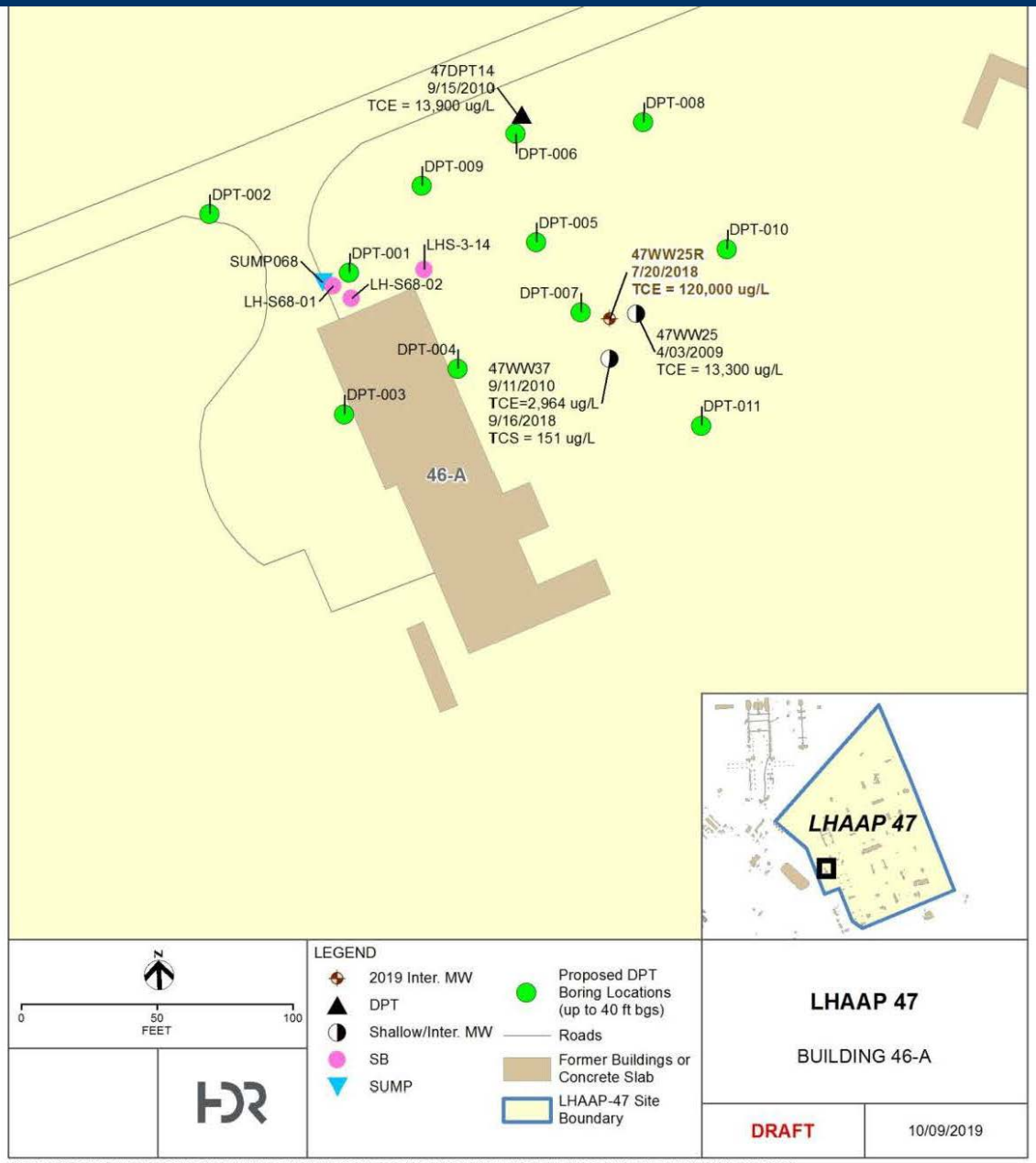


SURFACE WATER SAMPLE LOCATIONS AND NEARBY MONITORING WELLS
LHAAP 47
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

FIGURE 2-1

LHAAP-47 Field Work Plan



Next RAB Meeting Schedule & Closing Remarks

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

Groundwater Treatment Plant - Processed Groundwater Volumes

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

Processed Water Discharged Data

(in gallons)

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

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

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

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

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

Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13
617,037	607,610	560,436	869,710	751,213	641,708	699,776	746,885	392,719	962,890	843,913	716,057

Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14
813,974	727,442	706,416	552,657	738,691	844,095	811,346	972,913	611,505	626,253	573,601	575,376

Oct-14	Nov-14	Dec-14	Jan-15	Feb-15	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15
440,877	572,479	634,890	614,073	516,592	1,111,859	1,108,336	822,637	1,020,313	1,002,887	951,758	306,467

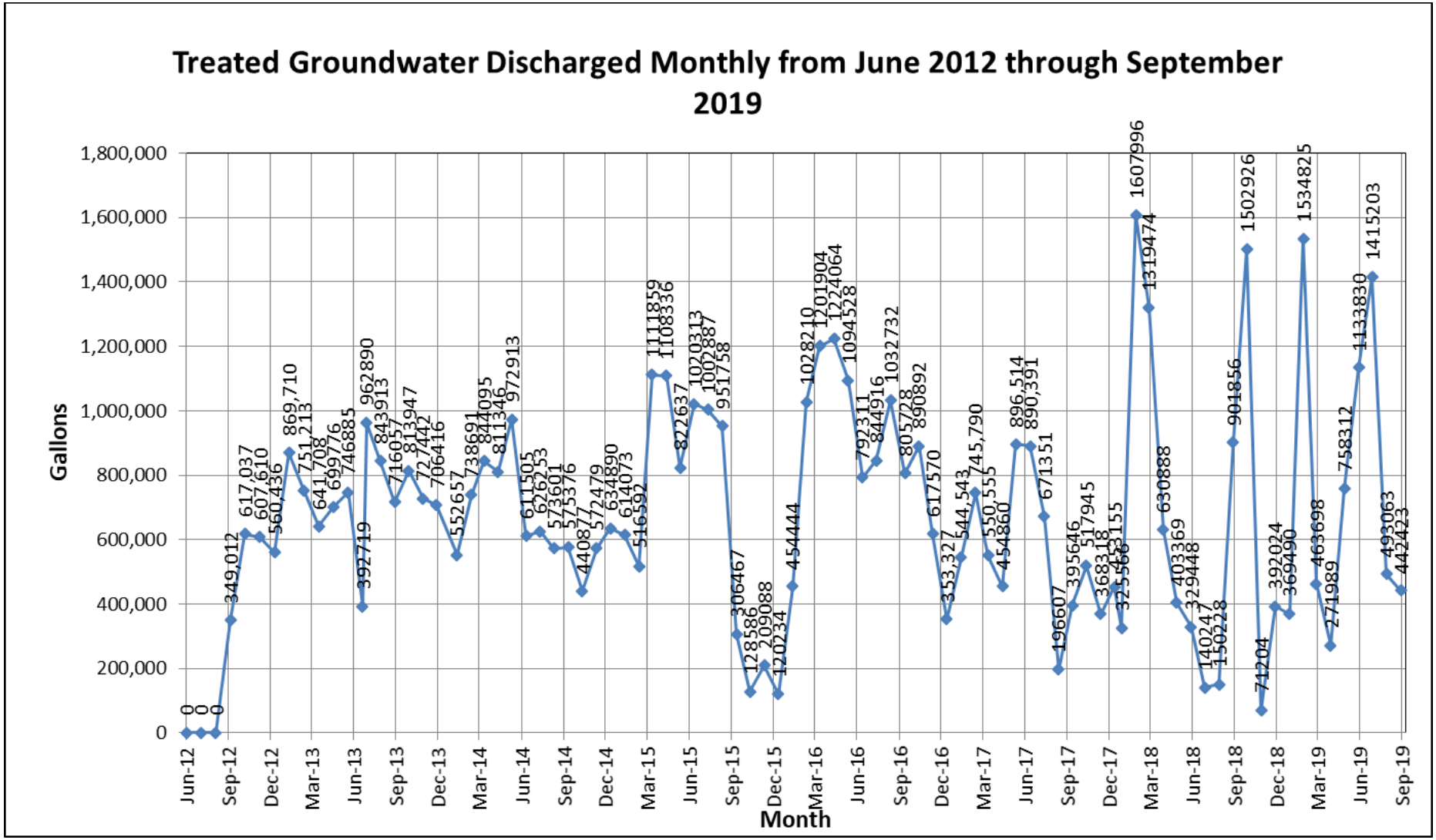
Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16
128,586	209,088	120,234	454,444	1,028,210	1,201,904	1,224,064	1,094,528	792,311	844,916	1,032,732	805,728

Oct-16	Nov-16	Dec-16	Jan-17	Feb-17	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17
890,892	617,570	353,327	544,543	745,790	550,555	454,860	896,514	890,391	528,538	195,198	961,324

Oct-17	Nov-17	Dec-17	Jan-18	Feb-18	Mar-18	Apr-18	May-18	Jun-18	Jul - 18	Aug-18	Sep-18
517,945	368,318	453,155	325,566	1,607,996	1,319,474	630,888	403,369	329,448	140,247	150,228	901,856

Oct-18	Nov-18	Dec-18	Jan-19	Feb-19	Mar-19	Apr-19	May-19	June-19	Jul - 19	Aug-19	Sep-19
1,502,926	71,204	392,024	369,490	1,534,825	463,698	271,989	758,312	1,133,830	1,415,203	493,063	442,423

*Indicates Estimate


Treated Groundwater Discharged Monthly from June 2012 through September 2019
Gallons
Month
1,800,000
1,600,000
1,400,000
1,200,000
1,000,000
800,000
600,000
400,000
200,000
0
Jun-12
Sep-12
Dec-12
Mar-13
Jun-13
Sep-13
Dec-13
Mar-14
Jun-14
Sep-14
Dec-14
Mar-15
Jun-15
Sep-15
Dec-15
Mar-16
Jun-16
Sep-16
Dec-16
Mar-17
Jun-17
Sep-17
Dec-17
Mar-18
Jun-18
Sep-18
Dec-18
Mar-19
Jun-19
Sep-19
0
0
0
349,012
617,037
607,610
560,436
869,710
751,213
641,708
699,776
746885
392719
962890
843913
716057
813947
72,7442
706416
552657
738691
844095
811346
972913
611505
626253
573601
575376
440877
572479
634890
614073
516592
1111859
1108336
822637
1020313
1002887
951758
306467
128586
209088
120234
454444
1028210
1201904
1224064
1094528
792311
844916
1032732
805728
890892
617570
353,327
544,543
745,790
550,555
454860
896,514
890,391
671351
196607
395646
517945
368318
325568
1607996
1319474
630888
403369
329448
140247
150228
901856
1502926
71204
392024
369490
1534825
463698
271989
758312
1133830
1415203
493063
442423

Water Discharge Location and Volume (Gallons)

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

Month	Total Combined to Harrison Bayou	LHAAP-18/24 Sprinklers	GWTP To INF Pond	INF Pond to Harrison Bayou	Contract Hauled Off-Site
Jun-19	1,133,830	0	0	847,918	0
Jul -19	1,415,203	0	0	903,001	0
Aug-19	374,629	0	118,434	0	0
Sep-19	0	0	442,423	0	0

Harrison Bayou and Goose Prairie Creek – Perchlorate Data

Surface water samples are collected quarterly from each location in Harrison Bayou and Goose Prairie Creek, unless the sampling location is dry.

Surface Water Sample Data (in micrograms per liter)

Quarter	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st
Creek Sample ID	**Jul 1999**	**Sep 1999**	**Feb 2000**	**Apr 2000**	**Aug 2000**	**Dec 2000**	**Feb 2001**	**Apr 2001**	**July 2001**	**Oct 2001**	**Jan 2002**
GPW-1	<1.0U	-	4	<4.0 U	<4.0 U	<4.0 U	-	2.65	<4.0 U	<4.0 U	<4.0 U
GPW-3	<1.0U	<4.0 U	17	8	<4.0 U	<4.0 U	-	2.28	<4.0 U	<4.0 U	<4.0 U
HBW-1	-	<80.0 U	310	23	-	-	<4.0 U	-	<4.0 U	<4.0 U	<4.0 U
HBW-7	-	<8.0 U	370	110	-	-	<4.0 U	-	<4.0 U	<4.0 U	<4.0 U
HBW-10	-	<8.0 U	905	650	<4.0 U	-	<4.0 U	-	<4.0 U	-	-

Quarter	2nd	3rd	4th	1st	2nd	3rd	3rd	4th	2nd	3rd	4th
Creek Sample ID	**June 2002**	**Sept 2002**	**Dec 2002**	**Feb 2003**	**June 2003**	**Aug 2003**	**July 2004**	**Dec 2006**	**May 2007**	**Aug 2007**	**Dec 2007**
GPW-1	<4.0 U	<4.0 U	18.3	18.6	59.9	-	2.25	-	<1.0 U	<1.0 U	10.7
GPW-3	<4.0 U	<4.0 U	5.49	12.6	14.7	-	2.2	-	<1.0 U	<1.0 U	7.48
HBW-1	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	99.3	<0.2U	<1.0 U	<1.0 U	122	<1.0 U
HBW-7	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	<4.0 U	<0.2U	<1.0 U	<1.0 U	1.02	<1.0 U
HBW-10	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	-	<0.2U	<1.0 U	<1.0 U	<1.0 U	<1.0 U

Quarter	1st	2nd	3rd	4th	2nd	3rd	3rd	3rd	4th	1st	2nd
Creek Sample ID	**Mar 2008**	**Jun 2008**	**Sep 2008**	**Dec 2008**	**May 2009**	**Jul 2009**	**Aug 2009**	**Sep 2009**	**Dec 2009**	**Mar 2010**	**Jun 2010**
GPW-1	27	<0.5U	<0.5U	<0.22U	16	<4U	NS	<1.2U	3.7	1.3J	<0.6U
GPW-3	21.9	9.42	1.1	<0.22U	8.9	<4U	NS	<0.6U	2.8	1.8J	<0.6U
HBW-1	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	NS	<1.5U	<0.275U	1.5U	<0.6U
HBW-7	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	24	<1.2U	<0.275U	1.5U	<0.6U
HBW-10	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	NS	<1.5U	<0.275U	1.2U	<0.6U

Quarter	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st
Creek Sample ID	**Sep 2010**	**Dec 2010**	**Mar 2011**	**Jun 2011**	**Sep 2011**	**Dec 2011**	**Mar 2012**	**Jun 2012**	**Not Applicable**	**Jan & Feb 2013**	**Mar 2013**
GPW-1	dry	<0.1U	8.7	dry	dry	1.76	0.163J	dry	NS	1.65	0.735
GPW-3	dry	0.199J	0.673	dry	dry	1.31	0.261	dry	NS	1.74	0.754
HBW-1	dry	<0.1U	<0.2U	dry	dry	<0.1U	0.1U	dry	NS	<0.2U	<0.2U
HBW-7	dry	<0.1U	<0.2U	dry	dry	0.171J	0.1U	dry	NS	<0.2U	<0.2U
HBW-10	dry	<0.1U	<0.2U	dry	dry	<0.1U	0.1U	dry	NS	<0.2U	<0.2U

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

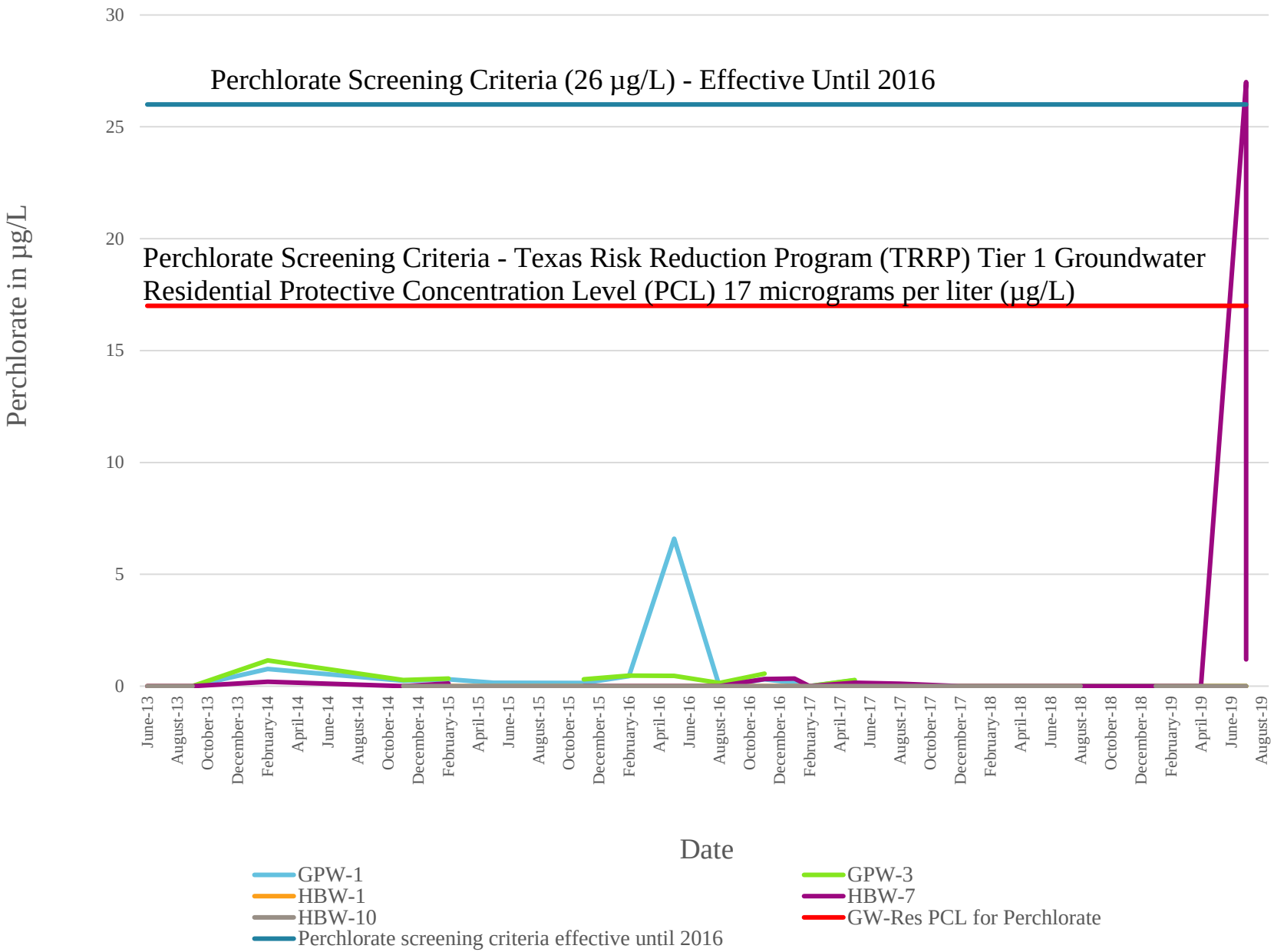
Quarter	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	3rd
Creek Sample ID	**Feb 2016**	**May 2016**	**Aug 2016**	**Nov 2016**	**Feb 2017**	**May 2017**	**Aug 2017**	**Dec 2017**	**Mar 2018**	**June 2018**	**August 2018**
GPW-1	0.447	6.59	<0.2 U	0.301 J	<1 U	0.263	dry	<4.0 U	<4.0 U	dry	<2.0 U
GPW-3	0.474	0.457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

NS – not sampled U – non-detect J – Estimated Dry – no surface water

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

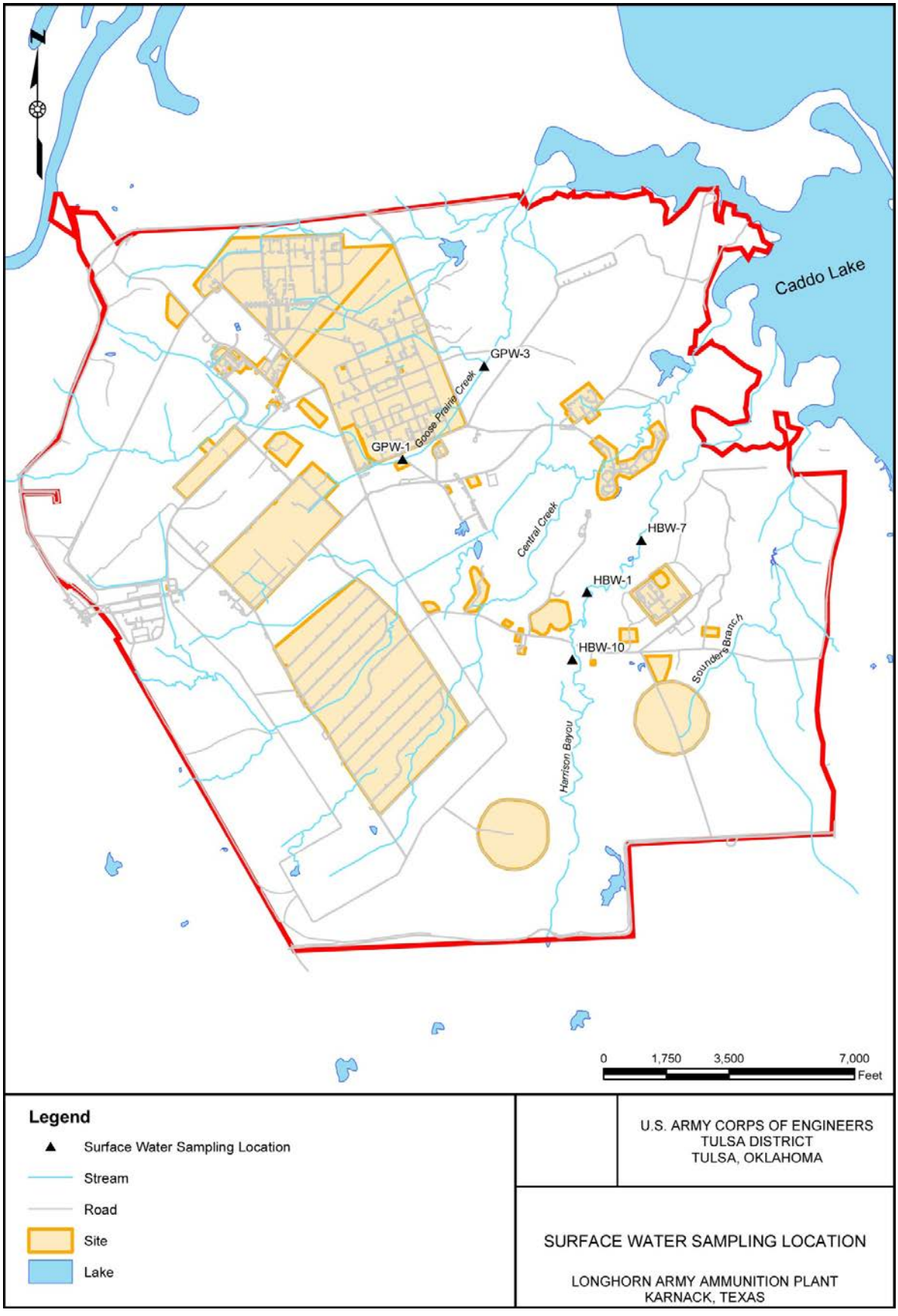
NS – not sampled U – non-detect J – Estimated Dry – no surface water

Surface Water Samples - Perchlorate



Note: Surface water at HBW-7 had a detection of 27 µg/L from a sample collected on 11 July 2019. Surface water at HBW-7 was resampled 19 days later (30 July 2019) with a detection of 1.2 J µg/L.

Longhorn Army Ammuntion Plant Creek Sampling Locations



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

December 5, 2019

DAIM-ODB-LO

Mr. Rich Mayer
US Environmental Protection Agency
Federal Facilities Section R6
1201 Elm Street, Suite 500
Dallas, Texas 75270-2102

Re: Draft Final 5th Annual Remedial Action Operations Report (September 2018-August 2019) LHAAP-35A (58), Shops Area Longhorn Army Ammunition Plant, Karnack, Texas, December 2019

Dear Mr. Mayer,

The above-referenced document is being transmitted to you for your records and includes revisions based upon your comments on the Draft. In accordance with the FFA, the Draft Final will be considered Final after 30 days without further comment.

The document was revised by Bhate Environmental Associates, Inc., (Bhate) 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
P. Bruckwicki, Caddo Lake NWR, TX
A. Williams, USACE, Fort Worth District, (Located in Tulsa, OK)
A. Sherman, USAEC, San Antonio, TX
K. Nemmers, Bhate, Lakewood, CO (for project files)

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

December 5, 2019

DAIM-ODB-LO

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

Re: Draft Final 5th Annual Remedial Action Operations Report (September 2018-August 2019) LHAAP-35A (58), Shops Area Longhorn Army Ammunition Plant, Karnack, Texas, December 2019

Dear Ms. Palmie,

The above-referenced document is being transmitted to you for your records and includes revisions based upon EPA comments on the Draft. In accordance with the FFA, the Draft Final will be considered Final after 30 days without further comment.

The document was revised by Bhate Environmental Associates, Inc., (Bhate) 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:
R. Mayer, USEPA Region 6, Dallas, TX
P. Bruckwicki, Caddo Lake NWR, TX
A. Williams, USACE, Fort Worth District, (Located in Tulsa, OK)
A. Sherman, USAEC, San Antonio, TX
K. Nemmers, Bhate, Lakewood, CO (for project files)

Responses to Comments on
Draft 5th Annual Remedial Action Operations (September 2018 – August 2019) at LHAAP-35A(58), Shops Area
Longhorn Ammunition Plant, Karnack, Texas
October 2019

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commenter Agrees (A) with response or Does not Agree (D) with response.

Comment #	Section/ Paragraph	Comment (December 2, 2019)	C, D, E or X[1]	Response (December 4, 2019)	A or D[2]	Comment	C, D, E or X[1]	Response	A or D[2]
Reviewer: Rich Mayer, USEPA **Respondent:** Kim Nemmers, Bhate									
1	Figure 7	Please include the well results for the wells that were sampled but there were no VOCs detections. From the reviewing the figure, it appears that certain wells were not sampled, such as monitoring well 35AWW12, even though they were.	E	Figure 7 shows only the two Intermediate wells. Figure 6 shows shallow wells including 35AWW12. No changes made.					
2	Table 1	The table is missing the heading information for the 4th column. EPA assumes it is the screened interval depths.	C	Missing heading is corrected to state: ”Screen Intervals (ft from Top of Casing)” in Draft Final Table 1.					
3	General Comment	It should be noted that monitoring wells 35AWW20 and LHSMW07 in the Western Plume contain 1,4-dioxane above the TCEQ residential PCL. This contaminant is not currently a COC but may be added in the future. The effect of EISB on this potential contaminant has not been shown in any reporting to date.	C	Noted. The effect of EISB on 1,4-dioxane will be evaluated in the next 5YR.					
		END of USEPA Comments							
Reviewer: April Palmie, TCEQ **Respondent:** Kim Nemmers, Bhate									
		TCEQ reviewed the Draft 5th Annual RAO for LHAAP 35A(58) and didn’t have any comments on the report. TCEQ accepts the recommendations on page 5-3.		Noted.					
		END of TCEQ Comments							

DRAFT FINAL
YEAR 5 ANNUAL REMEDIAL ACTION OPERATION REPORT (SEPTEMBER 2018-AUGUST 2019)
LHAAP-35A (58) SHOPS AREA
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

December 2019

Prepared For:

U.S. Army Corps of Engineers
Tulsa District
1645 S 101 E Avenue
Tulsa, Oklahoma 74128-4609

Contract No: W9128F-13-D-0012
Delivery Order No: W912BV17F0150
Bhate Project No.: NWO1312.0150.012.0001.03

Prepared By:

1608 13th Avenue South, Suite 300
Birmingham, Alabama 35205
1-800-806-4001 • www.bhate.com

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YEAR 5 ANNUAL REMEDIAL ACTION OPERATION REPORT (SEPTEMBER 2018-AUGUST 2019) LHAAP-35A (58) SHOPS AREA LONGHORN ARMY AMMUNITION PLANT KARNACK, TEXAS

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ACRONYMS AND ABBREVIATIONS

<	Less than
%	Percent
AECOM	AECOM Technical Services, Inc.
APTIM	APTIM Federal Services, LLC
bgs	Below ground surface
Bhate	Bhate Environmental Associates, Inc.
COC(s)	Contaminant(s) of concern
CSM	Conceptual site model
DCA	Dichloroethane
DCE	Dichloroethene
DHB	Dehalobacter
DHC	Dehalococcoides
DO	Dissolved oxygen
EISB	Enhanced In-situ Bioremediation
ESD	Explanation of Significant Differences
ft	Feet (or foot)
HPLC	High Performance Liquid Chromatography
IWWP	Installation-Wide Work Plan
J	Data qualifier denoting an estimated concentration
LHAAP	Longhorn Army Ammunition Plant
LUC	Land Use Control
MC	Methylene chloride
MCL	Maximum contaminant level
µg/L	Micrograms per liter
mg/L	Milligrams per liter
mL	Milliliter
MNA	Monitored Natural Attenuation
MSC	Medium-specific concentration

msl	Mean sea level
mV	Millivolt
No.	Number
ORP	Oxidation-reduction potential
PCE	Tetrachloroethene
PCBs	Polychlorinated biphenyls
pH	Potential of hydrogen
RA(O)(s)	Remedial Action Operation(s)
RAO(s)	Remedial Action Objective(s)
RACR	Remedial Action Completion Report
RAWP	Remedial Action Work Plan
RD	Remedial Design
ROD	Record of Decision
Shaw	Shaw Environmental, Inc.
SVOC(s)	Semi-volatile Organic Compound(s)
TCA	Trichloroethane
TCE	Trichloroethene
TM	Technical Memorandum
TOC	Total organic carbon
U.S.	United States
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VC	Vinyl chloride
VFA	Volatile Fatty Acids
VOC(s)	Volatile Organic Compound(s)

1 INTRODUCTION

The United States (U.S.) Army Corps of Engineers (USACE), Tulsa District, contracted Bhate Environmental Associates, Inc. (Bhate), to perform remedial actions at multiple sites at the former Longhorn Army Ammunition Plant (LHAAP) in Karnack, Texas, under the Huntsville District's Architect-Engineer Indefinite Delivery Contract Number (No.) W9128F-13-D-0012, Delivery Order No. W912BV17F0150. Bhate is performing groundwater and surface water monitoring as part of Remedial Action Operations (RA(O)s) for the Enhanced In-situ Bioremediation (EISB) and Monitored Natural Attenuation (MNA) groundwater remedy at LHAAP-35A (58). Remedial activities are required under the Record of Decision (ROD) issued for LHAAP-35A (58) in September 2010 (Shaw Environmental, Inc. [Shaw], September 2010).

The Remedial Action Work Plan (RAWP) for the entire site was prepared in August 2013 in accordance with the ROD and was implemented in September 2013 (AECOM Technical Services, Inc. [AECOM], August 2013). Within the eastern plume, EISB was performed in September 2013. The MNA remedy for the western plume at this site, as presented in the ROD, calls for an evaluation of the remedy after 2 years of implementation. The ROD also provides for implementation of a contingency remedy to enhance MNA if it is found to be ineffective. RA(O) implementation for the western plume was completed between October 2013 and October 2015 and the Year 2 RA(O) report was finalized in May 2016 (AECOM, May 2016). After 2 years of MNA, the Year 2 RA(O) report concluded that MNA was ineffective and implementation of a contingency remedy was appropriate. A RAWP for the contingency remedy for the western plume was developed and finalized (Bhate, January 2018). The contingency remedy for the western plume is EISB injections, which was implemented in March and April 2018, as documented in the Remedial Action Completion Report (RACR) (Bhate, August 2018).

Groundwater monitoring at LHAAP-35A (58) was conducted quarterly following EISB injections at the eastern plume for 2 years but is now semi-annual. The contingency remedy within the western plume requires that quarterly sampling be completed in select performance monitoring wells for 2 years. This report includes the second, third, fourth, and fifth quarterly sampling events in the western plume completed in September 2018, December 2018, April 2019, and June 2019 with future quarterly events to be included in the Annual RA(O) Reports. This RA(O) report documents Year 5 of RA(O) implementation and summarizes the Land Use Control (LUC) compliance inspection; monitoring well inspection, maintenance, and repair activities; results of groundwater and surface water sampling; and an evaluation of EISB and MNA between September 2018 and July 2019.

LHAAP is located in east-central Texas in the northeastern corner of Harrison County between State Highway 43 in Karnack, Texas, and the western shore of Caddo Lake (**Figure 1**). The nearest cities are Marshall, Texas, approximately 14 miles to the southwest, and Shreveport, Louisiana, approximately 40 miles to the east. Caddo Lake is a large freshwater lake that bounds LHAAP to the north and east. The eastern fence of the LHAAP installation is 3.5 miles from the Texas-Louisiana border (AECOM, May 2016).

1.1 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for LHAAP-35A (58), consistent with the reasonably anticipated future use of the site as a national wildlife refuge, as presented in the ROD (Shaw, September 2010) are:

- Protection of human health by preventing human exposure to the contaminated groundwater;
- Protection of human health and the environment by preventing contaminated groundwater from migrating into nearby surface water; and,
- Returning groundwater to its potential beneficial use as a drinking water source, wherever practicable.

An Explanation of Significant Differences (ESD) was prepared and finalized for LHAAP-35A (58), Shops Area, Group 4 (Bhate/APTIM Federal Services, LLC [APTIM], July 2018) to formalize that the LUCs and groundwater monitoring required for LHAAP-03, a small site entirely contained in the LHAAP-35A (58) eastern Volatile Organic Compound (VOC) and LUC boundaries, will be captured under LHAAP-35A (58). This 2018 ESD identifies that well 03WW01 be sampled for arsenic within the LHAAP-35A (58) RA(O)and clarifies that LUCs will remain in place until the levels of the contaminants of concern (COCs) in soil and groundwater allow for unrestricted use and unlimited exposure

1.2 Performance Objectives

The LHAAP-35A (58) site has groundwater plumes in two distinct areas: 1) eastern plume and 2) western plume. The current remedies selected for the two areas are: LUC; EISB in the area of highest levels of contamination; and MNA for the remainder of the plume, beyond the influence of the EISB treatment area. EISB was implemented as a contingency remedy within the western plume in 2018 as documented in the Final ESD ROD for the Western Plume Contingency Remedy at LHAAP-35A(58) Shops Area (Bhate, March 2018). EISB was previously completed in the eastern plume in 2013.

The performance objectives at LHAAP-35A (58) consist of two components: physical inspections and groundwater/surface water monitoring. As a component of the LUC implementation, a civil survey of the LUC boundary was conducted in November 2014 and recorded in the Harrison County Courthouse in March 2015 (AECOM, May 2016). Physical inspections are conducted annually to confirm compliance with the LUC objectives. These objectives include preventing human exposure to groundwater contamination at levels that pose an unacceptable risk to a future maintenance worker and ensuring that there is no withdrawal or use of groundwater from the site for anything other than environmental monitoring and testing until the cleanup levels (maximum contaminant levels [MCLs]) are attained. Groundwater monitoring conducted at the site since October 2013 was included in the facility-wide fourth Longhorn Five-Year Review Report, completed in 2019 (USACE, June 2019).

Groundwater and surface water monitoring is being performed to demonstrate that EISB in conjunction with MNA of the eastern and western plumes are effective remedies to:

- Detect changes in environmental conditions that may reduce the efficacy of the remedial processes,
- Identify potentially toxic and/or mobile transformation products,
- Verify that the plumes are not expanding,
- Verify that no unacceptable impacts to downgradient receptors are occurring, such as discharges of contaminated groundwater to surface water,
- Detect new releases of contaminants to the environment that could impact the effectiveness of the remedies, and
- Verify attainment of the RAOs.

Groundwater monitoring completed as part of the Year 5 RA(O) activities consisted of two semi-annual groundwater sampling events conducted in December 2018 and June 2019 as specified in the Eastern Plume RAWP (AECOM, August 2013). Quarterly sampling of the western plume is required for 2 years following the EISB treatment and this Year 5 Annual RA(O) Report includes the 2nd through 5th quarters of sampling conducted in September 2018, December 2018, March 2019, and June 2019. Semi-annual surface water sampling at 35ASW03, located adjacent to the western groundwater plume in a ditch that runs parallel to 4th Street, was completed in December 2018 and June 2019, and is also included in this Report.

1.3 Site Description

The LHAAP-35A (58) site, also known as the Shops Area, is located in the north-central portion of LHAAP and currently covers an area of approximately 11 acres (**Figure 1**) (Shaw, September 2010). The surface features include asphalt-paved roads, a parking area, and areas that are wooded and overgrown with grasses and other vegetation (**Figure 2**). The topography is relatively flat with the surface drainage flowing into the tributaries of Goose Prairie Creek, which eventually discharges into Caddo Lake.

The Shops Area, which is now designated as LHAAP-35A (58), was established in 1942 as part of the installation's initial construction (Shaw, September 2011). The facility was used to provide plant-operated laundry, automotive, woodworking, metalworking, painting, refrigeration, and electrical services. The site was active throughout the LHAAP's mission and was deactivated along with the rest of the installation in 1996-1997. The LHAAP-35A (58) site boundary has changed over the years. Earlier investigations for LHAAP-35A (58) were performed in areas to the south that are no longer included within the site boundary (AECOM, May 2016). LHAAP-35A (58) encompasses the following sites:

- LHAAP-02, vacuum truck overnight parking
- LHAAP-03, the Paint Shop Building 722 (waste collection)
- LHAAP-60, Former Storage Building 714
- LHAAP-68, a mobile storage tank parking area
- LHAAP-69, service station with underground storage tanks

The following sites were within the historical LHAAP-35A (58) site boundary, but are not included within the current site boundary:

- LHAAP-04, former Pilot Wastewater Treatment Plant
- LHAAP-56, a vehicle wash rack and oil/water separator, Building 744-A
- LHAAP-59, Storage Building 725
- LHAAP-60, Building 411
- LHAAP-61, Water Treatment Plant
- LHAAP-66, 405-L Transformer Yard

The following sites are within the LUC boundary for LHAAP-35A (58):

- LHAAP-02, vacuum truck overnight parking
- LHAAP-03, the Paint Shop Building 722 (waste collection)
- LHAAP-56, a vehicle wash rack and oil/water separator, Building 744-A
- LHAAP-59, Storage Building 725
- LHAAP-60, Former Storage Building 714
- LHAAP-65, Former Building 209 (flammable materials storehouse)
- LHAAP-68, a mobile storage tank parking area
- LHAAP-69, service station with underground storage tanks

LHAAP-60, Building 411, which is located within the historical site boundary of LHAAP-35A (58) is included within the LUC boundary for LHAAP-04.

1.4 Conceptual Site Model

Much of the following conceptual site model (CSM) information has previously been presented in the 2nd Annual RA(O) Report (January 2015 – October 2015) (AECOM, May 2016). **Figure 3** presents the CSM from the ROD (Shaw, September 2010). Between 1992 and 2008, multiple investigations were conducted in a phased approach to evaluate the nature and extent of contamination at the LHAAP-35A (58) site. The findings from these investigations were that the shallow zone groundwater was impacted with VOCs, while the soil and former sump/waste rack sump areas (LHAAP-56) posed no unacceptable threat to human health or the environment (Shaw, September 2011). **Figure 2** shows the locations of all the shallow, intermediate, and deep zone monitoring wells, as well as surface water sampling locations, present at the site. The sources of contamination at LHAAP-35A (58) were surface spills associated with the various support services that occurred in the area. The spills resulted in minor soil contamination and the COCs released to the surface soil subsequently migrated downward through leaching, to the groundwater.

Overland flow does not appear to be a complete pathway for migration of contaminants to surface water, as none of the COCs (VOCs, Semi-volatile Organic Compounds [SVOCs], explosives,

pesticides, or polychlorinated biphenyls [PCBs]) were detected in water samples from the on-site ditch. Likewise, no VOCs, SVOCs, explosives, or pesticides were detected in samples of the ditch sediment. Some metals were detected in surface water and sediment at concentrations in the naturally occurring background range.

Investigation results indicate that the shallow zone groundwater is impacted with VOCs, but soil and former sump/waste rack areas pose no unacceptable risk to human health or the environment (Shaw, September 2011). There have been no previous remedial actions at LHAAP-35A (58). The nearest surface water body to LHAAP-35A (58) is a ditch that runs parallel to 4th Street on the western boundary of the site and flows to the southeast. The depth of groundwater in wells adjacent to the ditch is well below the bottom of the ditch at 18 to 25 feet (ft) below ground surface (bgs) (e.g., in wells 35AWW16, 35AWW18, and LHSMW07).

The potentially complete exposure pathways are groundwater use as drinking water and potential migration of impacted groundwater into surface water. Shallow groundwater is not used as drinking water at the refuge and this potential exposure pathway is eliminated from any hypothetical future receptor because LUCs are in place that prohibit the use of groundwater for any purpose other than for environmental monitoring and testing. **Figure 2** shows the groundwater use restrictions area established for this site.

The hydrogeology beneath the site, as presented in the Draft Final RACR (AECOM, October 2015), consists of three water-bearing zones; identified as shallow, intermediate, and deep. The shallow zone extends to approximately 40 ft bgs. The lithology of the shallow zone is characterized by discontinuous layers of fine grained soils consisting of interbedded silt, sand, and clay. According to the groundwater gauging data conducted in October 2013 (First Performance Monitoring Sampling Event), the depth to groundwater ranged from 17.53 ft bgs to 30.13 ft bgs. Groundwater elevations in the shallow zone in October 2013 ranged from 184.21 ft above mean sea level (msl) to 202.32 ft above msl.

Data from boring log 35AWW02, which was drilled in the deep zone to a depth of 140 ft bgs, and 35AWW05, which was drilled in the intermediate zone to a depth of 75.75 ft bgs, indicate the soils in the intermediate and deep zones consist mostly of clay with the occasional presence of silt and sand layers. The occurrence of predominantly clay soil beneath the shallow zone impedes the vertical migration of groundwater, which is corroborated by the difference in groundwater elevations between the shallow zone and the intermediate and deep zones (AECOM, May 2016). Based on groundwater surface measurements obtained in October 2013, groundwater elevation for the intermediate zone was approximately 178 ft above msl, and the elevation of deep zone groundwater was 175.75 ft above msl.

Based on previous investigations, the shallow groundwater COCs at LHAAP-35A (58) are tetrachloroethene (PCE); trichloroethene (TCE); 1,1,2-trichloroethane (TCA); 1,1-dichloroethene (DCE); 1,2-dichloroethane (1,2-DCA); cis-1,2-DCE; trans-1,2-DCE; vinyl chloride (VC); methylene chloride (MC); and benzene. In addition, low concentrations of 1,1-DCA were detected in the shallow zone groundwater, but were below the groundwater medium-specific concentration

(MSC) so 1,1-DCA is not considered a groundwater COC at this site. No COCs were detected in samples from the intermediate and deep groundwater zones.

Although arsenic has not been designated as a COC, it is included in the shallow zone groundwater monitoring program in accordance with the Revised Technical Memorandum, Steps to Remedy-in-Place for LHAAP-03/LHAAP-58 (AECOM, November 2012); the ESD for LHAAP-03 groundwater and LUCs (Bhate/APTIM, July 2018); and the 2013 RAWP (AECOM, August 2013).

2 SITE ACTIVITIES AT LHAAP-35A (58)

2.1 Annual LUC Compliance Inspection, Maintenance, and Repairs

2.1.1 Annual LUC Compliance Inspection

The objectives of the LUCs at LHAAP-35A (58) are to prevent human exposure to groundwater contamination presenting an unacceptable risk to human health, and to ensure that there is no withdrawal or use of groundwater beneath the site for any purpose other than environmental monitoring and testing until the cleanup levels are attained (AECOM, August 2013). The ESD for LHAAP-03 groundwater and LUCs formally changed the duration of the LUCs, which will remain in effect until COC concentrations in groundwater and soil are reduced to levels that allow unrestricted use and unlimited exposure (Bhate/APTIM, July 2018). As depicted on **Figure 2**, the sites that are included in the LUC boundary under LHAAP-58 include LHAAP-02, LHAAP-03, LHAAP-35A, LHAAP-56, LHAAP-59, LHAAP-60D, LHAAP-65, LHAAP-68, and LHAAP-69. Notices of the groundwater use restrictions accompany all property transfer documents and were recorded at the Harrison County Courthouse in March 2015 in accordance with the Texas Administrative Code Title 30, §335.566. Additional details regarding the implementation of the LUC are presented in the RACR (AECOM, October 2015).

Bhate performed the annual LUC compliance inspection for LHAAP-35A (58) on May 13, 2019. The Annual Land Use Control Compliance Certification Documentation form for the Year 5 RA(O) period is presented in **Appendix A**. No compliance issues or concerns were noted during the annual inspection in 2019.

2.1.2 Well Field Operation & Maintenance

Inspections of the conditions/integrity of monitoring wells were conducted in June 2019 and were documented in a photographic log (**Appendix B**) and during each sampling event with the information recorded on the field sampling forms. Monitoring well 35AWW04 required painting as noted in the August 2018 inspection from the Year 4 RA(O) inspections, which was completed on October 4, 2018. Maintenance items for the upcoming period, noted during the June inspection, includes painting of wells LHSMW04 and LHSMW07. Mowing the area to control brush and weeds was conducted on a routine basis and as needed to allow access to the wells, typically before sampling events. During the Year 5 annual reporting period, mowing was conducted prior to the semi-annual groundwater sampling events (December 2018 and June 2019). **Appendix B** provides photos of the June 2019 monitoring well conditions, and **Appendix C** provides information about the individual well surface conditions observed during each of the Year 5 sampling events.

2.2 Groundwater Monitoring for RA(O)

During the Year 5 RA(O) period, 24 monitoring wells were gauged for depth to water in December 2018 and June 2019. The RAWP (AECOM, August 2013) proposed inclusion of 20 monitoring wells in the MNA program (18 shallow groundwater zone wells [35AWW06, 35AWW08,

35AWW10, 35AWW11, 35AWW12, 35AWW13, 35AWW14, 35AWW15, 35AWW16, 35AWW17, 35AWW18, 35AWW19, 35AWW20, 35AWW21, 35AWW22, LHSMW04, LHSMW06, and LHSMW07] and 2 intermediate groundwater zone wells [35AWW01 and 35AWW05]).

The following 23 monitoring wells were sampled in December 2018: 03WW01, 35AWW01, 35AWW05, 35AWW06, 35AWW08, 35AWW09, 35AWW10, 35AWW11, 35AWW12, 35AWW13, 35AWW14, 35AWW15, 35AWW16, 35AWW17, 35AWW18, 35AWW19, 35AWW20, 35AWW21, 35AWW22, 35AWW23, 35AWW24, LHSMW06, and LHSMW07. As indicated on **Figure 6**, LHSMW04 was dry in December 2018, and therefore was not sampled. LHSMW04 was also dry in October 2016, November 2017, and July 2018. Two intermediate groundwater zone wells (35AWW01 and 35AWW05) were sampled in December 2018. Before collecting groundwater samples, the wells were gauged using a water level probe and the depth to water was recorded to the nearest 0.01 ft from the top of casing. Groundwater samples were collected using the low-flow sampling technique described in the Groundwater Sampling Procedures in the Installation-Wide Work Plan (IWWP) (Bhate, May 2018). After water quality parameters stabilized and were within acceptable ranges, samples were collected at the same low flow rate. Although no record of the location of the pump inlet in the well was made on sampling logs compiled during the September 2018 groundwater sampling event or for Year 4 beginning November 2017, it is typically placed in the middle of the screen when water levels are sufficient. A technical memorandum describing the sampling process and lack of data on these forms will be prepared and placed into the Administrative Record. The samples were analyzed by ALS Environmental for alkalinity (SM2320B); phosphorus (E365.3); dissolved gases (RSK-175); Total Organic Carbon (TOC) (SM5310C); VOCs (SW8260C); ferrous iron (SM3500-Fe); total and dissolved metals (iron and manganese) and total arsenic (SW6020A); chloride, nitrate, nitrite, and sulfate (SW9056A); sulfide (E376.1); Volatile Fatty Acids (VFAs) (High Performance Liquid Chromatography [HPLC]-METACIDS); and dechlorinating bacteria (dehalococcoides [DHC]/dehalobacter [DHB]) (CENSUS).

The following 21 shallow zone wells were sampled in June 2019: 03WW01, 35AWW06, 35AWW08, 35AWW09, 35AWW10, 35AWW11, 35AWW12, 35AWW13, 35AWW14, 35AWW15, 35AWW16, 35AWW17, 35AWW18, 35AWW19, 35AWW20, 35AWW21, 35AWW22, 35AWW23, 35AWW24, LHSMW06, and LHSMW07. LHSMW04 was dry in June 2019, and therefore was not sampled during the Year 5 RA(O) event. Intermediate groundwater zone wells, 35AWW01 and 35AWW05, were sampled in June 2019. Before collecting groundwater samples, the wells were gauged using a water level probe and the depth to water was recorded to the nearest 0.01 ft from the top of casing. Groundwater samples were collected using the low-flow sampling technique described in the Groundwater Sampling Procedures in the IWWP (Bhate, May 2018) for the June 2019 sampling event. After water quality parameters stabilized and were within acceptable ranges, samples were collected at the same low flow rate. The MNA analyte list was modified for the June 2019 sampling event to follow the recommendations put forth in the Final Technical Memorandum (TM) - MNA Parameters (Bhate/APTIM, February 2019) (**Appendix D**). The TM modified the MNA analyte list for consistency across several sites and to reduce redundant or non-essential parameters. Analytes eliminated in the June 2019 semi-annual sampling event were alkalinity; nitrite; sulfide; TOC; total iron; dissolved iron and manganese; and total phosphorous. The samples were analyzed by ALS Environmental for dissolved gases

(RSK-175); VOCs (SW8260C); total metals (iron and manganese) and total arsenic (SW6020A); chloride, nitrate, and sulfate (SW9056A); VFAs (HPLC-METACIDS); and dechlorinating bacteria (DHC/DHB) (CENSUS). Select wells continued to be evaluated for TOC (SM5310C) due to the recent injections within the western plume.

Six wells within the western plume are required to be sampled quarterly for 2 years. Per the Western Plume RAWP (Bhate, January 2018), these wells include 35AWW06, 35AWW11, 35AWW19, 35AWW20, 35AWW23, and LHSMW07. However, the master sampling plan for the Year 5 RA(O) sampling indicated that well 35AWW23 was to be sampled semi-annually and well 35AWW24 was to be sampled quarterly, which is what was implemented and is documented in this report. In addition, monitoring well LHSMW06 was sampled semi-annually and is used to define the western plume though it is considered an MNA well and not associated with performance monitoring of the Western Plume Contingency RAWP. Also, monitoring well 35AWW15 was sampled semi-annually and is used to delineate the upgradient extent of the western plume though it is not considered a performance monitoring well for the Western Plume RAWP. The western plume monitoring wells were sampled in September 2018, December 2019, March 2019, and June 2019 and were analyzed for VOCs, MNA parameters, volatile fatty acids, and DHB/DHC. Analytes eliminated in March and June 2019, per the Draft TM – MNA Parameters (Bhate/APTIM, January 2019) were alkalinity; nitrite; sulfide; TOC; total iron; dissolved iron and manganese; and total phosphorous.

The LHAAP-35A (58) monitoring wells are depicted on **Figure 2**. **Table 1** presents the monitoring wells that were gauged during the Year 5 RA(O) period. Each of the monitoring wells were secure and sampled with no technical issues encountered.

During the 5 years of RA(O) sampling, only monitoring well LHSMW04, located to the east of the eastern groundwater plume, has been periodically dry. However, the absence of data from this well has had no effect on evaluating EISB or MNA. Monitoring well LHSMW04 is located between 35AWW09 and 35AWW12 and the results for these two wells provide ample data to evaluate this area.

Groundwater sampling forms are presented in **Appendix C**. Chain of custody forms, laboratory reports, and quality control summary reports are presented with the laboratory results in **Appendix E**.

2.2.1 Groundwater Elevation and Flow Direction

2.2.1.1 Shallow Groundwater Zone

Groundwater levels for the Year 5 RA(O) were measured in December 2018 and June 2019. The groundwater flow direction in the shallow water bearing unit during the Year 5 RA(O) monitoring period at LHAAP-35A (58) is interpreted to the southeast in the western portion of the site and to the east-southeast in the eastern portion of the site (see **Figures 4 and 5**). This corresponds well with the flow directions presented in the Remedial Design (RD) document (Shaw, September 2011), which was interpreted to the southeast in the westernmost area, and to the east for the remainder of the site. Groundwater elevation data are presented in **Table 1**.

The shallow zone groundwater elevations generally increased across the site between December 2018 and June 2019. The greatest increase, 2.70 ft, occurred in shallow monitoring well 35AWW10. A total of 11 wells had increases greater than 1 ft. Only two wells, 35AWW15 and 35AWW23 had decreases in groundwater elevations at 1.22 ft and 3.26 ft, respectively.

2.2.1.2 Intermediate Groundwater Zone

Wells 35AWW01 and 35AWW05 (**Figure 2**) are completed in the intermediate groundwater zone. Groundwater elevations decreased in each well; 2.53 ft in 35AWW05 and 4.25 ft in 35AWW01 between December 2018 and June 2019. Because there are only two wells screened in the intermediate groundwater zone, a potentiometric surface map cannot be constructed to determine the groundwater flow direction. The groundwater elevations are presented in **Table 1**.

2.2.1.3 Deep Groundwater Zone

Well 35AWW02 (**Figure 2**) is the only well screened in the deep groundwater zone. This well is not included in the sampling program, in accordance with the RAWP (AECOM, August 2013). Therefore, this monitoring well was not gauged during the Year 5 RA(O) sampling events. The groundwater elevation at 35AWW02 was relatively static (within 0.44 ft) in measurements between October 2013 and October 2016 (**Table 1**).

2.2.2 Vertical Gradient

There are two pairs of shallow and intermediate zone co-located wells, which include monitoring wells 35AWW08 (shallow) and 35AWW01 (intermediate); and LHSMW07 (shallow) and 35AWW05 (intermediate). During the Year 5 RA(O) monitoring period, the elevation difference between wells 35AWW08 and 35AWW01 was 9.64 ft in December 2018 and 14.49 ft in June 2019. The elevation differences between wells LHSMW07 and 35AWW05 was over 24 ft in both the December 2018 and June 2019 sampling events. These elevation differences are consistent with those observed in the first 4 years of RA(O) monitoring. This difference in elevation between the shallow groundwater zone and the intermediate groundwater zone indicates that there is hydraulic separation between these two water bearing zones. Because the potentiometric level of the shallow zone groundwater is higher than the potentiometric level of the intermediate zone groundwater, a potential downward vertical gradient exists at this site.

2.3 Groundwater Analytical Results

2.3.1 Shallow Zone

The COCs for shallow zone groundwater are 1,1,2-TCA; 1,1-DCE; 1,2-DCA; benzene; cis-1,2-DCE; trans-1,2-DCE; TCE; PCE; methylene chloride, and VC (AECOM, May 2016). Analytical results for the December 2018 and the June 2019 semi-annual samples in the eastern plume are presented in **Table 2**, and analytical results for the quarterly sampling events from the western plume are presented in **Table 3**. **Figure 6** presents the COC analytical data for September 2018 through June 2019.

Twenty-three wells were sampled for COCs during the Year 5 RA(O), not including well LHSMW04, which was dry during the Year 5 RA(O) sampling events. Select wells were also sampled for MNA parameters per the RAWP (AECOM, August 2013) and the TM - MNA Parameters (Bhate/APTIM, February 2019).

During the December 2018 event, wells 03AWW01, 35AWW06, 35AWW08, 35AWW09, 35AWW11, 35AWW14, 35AWW18, 35AWW19, 35AWW20, 35AWW23, LHSMW06, and LHSMW07 had one or more COCs reported at concentrations above the laboratory detection limits. Only wells 03WW01, 35AWW08, 35AWW09, 35AWW14, 35AWW19, 35AWW20, 35AWW23, and LHSMW06 had concentrations of COCs exceeding the MCLs. Additional MCL exceedances were reported for the VFA, propionic acid (MCL of 51 milligrams per liter [mg/L]), in 35AWW06, 35AWW11, and 35AWW23. Propionic acid is present due to fermentation of the carbon substrate as part of the reductive dechlorination process.

During the June 2019 event, monitoring wells 03WW01, 35AWW08, 35AWW09, 35AWW14, 35AWW18, 35AWW19, 35AWW20, 35AWW23, LHSMW06, and LHSMW07 had one or more COCs listed above reported at concentrations above laboratory detection limits. Only wells 03WW01, 35AWW08, 35AWW09, 35AWW14, 35AWW20, LHSMW06, and LHSMW07 had concentrations exceeding COC MCLs. Additional MCL exceedances were reported for the VFA, propionic acid (MCL of 51 milligrams per liter [mg/L]), in 35AWW06, 35AWW11, and 35AWW23.

Groundwater monitoring well sampling forms were completed for each well sampled and are included in **Appendix C**. The laboratory analytical results are included in **Appendix E**.

2.3.2 Intermediate Zone

Wells 35AWW01 and 35AWW05 (**Figure 7**) are completed in the intermediate groundwater zone. Both monitoring wells were sampled during the Year 5 RA(O) monitoring period. Analytical results for these two wells were below laboratory detection limits for all analytes in both the December 2018 and June 2019 events. The laboratory analytical results are shown in **Table 2** and laboratory analytical reports are included in **Appendix E**.

2.3.3 Deep Zone

Well 35AWW02 is completed in the deep groundwater zone. This well is not included in the sampling program in accordance with the Eastern Plume RAWP (AECOM, August 2013) and was not sampled during the Year 5 RA(O). Deep well 35AWW02 was sampled only during the October 2013 sampling event and the COC concentrations were below the laboratory detection limits. The laboratory analytical results for 35AWW02 are included in **Table 4** (Historical Monitoring Well COC Concentrations).

2.3.4 Arsenic Monitoring

Although arsenic has not been designated as a COC, groundwater was analyzed for arsenic from the Year 1 RA(O) monitoring period through July 2015 of the Year 2 RA(O) monitoring period, as described in the Revised Technical Memorandum, Steps to Remedy-in-Place for LHAAP-03/LHAAP-58 (AECOM, November 2012). The four quarters of arsenic monitoring were

completed to be compliant with the Eastern Plume RAWP (AECOM, August 2013). However, per the Year 2 RA(O) Report (AECOM, May 2016), monitoring arsenic was recommended for wells within the eastern plume (03WW01, 35AWW08, and 35AWW09). Continuation of the arsenic sampling program during the period of implementation and monitoring of EISB effectiveness within the western plume was also recommended based upon the recommendation to implement EISB for the western plume. However, arsenic sampling at LHAAP-58 was inadvertently left out of the Year 3 RA(O) monitoring period and no arsenic monitoring was conducted during the Year 3 reporting period. During Year 4 RA(O), arsenic was sampled in 35AWW01, 35AWW06, 35AWW07, 35AWW08, 35AWW09, LHSMW03, LHSMW06, LHSMW07, and 1004TW001 in November 2017 and 35AWW01, 35AWW08, 35AWW09, and LHSMW06 in July 2018.

During the Year 5 Year RA(O) monitoring period, arsenic sampling was completed in select monitoring wells. In December 2018, groundwater from the following monitoring wells was analyzed for arsenic: 35AWW01, 35AWW08, 35AWW09, and LHSMW06. In June 2019, groundwater from the following monitoring wells was analyzed for arsenic: 03WW01, 35AWW08, 35AWW09, 35AWW20, and LHSMW06.

Arsenic was reported at concentrations above the MCL during the Year 1 RA(O) monitoring period and during the July 2015 sampling event of the Year 2 RA(O) monitoring period in wells 03WW01, 1004TW001, 1004TW006, 35AWW08, 35AWW20, and LHSMW07 (AECOM, May 2016). Background concentrations of arsenic at Site LHAAP-58 were reported up to 62.1 micrograms per liter (µg/L) in November 2008 for perimeter well 110 in a filtered sample that was collected on December 16, 2004 (Shaw, June 2007). Therefore, the presence of arsenic in site groundwater cannot be attributed solely to reductive conditions caused by EISB, although these conditions could have contributed to an increase in arsenic concentrations in groundwater observed in the first 2 years of RA(O).

In December 2018, only monitoring well 35AWW08 (0.0593 mg/L) exceeded the MCL of 0.010 mg/L. The three other monitoring wells sampled did not have arsenic detected in the groundwater above the MCL. In June 2019, arsenic was reported above the MCL in 03WW01 (0.0133 mg/L) and 35AWW08 (0.116 mg/L). The three additional wells sampled for arsenic had reported concentrations below the MCL in June 2019.

2.4 Surface Water Sampling

The Eastern Plume RAWP (AECOM, August 2013) specifies that surface water monitoring for COCs (1,1,2-TCA; 1,1-DCA; 1,1-DCE; 1,2-dichloroethane; benzene; cis-1,2-DCE; TCE; PCE; and VC) will be performed at surface water sample location 35ASW03, which is in a ditch that runs parallel to 4th Street, on the western boundary of the site and adjacent to the western groundwater plume. **Figure 2** depicts the surface water sampling location. One surface water sample was collected at location 35ASW03 in both the December 2018 and June 2019 sampling events. The above listed VOCs were not detected in either collected sample.

The Draft Final RACR for LHAAP-35A (58) (AECOM, October 2015) states that *the water level in 35AWW18 will be gauged for comparison with the ditch bottom elevation at 35BSW03*. The

surveyed bottom of the ditch at the lowest point is 213.58 ft above msl. The gauged water levels in the nearest upgradient monitoring well 35AWW18 in December 2018 and June 2019 were 196.16 ft above msl and 196.90 ft above msl, respectively. Even though the groundwater elevations at LHAAP were elevated due to high precipitation occurring over the fall, winter, and spring months, the groundwater surface was significantly below the base of the ditch, and groundwater was not discharging to surface water in the ditch.

Surface water samples are collected to evaluate the potential effect of the plume on surface water. The analytical results demonstrate that none of the LHAAP-58 COCs are present in surface water. Therefore, it is not likely that the groundwater at LHAAP-58 is or will contribute to the nearby surface water.

2.5 Well Abandonment

No additional wells are recommended for removal from the monitoring program beyond those previously recommended in the Year 2 RA(O) Report (AECOM, May 2016), which included 35AWW02, 35AWW03, and 1004TW0001,. As noted in the Year 3 RA(O) Report (Bhate, April 2018), well 1004TW006 was recommended for abandonment but could not be located.

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3 PERFORMANCE MONITORING OF EISB

The EISB target area is located within the vicinity of wells 03WW01 and 35AWW08 within the eastern groundwater plume. Well 35AWW10 is considered an upgradient clean well and well 35AWW09 is located downgradient of the EISB area, but within the groundwater plume. Groundwater monitoring was performed in August 2013 prior to EISB implementation (baseline event), in October 2013 after the EISB injections, and in January 2014, May 2014, October 2014, January 2015, April 2015, July 2015, October 2015, April 2016, October 2016, November 2017, June/July 2018, December 2018, and June 2019. Within the western groundwater plume, groundwater sampling completed in July 2018 was the first sampling event following EISB implementation. **Figure 6** presents the EISB treatment locations within the western groundwater plume. A total of six monitoring wells are to be evaluated via a total of eight quarterly performance monitoring events, over the 2 years following injections, to assess the EISB in the western plume (Bhate, January 2018). This report presents the results of quarterly sampling events 2 through 5 completed from September 2018 through June 2019. The EISB performance and key parameters are discussed below and much of the information is provided in **Tables 2, 3, 5, and 6**.

The monitoring program is intended to track the biologic degradation of the chlorinated solvents from PCE through VC and finally to ethene (PCE to TCE to cis-1,2-DCE to VC and finally ethene), while also monitoring the in-situ conditions for favorable biologic activity. Analytes eliminated in March and June 2019, per the Draft TM – MNA Parameters (Bhate/APTIM, January 2019), were alkalinity; nitrite; sulfide; total iron; dissolved iron and manganese; and total phosphorous.

3.1 Analysis of VOCs

3.1.1 Eastern Plume

Major reductions have been observed in PCE in the eastern two monitoring wells, 03WW01 and 35AWW08, located within the influence of the EISB treatment area. Between August 2013 (baseline sampling event) and June 2019, PCE concentrations reported for well 35AWW08 have decreased from 1,640 µg/L to 4.8 J (data qualifier denoting an estimated concentration) µg/L (**Table 4**). This difference in PCE concentrations in well 35AWW08 is a decrease of approximately 99.7%. PCE concentrations in well 35AWW08 have remained below the MCL of 5 µg/L through three semi-annual sampling events since July 2018. From August 2013 to June 2019, PCE concentrations in well 03WW01 decreased from 368 µg/L to 3.2 J µg/L (**Table 4**). This is a decrease of approximately 97.6% of PCE in well 03WW01. PCE concentrations in well 03WW01 have remained below the MCL of 5 µg/L since October 2016, except for the December 2018 sampling event when a concentration of 15 µg/L was reported.

TCE, a degradation product of PCE, initially decreased between August 2013 and October 2013 (following EISB injections), but subsequently increased (due to reduction of PCE into TCE) indicating the occurrence of early stages of dechlorination. In monitoring well, 03WW01, TCE dropped below the MCL of 5 µg/L in October 2016 and has remained below the MCL through June 2019, except for a reported concentration of 5.7 µg/L in December 2018. The maximum

detected TCE concentration in either the December 2018 or June 2019 sampling events was in well 35AWW09 in December 2018 at a concentration of 150 µg/L (**Table 2**).

The concentrations of cis-1,2-DCE remained below the MCL of 70 µg/L in the eastern plume monitoring wells (**Table 2**) during the December 2018 and June 2019 sampling events. VC was detected above the MCL of 2 µg/L in well 03WW01 during both the December 2018 and June 2019 sampling events at concentrations of 7.6 µg/L and 11 µg/L, respectively. The lack of increase in the cis-1,2-DCE and VC is likely due to the low levels of PCE and TCE currently remaining and degrading to these daughter products. Ethene is being produced which indicates that complete degradation is occurring.

3.1.2 Western Plume

PCE was not detected above the MCL of 5 µg/L in the western plume wells during the Year 5 RA(O) sampling events (**Table 3**). Well 35AWW20 had reported concentrations of TCE; cis-1,2-DCE; and VC above MCLs (**Table 3**). Concentration ranges for the three compounds were comparable to historical concentrations. However, in December 2018, the TCE concentration was 570 µg/L. The December 2018 detection of TCE in well 35AWW20 is considered elevated when compared to the previous sampling event in September 2018 at 170 µg/L and the following sampling event in March 2019 at 180 µg/L. Also, the cis-1,2-DCE in December 2018 was 120 µg/L, which is also considered elevated when compared to the previous sampling event in September 2018 at 45 µg/L and the following sampling event in March 2019 at 49 J µg/L. TCE was detected above the MCL in well 35AWW23 in December 2018 at a concentration of 5.3 µg/L, but was below the MCL in June 2019. TCE was also detected above the MCL in LHSMW06 in December 2018 and June 2019 at concentrations of 16 µg/L and 7.5 µg/L, respectively. VC was detected above the MCL of 2 µg/L in well LHSMW06 in the December 2018 sampling event at 5.0 µg/L, but was below the MCL in the June 2019 sampling event.

3.2 Analysis of Field Parameters

The field parameters (potential of hydrogen [pH], dissolved oxygen [DO], oxidation-reduction potential [ORP], temperature, and specific conductivity) were measured in the LHAAP-35A (58) wells during the monitoring events. Wells 03WW01 and 35AWW08 are sampled using a bailer, the ORP and DO concentrations are not considered accurate though the information is recorded on the field forms. Therefore, as these concentrations are not representative of true field conditions, they are not included in **Table 5**. In the future, the field parameters will be collected, when able, prior to using the bailer to collect the rest of the sample. The pH in these two wells initially decreased, potentially related to substrate fermentation and organic acid production. However, since October 2014, and continuing through this Year 5 monitoring period, the pH in both wells has generally increased, indicating a self-buffering capacity of the aquifer.

3.3 TOC Levels

TOC is an indicator of the presence of carbon substrate. The background level of TOC is typically less than 10 mg/L. Therefore, TOC present above the background level are indicative of the substrates presence in groundwater near the sampled monitoring well.

3.3.1 Eastern Plume

After injection of the carbon substrate, there was an initial spike of the TOC levels in both wells (03WW01 and 35AWW08), indicating effective substrate distribution from the injection points to the impacted zone. TOC levels have since decreased. Over the course of the Year 5 monitoring period, the TOC levels have continued to decrease, which is expected as the carbon substrate is consumed and due to migration away from the injection area. The most recent residual TOC levels (June 2019) of 66 mg/L in 03WW01 and 306 mg/L in 35AWW08 indicate that TOC remains at sufficiently high concentrations to support reductive dechlorination, albeit at much reduced amounts compared to the period immediately after injection in October 2013 (**Table 5**). The June 2019 TOC levels were higher than background TOC concentrations in nearby wells such as 35AWW09 and 35AWW10 with October 2016 TOC concentrations of 5.76 mg/L and 3.21 mg/L, respectively.

3.3.2 Western Plume

Within the western plume, TOC increased in the sampled monitoring wells following the EISB injections when compared to the baseline sampling results, within the influence of the injection points with the exception of 35AWW19. The greatest increases were observed in 35AWW06 and 35AWW11. The June 2019 data indicate elevated TOC concentrations are present in wells 35AWW06, 35AWW11, and 35AWW23 (**Table 6**).

3.4 Analysis of Anions

Although sulfate reduction occurs through competing reactions to reductive dechlorination, the decrease in sulfate concentration is indicative of reducing aquifer conditions.

3.4.1 Eastern Plume

Decreased sulfate concentrations in the two EISB wells relative to levels in nearby wells that did not receive EISB treatment such as 35AWW09 and 35AWW10, indicate the development of reducing conditions conducive to reductive dechlorination occurred following initial injections. Sulfate concentrations increased in monitoring well 03WW01 in June 2019 to 239 mg/L from 42.8 mg/L in December 2018, which is the highest sulfate concentration measured since May 2014. Sulfate concentrations remain low in monitoring well 35AWW08 at a concentration of 1.42 J mg/L in June 2019 (**Table 5**).

3.4.2 Western Plume

Following the EISB injections, sulfate decreased in each of the wells influenced by the EISB injections by approximately 50 percent (%). Monitoring well 35AWW19 was the exception with a decrease in sulfate but to a lesser extent than observed in the other wells. In June 2019, sulfate concentrations increased in 35AWW20, the one well with COCs above MCLs within the western plume, to 1,240 mg/L, maintaining an increasing trend since the July 2018 concentration of 882 mg/L (**Table 6**).

3.5 Dissolved Gases

3.5.1 Eastern Plume

The methane concentration during the Year 5 monitoring period in 03WW01 increased in both sampling events (2,900 µg/L in June 2019) reversing a decreasing trend observed in the previous three semi-annual sampling events. (**Table 5**). The methane concentration in 35AWW08 decreased to non-detectable levels (less than [<] 1.0 µg/L) in December 2018 but rebounded to 3,000 µg/L in June 2019. Methane concentrations are still representative of strong reducing conditions due to methanogenesis.

Concurrently, carbon dioxide levels remain elevated in both 03WW01 and 35AWW08, supporting the continued metabolism of the carbon substrate. Ethene was detected at low levels in both 03WW01 and 35AWW08, indicating that complete dechlorination is occurring.

3.5.2 Western Plume

Methane following the EISB treatment of the western plume remained stable or decreased. In June 2019, methane concentrations had increased in 35AWW20, the one well with COCs above MCLs in the western plume, to 920 µg/L, the highest concentration reported since injections. Carbon dioxide levels have remained relatively stable in 35AWW20 at over 700,000 µg/L since September 2018 (**Table 6**). Ethene increased slightly in 35AWW20 in December 2018 to 1.94 J µg/L but returned to previous levels June 2019 (1.3 µg/L). Ethene production indicates complete reduction of the COCs is occurring.

3.6 Dechlorinating Bacteria

3.6.1 Eastern Plume

The dechlorinating bacteria count spiked after the bioaugmentation event (November 2013) in wells 03WW01 and 35AWW08, indicating effective distribution of the introduced culture within the eastern plume per the RAWP. The introduced bacterial cultures then decreased in October 2014, in particular the concentrations of DHC species, the bacteria responsible for degrading cis-1,2-DCE to VC, which decreased to 10.9 cells/milliliter (mL) in 03WW01 and to 70.4 cells/mL in 35AWW08. However, during the Year 3 RA(O) sampling event, DHC species spiked to the highest levels yet observed, to 9,460,000 cells/mL in 03WW01 and to 25,600,000 cells/mL in 35AWW08. During the Year 4 RA(O) sampling events, DHC species decreased in 03WW01 to 7.5 cells/mL in July 2018 and in 35AWW08 to 1,410,000 cells/mL in July 2018. Concentrations rebounded in the Year 5 RA(O) to 6,040 cells/mL in June 2019 in 03WW01 and to 3,790,000 cells/mL in 35AWW08 (**Table 5**). DHC species counts are still adequate for the continued degradation of PCE/TCE to VC.

3.6.2 Western Plume

The DHB population increased significantly after injection in the western plume in each of the monitoring wells influenced by the EISB treatment. DHC increased in a few of the monitoring wells but not significantly. The critical performance monitoring well in the western plume, 35AWW20, has had a decreasing trend of DHB from a maximum of 5,970,000 cells/mL in July

2018 to < 21.7 cells/mL in June 2019. DHC was not detected in 35AWW20 from September 2018 through December 2018, but did have a reported cell count of 15,500 cells/mL in June 2019 (**Table 6**).

3.7 Summary

In summary, the EISB treatment has been effective in reducing the VOC concentrations (PCE by as much as 99.7%) and the conditions are still conducive for continued reductions. Although biologic activity has slowed and substrate mass is decreasing, the COC mass requiring treatment is also greatly diminished. Therefore, continued reductions of COC concentrations do not require robust biologic activity. Reductions of VOCs have been observed throughout both the eastern and western plume areas as presented on **Figure 9**. The individual COC lateral extents comparing October 2016 MCL exceedances and those documented in June 2019 show a greatly contracted plume footprint. Combining the reduction in maximum concentrations and the reduction in areal extent indicate significant remediation progress.

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4 NATURAL ATTENUATION EVALUATION

This section presents the results of the natural attenuation evaluation in accordance with the three lines of evidence discussed in the Final Remedial Design (Shaw, September 2011) for LHAAP-35A (58) groundwater COCs. The discussion below pertains only to the shallow aquifer where COCs are detected above cleanup levels. Analytes eliminated in March and June 2019, per the Draft TM – MNA Parameters (Bhate/APTIM, January 2019) were alkalinity, nitrite, sulfide, total iron, dissolved manganese, total phosphorous, and dissolved iron (lab analysis).

4.1 First Line of Evidence: Change in COC Concentrations over Time and with Distance

Natural attenuation is the combination of multiple mechanisms, including biodegradation, volatilization, dilution, advection, and absorption that reduce contaminant concentrations. The decrease of COC concentrations over time and distance in the absence of any other treatment is evidence of natural attenuation (AECOM, May 2016). The change in groundwater COC concentrations over time and with distance was evaluated at LHAAP-35A (58). COC exceedances for the Year 5 RA(O) monitoring period are presented on **Figure 6**.

Per the August 2013 RAWP (AECOM, August 2013), eighteen shallow monitoring wells were included in the MNA monitoring program for VOCs (35AWW06, 35AWW08, 35AWW10, 35AWW11, 35AWW12, 35AWW13, 35AWW14, 35AWW15, 35AWW16, 35AWW17, 35AWW18, 35AWW19, 35AWW20, 35AWW21, 35AWW22, LHSMW04, LHSMW06, and LHSMW07). Wells 35AWW01 and 35AWW05 are the intermediate groundwater wells evaluated for MNA. Note that LHSMW04 was not sampled because it was dry. However, following the 2018 EISB treatment within the western plume, wells 35AWW20, LHSMW07, and 35AWW19 are performance monitoring wells for the contingency remedy.

The only wells where COCs were detected above their respective MCLs during the Year 5 RA(O) groundwater sampling events are 03WW01, 35AWW08, 35AWW09, 35AWW14, 35AWW19, 35AWW20, 35AWW23, LHSMW06, and LHSMW07 (**Tables 2 and 3**). The only wells where COCs were detected above their respective MCLs during the June 2019 groundwater sampling event are 03WW01, 35AWW08, 35AWW09, 35AWW14, 35AWW20, LHSMW06, and LHSMW07 (**Tables 2 and 3**).

Wells 35AWW06, 35AWW11, and 35AWW23 exceeded the MCL for propionic acid during the Year 5 RA(O), which is not a COC. Arsenic was analyzed during Year 5 RA(O) in selected wells and exceeded the MCL of 0.01 mg/L in 03WW01 at a concentration of 0.0133 mg/L in June 2019 and in 35AWW08 at a concentration of 0.0593 mg/L in December 2018 and 0.116 mg/L in June 2019.

The Draft Final RACR for LHAAP-35A (58) (AECOM, October 2015) states that historical groundwater data indicates that monitoring wells 35AWW20 and LHSMW07 in the western plume, and wells 35AWW08 and 35AWW09 in the eastern plume, will be the primary focus of COC trend analysis as they contain the highest relative COC concentrations. Additionally, well

03WW01, located in the eastern plume, had COC exceedances during this monitoring period and is therefore discussed herein.

Mann-Kendall analysis for the available historical data in each well (typically starting in 2008) through the end of the Year 5 RA(O) period (June 2019) was completed for various COCs for monitoring wells 03WW01, 35AWW08, 35AWW09, 35AWW20, LHSMW06, and LHSMW07. The results are presented in **Appendix F** in graphical format with statistical results presented on the right hand side. The USEPA's ProUCL version 5.1 software was used for this analysis. Data used to generate the Mann-Kendall analysis is presented in **Tables 2 through 4.** The dates are displayed in numerical format (elapsed days) rather than in a date format as required by the program. The concentration of COCs are presented on the data points on the graph in µg/L. The level of significance was 5 %. A summary table of the Mann-Kendall results is presented below.

Mann-Kendall Trend Summary

Monitoring Well	PCE	TCE	cis-1,2-DCE	1,1-DCE	VC
03WW01	**Significant Decrease***	**Significant Decrease***	**Significant Increase***	--	--
35AWW08	**Significant Decrease***	**Significant Decrease**	No significant trend*	--	--
35AWW09	**Significant Increase**	**Significant Increase**	No significant trend*	--	--
35AWW20	--	**Significant Decrease**	No significant trend	**Significant Decrease**	No significant trend
LHSMW06	--	**Significant Increase**	--	**Significant Increase***	**Significant Increase***
LHSMW07	--	No significant trend*	--	**Significant Decrease**	No significant trend*

Note:
* Most recent concentrations have achieved MCLs

Of the analyzed parameters and wells using Mann-Kendall statistical analysis set, three monitoring wells, 03WW01 and 35AWW08 within the eastern plume and 35AWW20 in the western plume, showed a significant decrease in concentration over time. ProUCL software was used to determine the best fit regression curve for the dataset from which the first order rate constant was determined (**Appendix G**). PCE at 03WW01, has achieved the MCL of 5 µg/L as of October 2016 (reported as non-detect). For 35AWW08, PCE was not detected and below the MCL for the first time in July 2018.

4.1.1 Eastern Plume

Well 03WW01

This well is located within the active EISB area. PCE and TCE previously detected in this well at concentrations above their respective MCLs were not detected during the Year 3 or Year 4 RA(O) monitoring periods. Detections in the Year 5 RA(O) were 15 µg/L in December 2018 and 3.2 J µg/L in June 2019 for PCE, and 5.7 µg/L in December 2018 and 2.9 J µg/L in June 2019 for TCE. Although the PCE and TCE concentrations were detected above the MCLs in December 2018, these detections reduced to below MCLs in the following semi-annual sampling event in June 2019. The decrease in PCE concentration is 99.1% between August 2013 and June 2019 and the decrease in TCE is 96.9% over the same time period.

Degradation of TCE resulted in the accumulation of cis-1,2-DCE to a high of 117 µg/L in April 2016, but declined in the Year 5 RA(O) to 41 µg/L in June 2019. Some limited accumulation of VC has also been observed in the Year 5 RA(O), with a concentration of 11 µg/L in 03WW01 in June 2019.

The Mann-Kendall trend analysis in 03WW01 was conducted for PCE; TCE; and cis-1,2-DCE for analytical results from 2008 through the end of the Year 5 RA(O) period (June 2019) (**Appendix F**). The Mann-Kendall results indicate statistically significant evidence of a decreasing trend in concentrations for PCE and TCE. The cis-1,2-DCE results indicate an increasing trend; however, the detected concentration is currently below the MCL.

Well 35AWW08

This well is located within the active EISB area. PCE concentrations decreased rapidly after the introduction of the carbon substrate and bacterial augmentation, with no detections above the MCL during the Year 5 RA(O) sampling events. TCE concentrations increased after substrate injection and more rapidly after bioaugmentation, reaching a peak of 953 µg/L in May 2014 followed by a decrease to 13 µg/L in June 2019, which exceeds the associated MCL. The initial increase in TCE concentrations is a reflection of PCE degradation.

Degradation of TCE resulted in a temporary increase in cis-1,2-DCE concentrations, especially during the Year 2 monitoring period, reaching a high of 79.6 µg/L in October 2015. However, neither cis-1,2-DCE or VC were detected in the June 2019 sampling event.

The Mann-Kendall trend analysis in 35AWW08 was conducted for PCE; TCE; and cis-1,2-DCE for analytical results from 2008 through the end of the Year 5 RA(O) period (June 2019) (**Appendix F**). The results provide statistically significant evidence of a decreasing trend in concentrations for PCE and TCE. The cis-1,2-DCE results indicate no significant trend, however, concentrations are currently below the MCL.

Well 35AWW09

This well is located downgradient of the active EISB area. PCE and TCE were detected in this well at concentrations above their respective MCLs throughout the Year 5 RA(O) monitoring period. PCE concentrations increased from 57.6 J µg/L in October 2013 to 450 µg/L in December 2018, but decreased in June 2019 to 130 µg/L. Similarly, TCE concentrations exhibited a significant

increase from 8.97 J µg/L in October 2013 to 150 µg/L in December 2018, but decreased during the second sampling event of the Year 5 RA(O) back to 38 µg/L. It should be noted that cis-1,2-DCE was not detected or was below 1 µg/L during the Year 5 RA(O) period.

The Mann-Kendall trend analysis in 35AWW09 was conducted for PCE; TCE; and cis-1,2-DCE for analytical results from 2008 through the end of the Year 5 RA(O) monitoring period (June 2019) (**Appendix F**). The results provide statistically significant evidence of an increasing trend in PCE and TCE concentrations, but no significant trend in cis-1,2-DCE concentrations, which are below the MCL.

The cause of the increase in COCs in well 35AWW09 appears to be migration of COCs in groundwater from the upgradient contaminated area (e.g., 35AWW08 and 03WW01). The initial increase in concentrations in 35AWW09 is likely associated with continued plume migration downgradient. The influence of biodegradation associated with EISB appears to remain within the area targeted for EISB (area of monitoring wells 35AWW08 and 03WW01) with little to no influence observed in 35AWW09. **Figure 8** shows COC concentration profiles in wells 03WW01, 35AWW08, and 35AWW09, and the table above summarizes the Mann-Kendall trend results for these same wells.

4.1.2 Western Plume

Well 35AWW20

The COCs 1,1-DCE; cis-1,2-DCE; TCE; and VC were detected in this well at concentrations above their respective MCLs during the quarterly Year 5 RA(O) monitoring events (**Table 3**). During the December 2018 sampling event, these COCs were elevated. However, concentrations of the COCs returned to the September 2018 levels in March 2019. EISB injections were completed in the Western Plume in March and April 2018 (Bhate, August 2018). Concentrations of TCE have decreased by approximately 55% between October 2013 and June 2019, while the concentrations of 1,1-DCE and cis-1,2-DCE have decreased by 44% and 28%, respectively, between October 2013 and June 2019. Degradation product VC increased between October 2013 and June 2019 from 105 µg/L to 140 µg/L.

In addition to the above constituents, well 35AWW20 contained 1,1,2-TCA and 1,2-DCA (daughter product of degradation of 1,1,2-TCA) above the MCLs (5 µg/L for 1,1,2-TCA and also for 1,2-DCA) throughout the Year 5 monitoring period. Prior to EISB treatment, the COC 1,1,2-TCA fluctuated between a minimum of 48.3 µg/L in February 2014 and a maximum of 82.7 µg/L in October 2016. Additionally, the 1,1,2-TCA daughter product, 1,2-DCA, fluctuated between a minimum of 13.2 µg/L in February 2014 and a maximum of 20.3 µg/L in October 2013. Concentrations of both COCs during the period following EISB treatment (November 2017 through June 2019) fluctuated between a minimum of 38 J µg/L in March 2019 and a maximum of 88 µg/L in December 2018 for 1,1,2-TCA and between a minimum of 8.7 µg/L (duplicate) in November 2017 and a maximum of 26 µg/L in December 2018 for 1,2-DCA.

The Mann-Kendall trend analysis in 35AWW20 was conducted for TCE; cis-1,2-DCE; 1,1-DCE; and VC for analytical results from 2008 through the end of the Year 5 RA(O) period (June 2019)

(**Appendix F**). The results indicate no significant trend in concentrations for cis-1,2-DCE and VC. Concentrations of TCE and 1,1-DCE indicate significant evidence of a decreasing trend over time at 35AWW20. These results support that attenuation is occurring in the vicinity of 35AWW20.

Well LHSMW06

The COCs TCE; 1,1-DCE; and VC slightly exceeded the MCLs in the December 2018 sampling event (**Table 3**). VC and 1,1-DEC returned to concentrations below the MCLs in June 2019. TCE remained above the MCL of 5 µg/L in June 2019 at 7.5 µg/L.

The Mann-Kendall trend analysis in LHSMW06 was conducted for TCE; 1,1-DCE; and VC for analytical results from 2008 through the end of the Year 5 RA(O) period (June 2019). The results indicate statistically significant increasing trends in concentrations for TCE; 1,1-DCE; and VC over time. However, VC and 1,1-DCE concentrations were below the associated MCLs in June 2019, and TCE slightly exceeded the MCL in the June 2019 sampling event.

Well LHSMW07

During the initial 3-year monitoring period, the COCs 1,1-DCE; TCE; and VC were detected in this well at concentrations above their respective MCLs as well as the first sampling event in Year 4 (November 2017). However, during the four sampling events in Year 5, only 1,1-DCE exceeded the MCL of 5 µg/L in June 2019, at a concentration of 16 µg/L.

The Mann-Kendall trend analysis in LHSMW07 was conducted for TCE; 1,1-DCE; and VC for analytical results from 2008 through the end of the Year 5 RA(O) period (June 2019). The results indicate no statistically significant trend in concentrations for TCE and VC over time. The results provide statistically significant evidence of a decreasing trend in concentrations for 1,1-DCE.

The COC, 1,1,2-TCA was detected above the MCL of 5 µg/L for the first time in April 2014 at 5.68 µg/L and was also above the MCL in October 2016 at a concentration of 7.72 µg/L. However, 1,1,2-TCA was not detected in December 2018, March 2019, or June 2019. It was detected at a concentration of 0.73 J µg/L in September 2018, below the MCL of 5 µg/L. The 1,1,2-TCA daughter product, 1,1-DCA while detected below the MCL, had concentrations between 9.6 µg/L in June 2019 and 42 µg/L in December 2018.

Figure 8 shows COC concentration profiles in wells 35AWW20 and LHSMW07 only, and the table above summarizes the Mann-Kendall trend results for these same wells.

4.1.3 Plume Stability

Contaminant concentration data for the December 2018 and June 2019 (eastern plume) sampling events and the September 2018, December 2018, March 2019, and June 2019 (western plume) sampling events are presented on **Figure 6** (shallow zone) and **Figure 7** (intermediate zone), respectively. EISB treatment of the western plume was implemented in March and April 2018, which has resulted in a decreasing shift compared to previous RA(O) event trends.

4.1.3.1 Eastern Plume

Based on the southeasterly direction of groundwater flow over the 5-year RA(O) monitoring period, the following wells are considered to be along the groundwater flow path: 35AWW10, 35AWW08, 03WW01, 35AWW09, and 35AWW21. The COC concentrations in the upgradient well, 35AWW10, remained below detection limits during the Year 5 RA(O) events. The in-plume wells (35AWW08 and 35AWW09) exhibit the highest concentrations of COCs in the eastern plume. Monitoring well 03WW01, which is hydraulically downgradient of 35AWW08 and upgradient of 35AWW09, has a Mann-Kendall significant decreasing trend for PCE and TCE and a significant increasing trend for cis-1,2-DCE, although the concentrations are below the MCLs for all three COCs.

Monitoring well 35AWW08 has a Mann-Kendall significant decreasing trend for both PCE and TCE and no significant trend for cis-1,2-DCE. Only TCE had a detected concentration above the MCL in June 2019, at 13 µg/L. The October 2016 TCE concentration at 35AWW08 was 235 µg/L.

There is a statistically significant increasing trend in concentrations of PCE and TCE in 35AWW09. Monitoring well 35AWW09 is located approximately 75 ft downgradient from 03WW01. The increase in concentrations in 35AWW09 is likely associated with downgradient dissolved phase migration from higher concentration areas near well 35AWW08.

The concentrations of COCs in downgradient wells 35AWW12 and 35AWW21 remained below the detection limits. No increased concentrations or detections of new COCs at boundary area wells 35AWW10, 35AWW13, 35AWW22, 35AWW12, and 35AWW21 occurred, therefore, the extent of the eastern plume is stable.

A review of the data in 35AWW09 over the course of the Year 5 monitoring period does not indicate any correlation between groundwater elevations and COC concentrations. COC concentration changes in 03WW01 and 35AWW08 could not be correlated with groundwater elevation because of EISB implementation in this area of the plume. **Figure 8** provides plots of groundwater COC concentrations and groundwater elevation changes over time in wells 03WW01, 35AWW08, and 35AWW09.

4.1.3.2 Western Plume

Based on the southeasterly direction of groundwater flow, the following wells can be considered to be along the groundwater flow path: 35AWW15, 35AWW20, 35AWW23, LHSMW07, and 35AWW19. The COC concentrations in upgradient well 35AWW15 have remained below detection limits throughout the Year 5 reporting period. The in-plume well (35AWW20) exhibits the highest levels of COCs, which have, based on the Mann-Kendall analysis, a decreasing trend or no significant trend. The concentrations of COCs in the in-plume downgradient well LHSMW07, based on Mann-Kendall, have a decreasing trend or no significant trend.

The TCE and 1,1-DCE concentrations in monitoring well 35AWW14 located in a downgradient direction of the western plume, have increased from below the MCL in October 2013 to above the MCL in October 2016, and remained above the MCL through June 2019. The 1,1-DCE concentration in monitoring well 35AWW19, located in a downgradient direction of the western

plume, has increased from below the MCL in October 2013 to above the MCL in January 2014 and remained above the MCL through December 2018. Detections of 1,1-DCE in monitoring wells 35AWW14 and 35AWW19 were stable or decreasing in the Year 5 RA(O) sampling events suggesting that migration of the plume is no longer occurring following EISB treatment of the western plume.

Evidence that plume expansion is not occurring is the decrease in concentrations of 1,1-DCE and VC in LHSMW06, located east and cross-gradient of 35AWW20, to below their MCLs in the June 2019 sampling event. However, it should be noted that elevated COCs were detected in LHSMW06 in the December 2018 sampling event. Further, concentrations of COCs in perimeter wells, including boundary area wells 35AWW15, 35AWW16, 35AWW17, and 35AWW18, exhibited no detections of COCs.

A review of the analytical data for individual wells over the course of the monitoring period for the western plume suggests potential correlation between non-remediation influences; i.e. groundwater elevations or rainfall and COC concentrations. **Figure 8** provides concentration profiles with groundwater levels for monitoring wells 35AWW20 and LHSMW07, located in the western plume.

4.2 Second Line of Evidence: Geochemical Indicators

Table 2 includes the geochemical indicator parameters that are useful for MNA evaluation. Some geochemical parameters are measured in the field and are recorded for all sampling events for all wells. The field parameters for LHAAP-35A (58) wells include: DO, ORP, pH, conductivity, turbidity, and temperature. DO and ORP measurements from bailed wells are not considered representative and are not included in **Tables 5 and 6**. The other geochemical indicators analyzed in the laboratory include: alkalinity, chloride, nitrate, nitrite, iron, sulfate, sulfide, methane, ethane, ethene, TOC, phosphorous, manganese, and dechlorinating bacteria. The following discussion examines the geochemical indicators recorded during the Year 5 RA(O) monitoring period. Analytes eliminated in March and June 2019 per the Draft TM – MNA Parameters (Bhate/APTIM, January 2019) were alkalinity, nitrite, sulfide, total iron, dissolved manganese, total phosphorous, and dissolved iron (lab analysis). TOC continues to be evaluated due to the recent EISB treatment with the western plume.

4.2.1 Eastern Plume

- Alkalinity – There is a positive correlation between zones of microbial activity and increased alkalinity (USEPA, September 1998). Alkalinity was one of the analytes eliminated in 2019 samples (Bhate/APTIM, 2018). During the Year 5 reporting period, alkalinity levels in the shallow zone groundwater within the eastern plume, EISB area, were 3,420 mg/L (35AWW08) and 282 mg/L (35AWW09) in December 2018. Outside the EISB area, alkalinity levels were lower (55.1 mg/L in 35AWW10). The higher alkalinity in 03WW01 and 35AWW08 is associated with biodegradation of organic substrate added to the groundwater and generation of carbon dioxide.

- Chloride – During biodegradation of chlorinated hydrocarbons in groundwater, chloride is released. This results in higher chloride concentrations in the contaminant plume as compared to background levels in upgradient wells or in un-impacted downgradient wells (USEPA, September 1998). Chloride levels in the shallow zone ranged between 6.59 mg/L in background well 35AWW10 and 2,510 mg/L in plume performance monitoring well 35AWW08 in June 2019. Additionally, chloride levels within eastern plume EISB treatment area wells 03WW01 (809 mg/L in June 2019) and 35AWW09 (1,340 mg/L in June 2019) provide evidence of biodegradation in the eastern plume. These levels can be compared to background chloride concentrations in upgradient well 35AWW10 with a chloride concentration of 6.59 mg/L in June 2019.
- Dissolved Oxygen – DO is the most thermodynamically favored electron acceptor used by microbes for biodegradation of organic carbon, whether natural or anthropogenic (USEPA, September 1998). Anaerobic bacteria generally cannot function at DO concentrations greater than about 0.5 mg/L and hence, reductive dechlorination will not occur. During the course of the monitoring period, the wells in the eastern plume (03WW01 and 35AWW08) were bailed, making the DO measurements in these wells unreliable. The DO level observed in eastern plume well 35AWW09 was 0.94 mg/L (June 2019); this DO level is not low enough to adequately support anaerobic conditions outside of the EISB treatment area (35AWW09).
- Oxidation-Reduction Potential – The ORP levels indicate how oxidative or reductive the groundwater is in the aquifer matrix and provide real-time data to determine if conditions are conducive for anaerobic biodegradation. ORP values less than 50 millivolts (mV) indicate that the aquifer is reaching anaerobic conditions that are favorable for the biological reductive dechlorination of chlorinated ethenes and ethanes. During the monitoring period, wells in the eastern plume (03WW01 and 35AWW08) were bailed, making the ORP measurements in these wells unreliable. The ORP measured outside of the EISB area was 272 mV in June 2019 at well 35AWW09. This indicates that conditions in the eastern plume outside of the EISB treatment area (35AWW09), are generally aerobic and not supportive of anaerobic degradation.
- Nitrate – After DO has been depleted in the microbiological treatment zone, nitrate may be used as an electron acceptor for anaerobic biodegradation of organic carbon by denitrification. In order for reductive dechlorination to occur, nitrate concentrations in the contaminated portion of the aquifer must be less than 1.0 mg/L (USEPA, September 1998). Nitrate was detected in 35AWW08 at 0.219 J mg/L in June 2019 and at 0.196 J mg/L in 03WW01. Based on these observations, nitrate reduction in the shallow aquifer is not a likely mode of microbial respiration at the site, and the lack of nitrate is favorable for achieving the reducing conditions ideal for anaerobic reductive dechlorination.
- Iron – In some cases, iron (III) (ferric iron) is used as an electron acceptor during anaerobic biodegradation of organic carbon. During this process, iron (III) is reduced to iron (II) (ferrous iron), which may be soluble in water. Ferrous iron concentrations can be used as

an indicator of anaerobic degradation of organic compounds. Ferrous iron concentrations in LHAAP-35A (58) wells during the December 2018 sampling event were as follows: 27.5 J mg/L in 03WW01; 21 J mg/L in 35AWW08; 0.13 J mg/L in 35AWW09; and 0.09 J mg/L in 35AWW10. Ferrous iron was not an analyzed compound in the June 2019 sampling event. The relatively high concentrations of ferrous iron in monitoring wells 03WW01 and 35AWW08 indicate active reductive conditions in the eastern plume around these wells as a result of EISB. However, ferrous iron concentrations in the remaining wells indicate limited reductive conditions in the portion of the eastern plume outside the influence of EISB.

- Sulfate – After DO and nitrate have been depleted in the microbiological treatment zone, sulfate may be used as an electron acceptor for anaerobic biodegradation. This process is termed "sulfate reduction" and results in the production of sulfide. Concentrations of sulfate greater than 20 mg/L may cause competitive exclusion of dechlorination. However, in many plumes with high concentrations of sulfate, reductive dechlorination still occurs (USEPA, September 1998). Sulfate concentrations were 239 mg/L in 03WW01 (June 2019) and 1.42 J mg/L in 35AWW08 (June 2019). The sulfate concentration in 35AWW09, outside the influence of EISB, was 908 mg/L in June 2019. Sulfate levels were above 20 mg/L in the wells sampled within the eastern plume, except 35AWW08.
- Dissolved gases – Methanogenesis occurs in highly reducing conditions and generally occurs after oxygen, nitrate, and sulfate have been depleted. Ethane and ethene are the end products of reductive dechlorination of chlorinated VOCs, and their levels increase if complete reductive dechlorination takes place. Methane levels above 500 µg/L are considered to indicate methanogenic conditions (USEPA, September 1998). Methane concentrations in well 03WW01 have increased from pre-EISB concentrations of 3.22 µg/L in August 2013 to 2,900 µg/L in June 2019. Similarly, methane concentrations in 35AWW08 increased from 10.1 µg/L in August 2013 to 3,000 µg/L in June 2019. However, methane was not detected in the December 2018 sample (**Table 5**). These wells are influenced by EISB and the production of methane is a strong indicator of anaerobic conditions. Ethene was detected at concentrations of 1.6 µg/L in 03WW01 and 4.1 µg/L in 35AWW08 in June 2019.
- TOC – Regardless of the electron acceptor being used, organic carbon is a required source of reduced carbon and energy to sustain microbial activity. TOC is utilized as a carbon and energy source to support the reductive dechlorination of the chlorinated COCs. TOC concentrations greater than 20 mg/L are considered adequate to support microbial activity (USEPA, September 1998). TOC concentrations in eastern plume area wells 03WW01 and 35AWW08, influenced by injected substrate, exceeded this threshold with December 2018 concentrations of 42 mg/L and 392 mg/L respectively. The TOC remained relatively stable in the June 2019 sampling event with detections for 03WW01 and 35AWW08 being 66.1 mg/L and 306 mg/L respectively. These concentrations indicate that sufficient TOC remains in the aquifer to support reductive dechlorination in the eastern plume. However, TOC is decreasing towards the lower end of the threshold.

- Phosphorus – Phosphorus in groundwater is a nutrient available to microbes for their metabolic processes during reductive dechlorination. Phosphorus is generally present at very low concentrations in the aquifer. Phosphorous was one of the analytes eliminated in 2019 samples (Bhate/APTIM, 2018). However, phosphorus was introduced with the injected substrate in the area of 03WW01 and 35AWW08. In 03WW01, phosphorous was reported at 243 mg/L in October 2013 but decreased to 3.05 mg/L in December 2018, indicating consumption of phosphorous by bacteria. Similarly, phosphorous was detected at 361 mg/L in 35AWW08 in October 2013, but decreased to 2.43 mg/L in December 2018. These levels continue to support microbial activities, but could become rate limiting quickly. Detected phosphorus levels in other sampled wells were generally low, indicating that groundwater does not have naturally available phosphorus to support biological degradation.
- Manganese – Manganese is a naturally occurring potential electron acceptor under anaerobic conditions. During anaerobic biological activity, manganese is solubilized from the aquifer matrix material. Manganese was one of the analytes eliminated in 2019 samples (Bhate/APTIM, 2018). Dissolved manganese concentrations in December 2018 were relatively low ranging from 0.0512 mg/L in 35AWW10 to 8.96 mg/L in 35AWW08. Both wells 03WW01 (4.22 mg/L in December 2018) and 35AWW08 (8.96 mg/L in December 2018), which are inside the EISB treatment area, had dissolved manganese concentrations above 1.0 mg/L, which are sufficient for continued biological activity.
- Dechlorinating bacteria – Dechlorinating bacteria, DHC and DHB, and associated functional genes were analyzed in groundwater samples from wells 03WW01, 35AWW08, 35AWW09, and 35AWW10, within and outside the eastern plume. Generally, the microbial population counts and the functional gene counts were at or below the laboratory reporting limits in areas not influenced by bioaugmentation (wells 35AWW09 and 35AWW10), indicating a limited natural population of the bacteria and the absence of gene expression necessary for anaerobic biological degradation of the COCs. At monitoring well 35AWW08, the microbial population counts were considered high at 3,790,000 cells/mL for DHC and 139,000 cells/mL for DHB in June 2019, indicating the proliferation of the microbial population during the Year 5 reporting period. The microbial population count in 03WW01 (6,040 cells/mL for DHC and 292 cells for DHB in June 2019) was low compared to the cell counts in 35AWW08, but elevated compared to 03WW01 cells counts in July 2018 (7.5 cells/mL for DHC and 5.5 cells/mL for DHB). The presence of the VC reductase in both 03WW01 and 35AWW08 indicates that complete reductive dechlorination can occur to allow VC to reduce to ethene over time.

The qualitative assessment of geochemical indicators in the shallow groundwater zone at LHAAP-35A (58) indicates naturally occurring geochemical conditions are not supportive of MNA. However, the areas influenced by the EISB treatment continue to allow for MNA.

4.2.2 Western Plume

- Alkalinity – There is a positive correlation between zones of microbial activity and increased alkalinity (USEPA, September 1998). Alkalinity was one of the analytes eliminated in 2019 samples (Bhate/APTIM, 2018). During the Year 5 reporting period, alkalinity levels in the shallow zone groundwater in the western plume ranged between 50.8 mg/L (35AWW24) and 2,060 mg/L (LHSMW07) in September 2018 and between 45.9 mg/L (35AWW24) and 1,640 mg/L (LHSMW07) in December 2018. The higher alkalinity following the EISB treatment is associated with biodegradation of organic substrate added to the groundwater and generation of carbon dioxide.
- Chloride – During biodegradation of chlorinated hydrocarbons in groundwater, chloride is released to groundwater. This results in higher chloride concentrations in the contaminant plume as compared to background levels in upgradient wells or in unimpacted downgradient wells (USEPA, September 1998). Prior to EISB injection, the chloride levels in the shallow zone detected in November 2017 ranged from 1,040 mg/L in 35AWW06 to 2,650 mg/L in 35AWW11. Chloride levels in 35AWW11 were slightly lower than the pre-EISB injection results but still elevated (approximately 2,000 mg/L). Chloride levels in the shallow zone were also elevated in LHSMW07, where chloride decreased over the Year 5 RA(O) from 2,180 mg/L in September 2018 to 1,780 mg/L in June 2019. The only other well with chloride greater than 1,000 mg/L was 35AWW20, which had chloride increase slightly over the Year 5 RA(O) reporting period. Additionally, chloride levels within the other western plume EISB treatment area wells provide evidence of biodegradation in the western plume. These levels can be compared to background chloride concentrations in downgradient wells such as 35AWW24 with a chloride concentration below 120 mg/L.
- Dissolved Oxygen – DO is the most thermodynamically favored electron acceptor used by microbes for biodegradation of organic carbon, whether natural or anthropogenic (USEPA, September 1998). Anaerobic bacteria generally cannot function at DO concentrations greater than about 0.5 mg/L and hence, reductive dechlorination will not occur. The DO levels observed in the western plume wells, 35AWW06, 35AWW11, 35AWW19, 35AWW20, 35AWW23, 35AWW24, and LHSMW07 were 0.1 mg/L or less in June 2019 (**Table 6**). These DO levels are adequate to support anaerobic conditions within the EISB treatment area.
- Oxidation-Reduction Potential – The ORP levels indicate how oxidative or reductive the groundwater is in the aquifer matrix and provide real-time data to determine if conditions are conducive for anaerobic biodegradation. ORP values less than 50 mV indicate that the aquifer is reaching anaerobic conditions that are favorable for the biological reductive dechlorination of chlorinated ethenes and ethanes. During the monitoring period, wells within proximity of the EISB treatment area (35AWW06, 35AWW11, 35AWW20, 35AWW23, and LHSMW07) exhibited a negative ORP. Areas outside of the treatment area (LHSMW06, 35AWW16, 35AWW18, 35AWW19, and 35AWW24) continued to have a positive ORP. These results indicate that conditions in the western plume outside of the EISB treatment

area are generally aerobic and not supportive of anaerobic degradation. The western plume EISB treatment area remains under reducing conditions.

- Nitrate – After DO has been depleted in the microbiological treatment zone, nitrate may be used as an electron acceptor for anaerobic biodegradation of organic carbon by denitrification. In order for reductive dechlorination to occur, nitrate concentrations in the contaminated portion of the aquifer must be less than 1.0 mg/L (USEPA, September 1998). Nitrate concentrations were non-detect or below 1 mg/L in the western plume monitoring wells in each of the four quarterly sampling events during the Year 5 Year monitoring period. Based on these observations, nitrate reduction in the shallow aquifer is not a likely mode of microbial respiration at the site, and the lack of nitrate is favorable for achieving the reducing conditions ideal for anaerobic reductive dechlorination.
- Iron – In some cases, iron (III) (ferric iron) is used as an electron acceptor during anaerobic biodegradation of organic carbon. During this process, iron (III) is reduced to iron (II) (ferrous iron), which may be soluble in water. Ferrous iron concentrations can be used as an indicator of anaerobic degradation of organic compounds. Ferrous iron concentrations in western plume wells during the Year 5 period ranged from 0.31 J mg/L (35AWW24, September 2018) to 88.1 J mg/L (35AWW06, December 2018). Starting in late 2019, this data will be collected in the field to ensure a more accurate result since the reaction from ferric to ferrous iron occurs quickly if exposed to oxygen. The relatively high concentrations of ferrous iron in monitoring wells outside of the main contaminant plume areas (35AWW06) and lower within the plume areas (LHSMW07) indicates active reducing conditions exist in the western plume and that ferric iron may be utilized as an electron acceptor in some areas of the plume generating elevated ferrous iron concentrations.
- Sulfate – After DO and nitrate have been depleted in the microbiological treatment zone, sulfate may be used as an electron acceptor for anaerobic biodegradation. This process is termed “sulfate reduction” and results in the production of sulfide. Concentrations of sulfate greater than 20 mg/L may cause competitive exclusion of dechlorination. However, in many plumes with high concentrations of sulfate, reductive dechlorination still occurs (USEPA, September 1998). Sulfate concentrations decreased significantly downgradient of the main plume in 35AWW06 from 1,560 mg/L in November 2017 to 2.08 J mg/L in June 2019 (**Table 6**). Concentrations have fluctuated within the plume (35AWW20) decreasing from 2,150 mg/L in November 2017 to 882 mg/L in July 2018 and increasing again to 1,240 mg/L in June 2019.
- Dissolved gases – Methanogenesis occurs in highly reducing conditions and generally occurs after oxygen, nitrate, and sulfate have been depleted. Ethane and ethene are the end products of reductive dechlorination of chlorinated VOCs and their levels increase if complete reductive dechlorination takes place. Methane levels above 500 µg/L are considered to indicate methanogenic conditions (USEPA, September 1998). Methane concentrations above 500 µg/L in June 2019 were present in wells 35AWW06, 35AWW11, 35AWW20, and 35AWW23. Ethene and ethane were detected within the western plume in

wells LHSMW07 and 35AWW20 in June 2019; the two wells with highest detected VOC concentrations. This indicates complete degradation of VOCs within the wells containing the highest VOC detections in the western plume.

- Total Organic Carbon – Regardless of the electron acceptor being used, organic carbon is a required source of reduced carbon and energy to sustain microbial activity. TOC is utilized as a carbon and energy source to support the reductive dechlorination of the chlorinated COCs. TOC concentrations greater than 20 mg/L are considered adequate to support microbial activity (USEPA, 1998). TOC concentrations in the western plume increased following EISB injections, which is to be expected. The two wells within the main portion of the VOC plume, LHSMW07 and 35AWW20, had TOC concentrations below 20 mg/L Although TOC concentrations are low in these two wells, ethene was detected, indicating that complete reductive dechlorination is occurring.
- Phosphorus – Phosphorus in groundwater is a nutrient available to microbes for their metabolic processes during reductive dechlorination. Phosphorus is generally present at very low concentrations in the aquifer. Phosphorous was one of the analytes eliminated in 2019 samples (Bhate/APTIM, 2018). The detected phosphorous levels within the sampled western plume wells were below 1 mg/L in September and December 2018, except for a concentration of 2.67 mg/L in well 35AWW06 in September 2018. The phosphorous levels present within the residual western plume are relatively low and could be rate limiting.
- Manganese – Manganese is a naturally occurring potential electron acceptor under anaerobic conditions. During anaerobic biological activity, manganese is solubilized from the aquifer matrix material. Manganese was one of the analytes eliminated in 2019 samples (Bhate/APTIM, 2018). Dissolved manganese concentrations in September and December 2018 ranged from 0.127 J mg/L (35AWW24, September 2018) to 9.5 mg/L (LHSMW07, September 2018), a general increase from the Year 4 concentrations. Therefore biological activity associated with the treatment appears to be occurring.
- Dechlorinating bacteria – Dechlorinating bacteria, DHC ethenogenes, DHB, and associated functional genes were analyzed in groundwater samples from wells within and outside the western plume. Monitoring wells 35AWW20 and LHSMW07 had significant changes in detections of DHB over the Year 5 reporting period with decreases from over 3 million cells/mL in each of these two monitoring wells to less than non-detected microbial counts. DHC increased in 35AWW20 from non-detected counts in September 2018 to 15,500 cells/mL in June 2019, while remaining fairly consistent in LHSMW07 in the 7,000 cells/mL to 11,000 cells/mL range over the past year of quarterly monitoring. The presence of the VC reductase in LHSMW07 at cell counts ranging from 1,620 cells/mL (June 2019) to 8,040 cells/mL (December 2018) over the four reported quarters of the Year 5 RA(O) is an increase over the 3.9 cells/mL reported in July 2018. An increase in VC reductase indicates that complete reductive dechlorination can occur to allow VC to reduce to ethene over time.

The qualitative assessment of geochemical indicators in the shallow groundwater zone at LHAAP-35A (58) indicates that geochemical conditions in many areas of the plume are supportive of MNA, both within the areas influenced by the EISB treatment and also downgradient of that area.

4.3 Third Line of Evidence: Predictive Modeling and Microbial Analysis

If the first two lines of evidence for MNA are deemed inadequate or inconclusive, and/or if the need for a contingency remedy is evaluated, data from field or microcosm studies will be necessary to establish the third line of evidence for MNA.

Dechlorinating bacteria, DHC ethenogenes, and associated functional genes were analyzed in wells within and outside the eastern and western plumes. Generally, outside the bioaugmentation area (35AWW09 and 35AWW10), the microbial population count and the functional gene counts were very low (less than 100 cells/mL) and in most cases below the laboratory reporting limits, indicating a limited population of the bacteria and an absence of gene expression necessary for anaerobic biological degradation of the COCs. Areas that were bioaugmented reflected higher concentrations of microbial population. It is recommended that microbial population analyses be discontinued in 35AWW10 and 35AWW24, located outside of the EISB areas, in future sampling events. It has been established that the microbial populations are limited and unaffected by the EISB injections in these areas.

5 CONCLUSIONS AND RECOMMENDATIONS

COC concentration data and geochemical indicator measurements were collected over the course of the monitoring period at LHAAP-35A (58) to evaluate the effectiveness of EISB and MNA groundwater remedy. A tiered approach based on assessment of three lines of evidence was used to evaluate the occurrence of natural attenuation in site groundwater. The first line of evidence evaluated reductions in COC concentrations over time and with increasing distance from source areas, including evaluation of Mann-Kendall tests for trends; the second line of evidence evaluated geochemical indicators; and the third line of evidence evaluated microbial conditions in the aquifer. The results of the tiered evaluation and the conclusions are summarized below.

Data for Year 5 RA(O) were collected between September 2018 and June 2019. The groundwater flow direction at the site is interpreted to the southeast in the western portion of the site and to the east-southeast in the eastern portion of the site (see **Figures 4 and 5**).

The EISB treatment in the eastern and western plume area appears to be effectively reducing the VOC concentrations and the current groundwater conditions are conducive to continued reductions of VOCs. **Figure 8** presents the graphical depiction of the decreasing trends of the COCs of various monitoring wells within LHAAP-58. **Figure 9** presents the change in the plumes from October 2016 to June 2019, which demonstrates the reduced lateral extent of the plumes.

The primary initial influence of EISB within the eastern plume was a reduction of PCE in 03WW01 and 35AWW08. TCE concentrations were observed to increase at each well after substrate injection, as PCE was degraded to TCE, followed by a decrease in concentration as the rate of TCE formation became lower than the rate of TCE biodegradation. Generally, cis-1,2-DCE was observed to increase in these two wells due to formation of cis-1,2-DCE from biodegradation of TCE. PCE; TCE; cis-1,2-DCE; and VC had reduced to non-detect at well 03WW01 by the end of the Year 3 RA(O) (October 2016). Throughout 2018 and 2019, cis-1,2-DCE and VC concentrations have increased gradually in 03WW01 until detected concentrations in June 2019 were 41 µg/L (cis-1,2-DCE) and 11 µg/L (VC). PCE and TCE concentrations increased in 03WW01 in December 2018 to 15 µg/L and 5.7 µg/L, respectively; but returned to levels below MCLs in June 2019. A significant reduction in PCE and TCE concentrations was observed in well 35AWW08, with PCE below detection limits since July 2018. Only TCE remained above MCL in June 2019 at 13 µg/L. Based upon the presence of ethene in both wells, complete degradation is occurring.

Concentrations of PCE and TCE in 35AWW09, located within the eastern plume but outside the EISB area, have fluctuated since July 2015. The June 2018 results were the lowest PCE and TCE results since 2014, however the December 2018 results were the highest over the same period. Continued monitoring of 35AWW09 will allow for further evaluation of the COC concentration trends. The concentrations of COCs in downgradient well 35AWW21, which is located outside the eastern plume, have remained below the detection limits. Therefore, based on the inferred east-southeastern groundwater flow path, COC levels are not increasing with distance from the source area. Concentrations of COCs away from the monitoring wells 35AWW08, 03WW01, and 35AWW09 have exhibited no increase in COC concentrations or new detections of COCs.

Specifically, the boundary area wells 35AWW10, 35AWW13, 35AWW22, 35AWW12, and 35AWW21 do not have increasing COC trends. Therefore, it appears that the lateral extent of the eastern plume is stable.

In the western plume, the EISB treatment was completed in March and April 2018 per the Final RAWP (Bhate, January 2018). The concentrations of COCs (PCE; TCE; cis-1,2-DCE; and VC), in upgradient well 35AWW15 have remained below detection limits during this monitoring period. Concentrations of COCs in perimeter wells, 35AWW15, 35AWW16, 35AWW17, and 35AWW18, which are located well away from the most impacted wells, 35AWW20 and LHSMW07, remain non-detect or below MCLs. PCE concentrations in LHSMW07 and 35AWW20, wells within the influence of the EISB treatment, were non-detect before EISB treatment and have remained below detection limits through the June 2019 sampling event. TCE; cis-1,2-DCE; and VC have been non-detect or below MCLs since September 2018 in LHSMW07. TCE; cis-1,2-DCE; and VC concentrations have fluctuated in 35AWW20 and remain above MCLs in June 2019.

The qualitative assessment of geochemical indicators and the absence of dechlorinating bacteria in the shallow groundwater zone (outside of the EISB zone) at LHAAP-35A (58) indicates current naturally occurring geochemical conditions are not optimal for, but may not preclude, MNA.

Historically the highest arsenic concentrations were detected in samples from 03WW01 at 89.1 µg/L in May 2014, and from 35AWW08 at 160 µg/L in January 2014. These wells are within the EISB area in the eastern groundwater plume. The presence of arsenic in groundwater above the MCL was reported in the past in samples from onsite wells and background wells, up to a maximum concentration of 62.1 µg/L in a filtered sample collected on December 16, 2004, from perimeter well 110. Therefore, the presence of arsenic in groundwater cannot be attributed solely to reductive conditions caused by EISB, although it may have contributed to an increase in arsenic concentrations. In December 2018 and June 2019, select monitoring wells were analyzed for arsenic. Only 03WW01 (0.0133 mg/L) and 35AWW08 (0.116 mg/L), within the eastern plume, exceeded the MCL of 0.010 mg/L. Monitoring for arsenic in the eastern plume is to be included in the Year 6 RA(O).

Groundwater monitoring continues to be performed at LHAAP-35A (58) on a semi-annual basis in compliance with the Eastern Plume RAWP (AECOM, August 2013). However, performance monitoring of the western plume will continue with quarterly sampling for the Year 6 RA(O) per the Western Plume RAWP (Bhate, January 2018). No change in land or groundwater use has occurred at the site, and current land use complies with the ROD.

Surface water samples were collected at surface water sample location 35ASW03 during the Year 5 RA(O) monitoring period. No COCs were detected in the surface water samples collected in December 2018 or June 2019. Surface water sampling will be conducted when the groundwater elevation in 35AWW18 is at or above the surveyed ditch elevation.

A LUC compliance inspection was conducted on May 13, 2019. No compliance issues or concerns were noted during the annual inspection (**Appendix A**). Well conditions, are documented in the photographic log presented in **Appendix B**. The operation and maintenance inspection information is documented in the well field sampling forms (**Appendix C**). Mowing the well areas

is conducted regularly, as part of routine maintenance at the site, particularly before sampling events.

Recommendations following the Year 5 RA(O), as discussed earlier in the report, are to reduce or eliminate microbial count analysis for wells 35AWW09 and 35AWW10. Monitoring well 35AWW10 is upgradient of the eastern plume injections, where no VOCs are detected. Therefore, continued evaluation of microbial analysis does not provide useful information. Monitoring well 35AWW09 is downgradient of the eastern plume injections and not directly influenced by the EISB injections such that reduction of microbial count analysis to annual is recommended. Per the Revised Final RAWP Contingency Remedy for the Western Plume, monitoring well 35AWW23 should be sampled quarterly instead of 35AWW24. Sampling of 35AWW24 is recommended to be continued semi-annually for VOCs only.

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FIGURES

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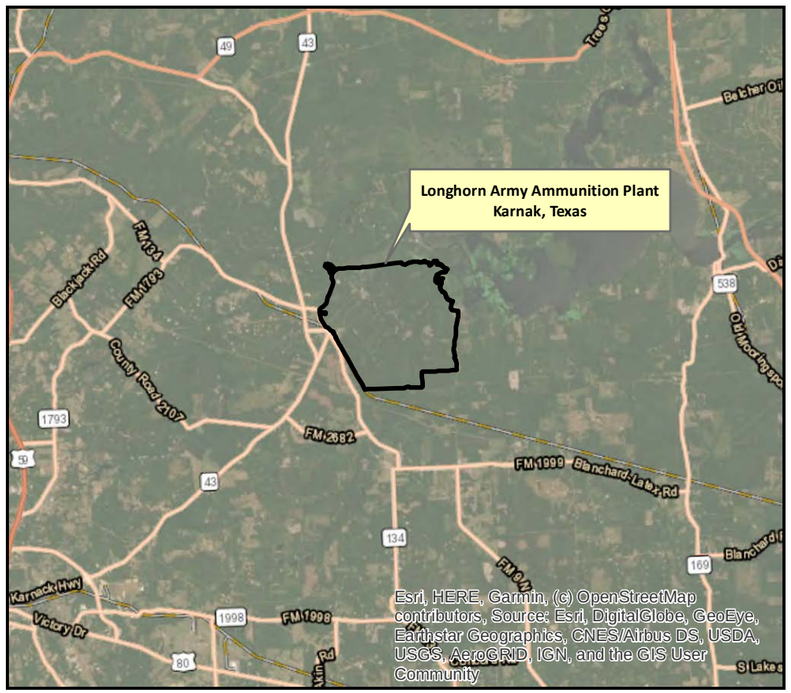
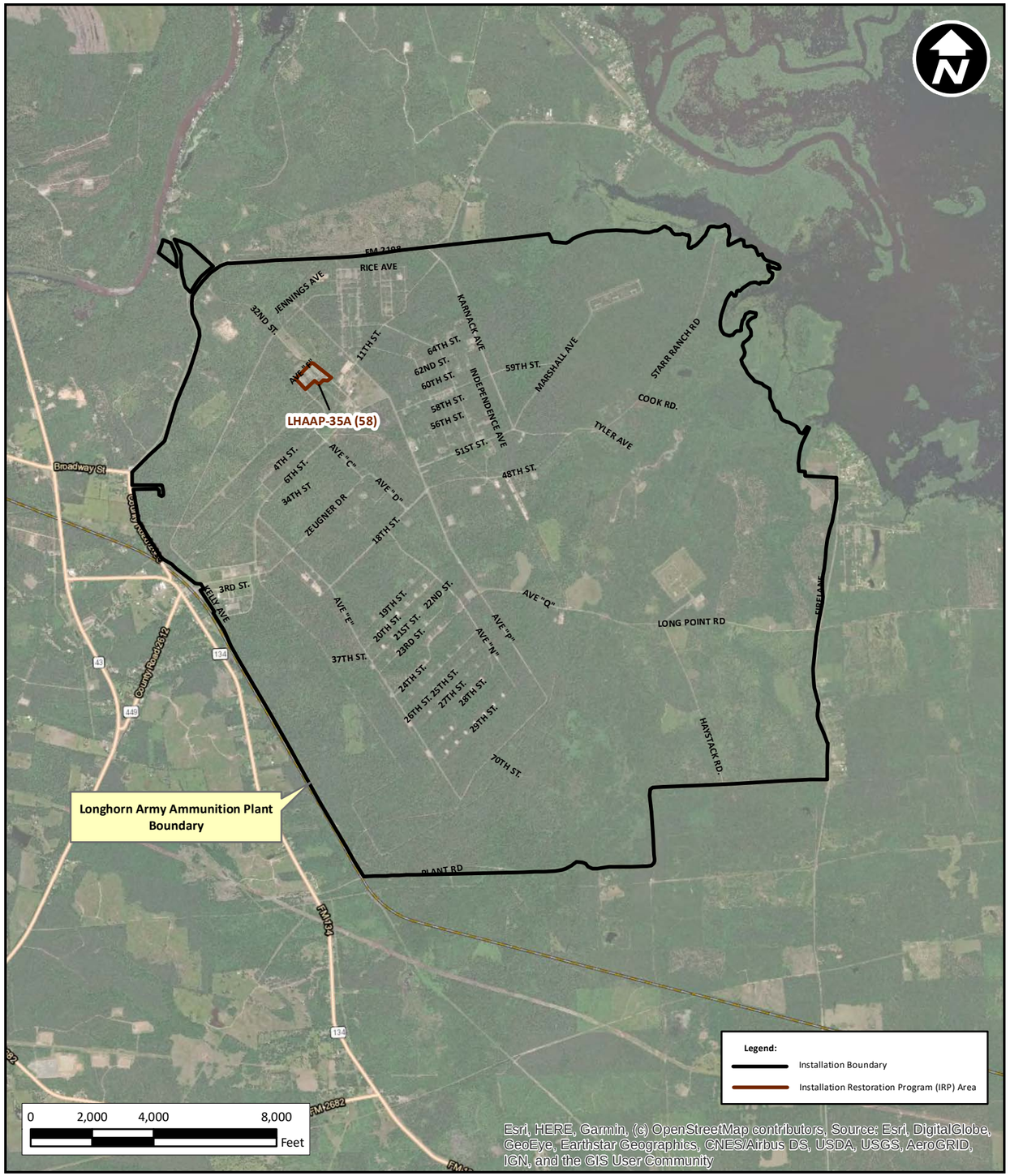
00943604







Longhorn Army Ammunition Plant
Location and Site Vicinity Map

Figure 1

Year 5 Annual Remedial Action Operation Report (September 2018 – August 2019)
LHAAP-35A (58), Shops Area
Longhorn Army Ammunition Plant
Karnack, Texas

PROJECT NO:	SCALE:	DATE:	DRAWN BY:
NWO1312.0150.012.0001.03	As Shown	9/10/2019	MRM

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00943605

Monitoring Well Location Map

Figure 2

Year 5 Annual Remedial Action Operation Report (September 2018 – August 2019)
LHAAP-35A (58), Shops Area
Longhorn Army Ammunition Plant
Karnack, Texas

DRAWN BY: MRM

DATE: 9/10/2019

SCALE: As Shown

PROJECT NO: NW01312.0150.012.0001.03

bhate

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Aerial Photography Source: Google Earth, April 2018

0 75 150 300 Feet

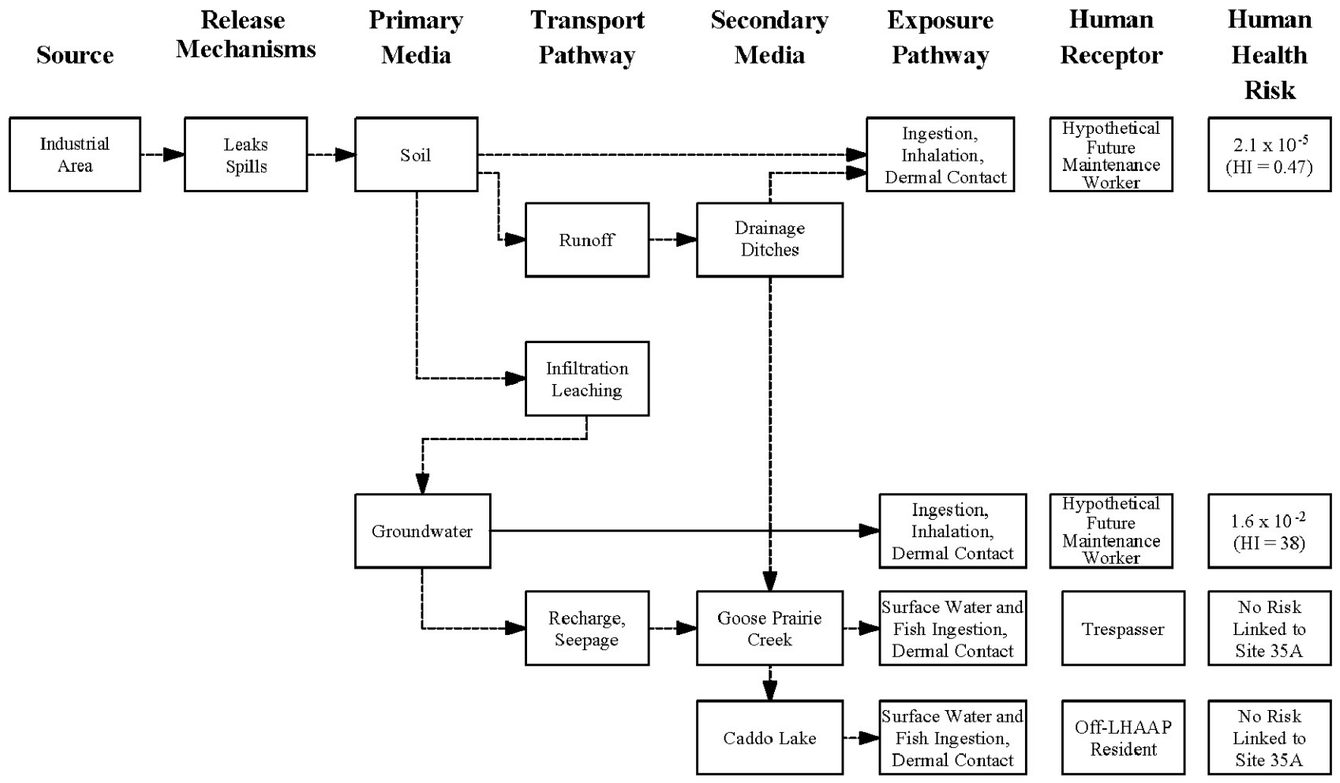
Legend:

- Shallow Monitoring Well Location
- Shallow Temporary Monitoring Well Location
- Intermediate Monitoring Well Location
- Deep Monitoring Well Location
- Surface Water Sample Location
- Groundwater Use Restrictions Area
- Installation Restoration Program (IRP) Area
- Stream
- 401 Building Number

00943606

Conceptual Site Model

Figure 3



Pathway considered for remediation

Pathway *not* considered for remediation

Source: Shaw, May 2010

Year 5 Annual Remedial Action Operation Report (September 2018 – August 2019)
LHAAP-35A (58), Shops Area
Longhorn Army Ammunition Plant
Karnack, Texas

DRAWN BY: MRM

DATE: 9/10/2019

SCALE: As Shown

PROJECT NO: NWO1312.0150.012.0001.03

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December 2018 Shallow Potentiometric Map

Figure 4

Year 5 Annual Remedial Action Operation Report (September 2018 – August 2019)
LHAAP-35A (58), Shops Area
Longhorn Army Ammunition Plant
Karnack, Texas

DRAWN BY: MRM

DATE: 9/10/2019

SCALE: As Shown

PROJECT NO: NWO1312.0150.012.0001.03

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LHAAP-35A (58)

32ND ST.
HARRELL ST
TACKET DR
AVE "F"
AVE "G"
8TH ST.
9TH ST.
10TH ST.
4TH ST.
6TH ST.
11TH ST.

35AWW03 (NM)
LHSMW05 (NM)
35AWW22 (186.42)
35AWW13 (194.09)
35AWW08 (187.40)
35AWW07R (NM)
35AWW15 (206.42)
35AWW10 (202.01)
LHSMW04 (Dry)
35AWW12 (186.33)
03WW01 (186.29)
35AWW09 (185.26)
LHSMW06 (204.00)
35AWW21 (186.15)
1004TW006 (NM)
35AWW20 (203.02)
1004TW001 (NM)
LHSMW03 (NM)
35AWW11 (189.10)
35AWW16 (202.62)
35AWW14 (188.86)
LHSMW07 (202.06)
35AWW23 (202.36)
35AWW06 (200.47)
35AWW18 (196.16)
35AWW17 (196.66)
35AWW19 (192.13)
35AWW24 (192.29)

205.00
203.00
201.00
199.00
197.00
195.00
193.00
191.00
189.00
187.00

Aerial Photography Source: Google Earth, April 2018

0 75 150 300 Feet

Legend:

- Shallow Monitoring Well Location
- Shallow Temporary Monitoring Well Location
- (202.36) Potentiometric Surface Elevation in Feet Above Mean Sea Level
- (NM) Not Measured
- Potentiometric Surface Contour
- Direction of Groundwater Flow
- Installation Restoration Program (IRP) Area
- *401* Building Number

00943608

June 2019 Shallow Potentiometric Map

Figure 5

Year 5 Annual Remedial Action Operation Report (September 2018 – August 2019)
LHAAP-35A (58), Shops Area
Longhorn Army Ammunition Plant
Karnack, Texas

DRAWN BY: MRM

DATE: 9/10/2019

SCALE: As Shown

PROJECT NO: NWO1312.0150.012.0001.03

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LHAAP-35A (58)

32ND ST.
HARRELL ST
TACKET DR
AVE "F"
AVE "G"
9TH ST.
8TH ST.
6TH ST.
4TH ST.
11TH ST.

35AWW03 (NM)
LHSMW05 (NM)
35AWW13 (196.04)
35AWW22 (186.74)
35AWW07R (NM)
35AWW10 (204.71)
35AWW08 (188.00)
LHSMW04 (Dry)
35AWW12 (187.40)
35AWW15 (205.20)
03WW01 (186.84)
35AWW09 (185.87)
LHSMW06 (206.25)
35AWW21 (187.67)
LHSMW03 (NM)
1004TW006 (NM)
35AWW20 (205.10)
1004TW001 (NM)
35AWW11 (190.88)
35AWW16 (203.58)
35AWW14 (189.76)
LHSMW07 (203.59)
35AWW23 (199.10)
35AWW06 (201.48)
35AWW18 (196.90)
35AWW17 (197.16)
35AWW19 (193.26)
35AWW24 (193.57)

206.00
204.00
202.00
200.00
198.00
196.00
194.00
192.00
190.00
188.00
186.00

Aerial Photography Source: Google Earth, April 2018

0 75 150 300
Feet

Legend:

- Shallow Monitoring Well Location
- Shallow Temporary Monitoring Well Location
- (187.67) Potentiometric Surface Elevation in Feet Above Mean Sea Level
- (NM) Not Measured
- Potentiometric Surface Contour
- Direction of Groundwater Flow
- Installation Restoration Program (IRP) Area
- *401* Building Number

00943609

Legend
J = Estimated value
U = Result is less than (<) the laboratory detection limit
COC = Contaminant of Concern
MCL = Maximum Contaminant Level
DCE = Dichloroethene
PCE = Tetrachloroethene
TCE = Trichloroethene
VC = Vinyl Chloride
NS = Not Sampled
Bold Red values exceed the United States Environmental Protection Agency MCL
All results and MCLs are reported in micrograms per liter (µg/L)

COCs shown on this figure	
COC	MCL
1,1-DCE	7
cis-1,2-DCE	70
PCE	5
trans-1,2-DCE	100
TCE	5
VC	2

LHSMW06		12/13/2018	12/13/2018	6/7/2019
COC	MCL	Result	Dup. Result	Result
1,1-DCE	7	**19**	**20**	4.3
TCE	5	**16**	**16**	**7.5**
VC	2	**5**	**5**	1.2

03WW01		12/12/2018	6/4/2019
COC	MCL	Result	Result
PCE	5	**15**	3.2J
TCE	5	**5.7**	2.9J
VC	2	**7.6**	**11**

35AWW20		9/26/2018	9/26/2018	12/10/2018	3/19/2019	6/4/2019
COC	MCL	Result	Dup. Result	Result	Result	Result
1,1-DCE	7	**1,100**	**970**	**2,700**	**1,500**	**1,800**
cis-1,2-DCE	70	45	40	**120**	49J	79
TCE	5	**170**	**150**	**570**	**180**	**230**
VC	2	<0.5U	<0.5U	**110**	**54J**	**140**

35AWW09		12/11/2018	6/3/2019
COC	MCL	Result	Result
PCE	5	**450**	**130**
TCE	5	**150**	**38**

LHSMW07		9/26/2018	12/10/2018	3/19/2019	6/3/2019
COC	MCL	Result	Result	Result	Result
1,1-DCE	7	3.1	<0.5U	<0.5U	**16**

35AWW08		12/12/2018	6/4/2019
COC	MCL	Result	Result
TCE	5	**12**	**13**

35AWW23		12/10/2018	6/3/2019
COC	MCL	Result	Result
TCE	5	**5.3**	1.8

35AWW14		12/13/2018	6/7/2019
COC	MCL	Result	Result
1,1-DCE	7	**10**	**12**
TCE	5	**9.4**	**12**

35AWW19		9/27/2018	12/10/2018	3/19/2019	6/3/2019
COC	MCL	Result	Result	Result	Result
1,1-DCE	7	**8.8**	**7.5**	3.6	2.6

Aerial Photography Source: Google Earth, April 2018

0 100 200 400 Feet

Legend:
- Shallow Monitoring Well Location
- Shallow Temporary Monitoring Well Location
- Shallow Monitoring Well Location No exceedances above MCLs for listed COCs
- Shallow Monitoring Well Location - Removed from RA(O)
- KB1® Plus Injection Point Locations (March 2018)
- KB1® Injection Point Locations (March 2018)
- Installation Restoration Program (IRP) Area
- Stream
- 401 Building Number

COC Exceedances in Shallow Groundwater (September 2018 - June 2019)

Figure 6

Year 5 Annual Remedial Action Operation Report (September 2018 – August 2019)
LHAAP-35A (58), Shops Area
Longhorn Army Ammunition Plant
Karnack, Texas

DRAWN BY: MRM
DATE: 9/25/2019
SCALE: As Shown
PROJECT NO.: NW013 12.0150. 012.0001.03

bhate
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00943610

Legend
COC = Contaminant of Concern
MCL = Maximum Contaminant Level
DCE = Dichloroethene
PCE = Tetrachloroethene
TCE = Trichloroethene
VC = Vinyl Chloride
All results and MCLs are reported in micrograms per liter (µg/L)

COCs shown on this figure

COC	MCL
1,1-DCE	7
cis-1,2-DCE	70
PCE	5
trans-1,2-DCE	100
TCE	5
VC	2

HARRELL ST.
32ND ST.
TACKET DR
AVE "P"
LHAAP-35A (58)
8TH ST.
9TH ST.
10TH ST.
11TH ST.
6TH ST.
AVE "G"
4TH ST.
35AWW01
35AWW05
207
102
102
102-R
103
L-6
101
GH-1
401

Aerial Photography Source: Google Earth, April 2018

0 100 200 400 Feet

Legend:
- Intermediate Monitoring Well Location
  No exceedances above MCLs for listed COCs
- Installation Restoration Program (IRP) Area
- Stream
- 401 Building Number

Figure 7
COC Exceedances in Intermediate Groundwater (December 2018 and June 2019)

Year 5 Annual Remedial Action Operation Report (September 2018 – August 2019)
LHAAP-35A (58), Shops Area
Longhorn Army Ammunition Plant
Karnack, Texas

PROJECT NO: NWO1312.0150.012.0001.03
DATE: 9/10/2019
SCALE: As Shown
DRAWN BY: MRM

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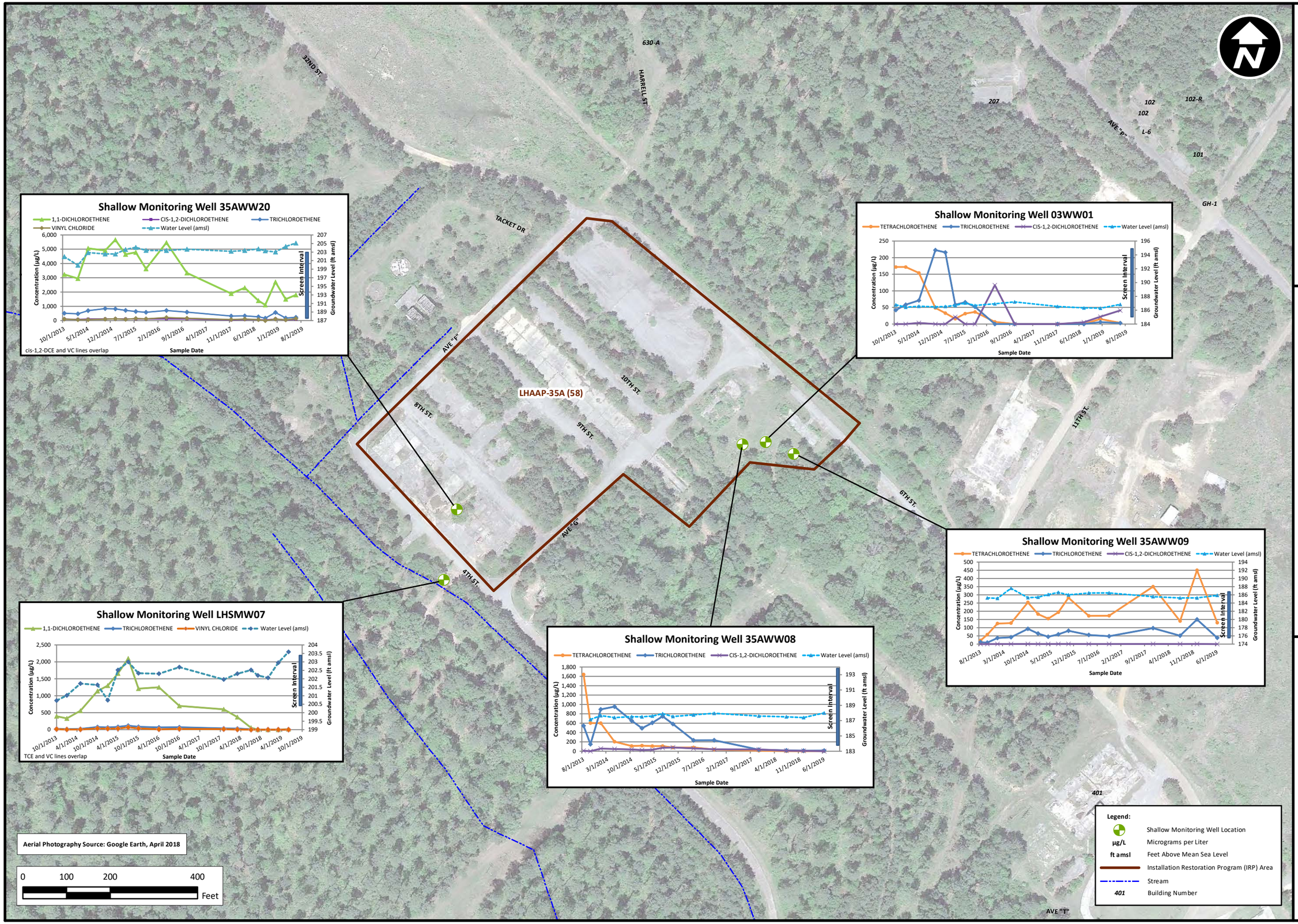
00943611



Shallow Monitoring Well 35AWW20

cis-1,2-DCE and VC lines overlap

Shallow Monitoring Well 03WW01

Shallow Monitoring Well LHSMW07

TCE and VC lines overlap

Shallow Monitoring Well 35AWW08

Shallow Monitoring Well 35AWW09

Aerial Photography Source: Google Earth, April 2018

0 100 200 400 Feet

Legend:

- Shallow Monitoring Well Location
- µg/L — Micrograms per Liter
- ft amsl — Feet Above Mean Sea Level
- Installation Restoration Program (IRP) Area
- Stream
- *401* — Building Number

COC Concentration Trends

Figure 8

Year 5 Annual Remedial Action Operation Report (September 2018 – August 2019)
LHAAP-35A (58), Shops Area
Longhorn Army Ammunition Plant
Karnack, Texas

DRAWN BY: MRM

DATE: 9/10/2019

SCALE: As Shown

PROJECT NO: NWO1312.0150.012.0001.03

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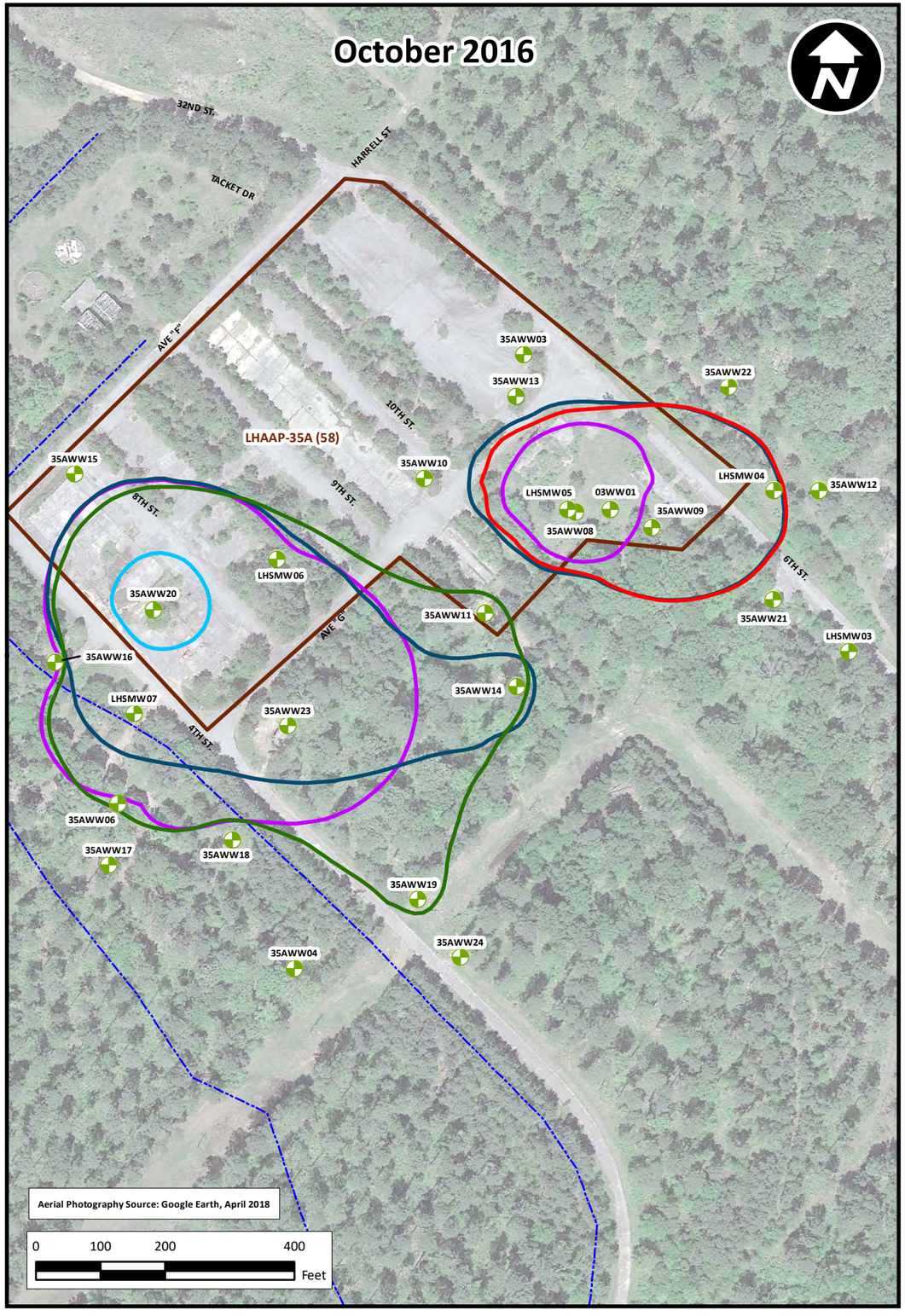

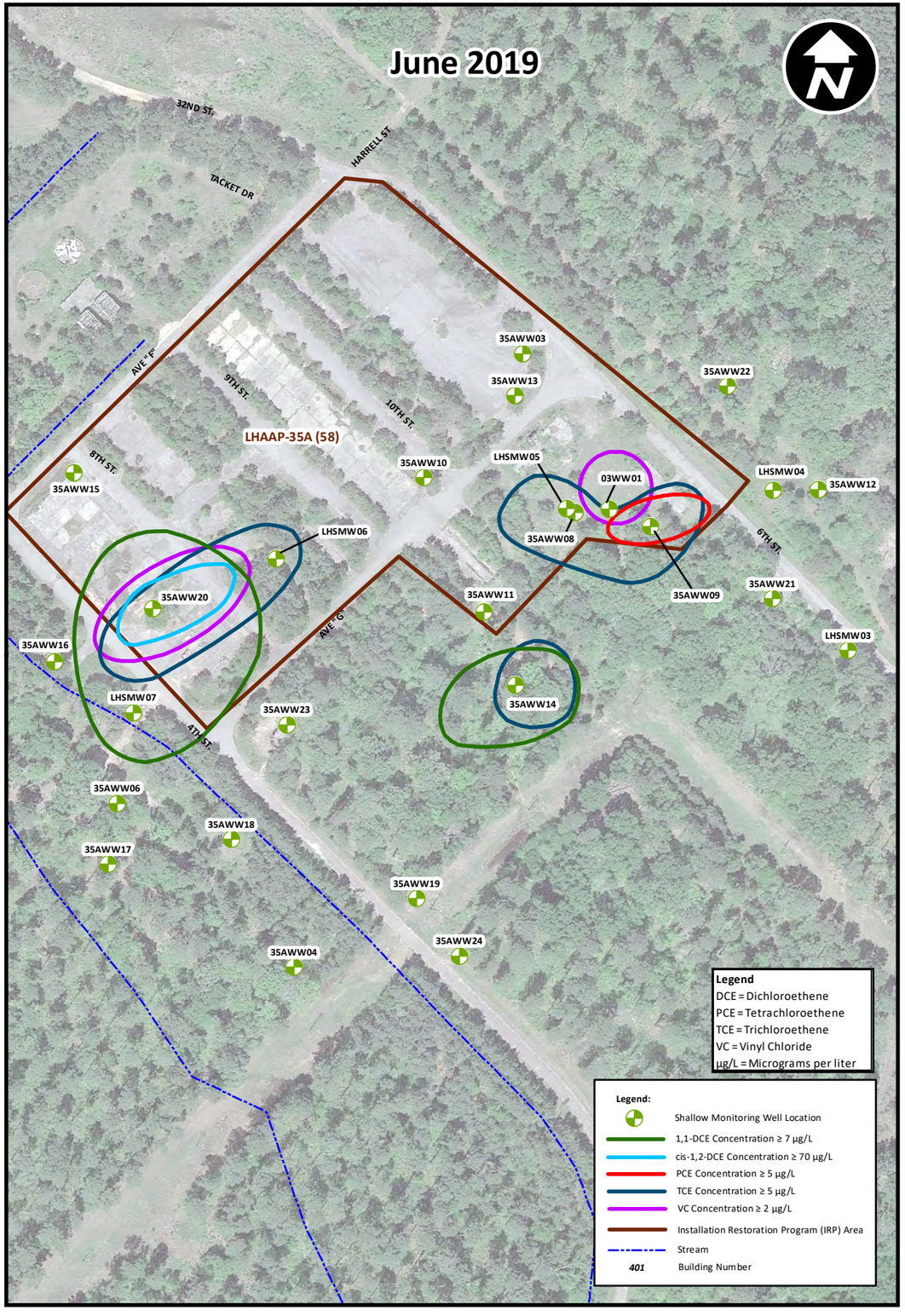

Lateral Extent of Plume Comparison (October 2016 and June 2019)

Figure 9

Year 5 Annual Remedial Action Operation Report (September 2018 – August 2019)
LHAAP-35A (58), Shops Area
Longhorn Army Ammunition Plant
Karnack, Texas

DRAWN BY: MRM

DATE: 9/10/2019

SCALE: As Shown

PROJECT NO: NWO1312.0150.012.0001.03

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TABLES

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Table 1
Groundwater Elevation Data
LHAAP-58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Well Identification	Aquifer	Sampling Date	Screen Intervals (ft from Top of Casing)	Top of Casing Elevation (ft)	Depth to Water (ft from Top of Casing)	Groundwater Elevation (ft above msl)
03WW01	Shallow	10/9/2013	21.53 - 31.53	216.29	29.51	186.78
		1/29/2014	21.53 - 31.53	216.29	29.86	186.43
		5/20/2014	21.53 - 31.53	216.29	29.72	186.57
		10/27/2014	21.53 - 31.53	216.29	29.81	186.48
		1/20/2015	21.53 - 31.53	216.29	29.75	186.54
		4/14/2015	21.53 - 31.53	216.29	29.60	186.69
		7/7/2015	21.53 - 31.53	216.29	29.25	187.04
		10/7/2015	21.53 - 31.53	216.29	29.60	186.69
		4/12/2016	21.53 - 31.53	216.29	29.36	186.93
		10/3/2016	21.53 - 31.53	216.29	29.09	187.20
		11/15/2017	21.53 - 31.53	216.29	29.75	186.54
		7/18/2018	21.53 - 31.53	216.29	29.96	186.33
		12/11/2018	21.53 - 31.53	216.29	30.00	186.29
		6/3/2019	21.53 - 31.53	216.29	29.45	186.84
1004TW001	Shallow	5/28/2014	NA	NM	18.05	NC
		10/30/2014	NA	NM	18.40	NC
		7/8/2015	NA	NM	17.00	NC
		4/14/2016	NA	NM	17.75	NC
		10/4/2016	NA	NM	17.46	NC
		11/17/2017	NA	NM	17.84	NC
1004TW006	Shallow	1/31/2014	NA	NM	19.17	NC
35AWW01	Intermediate	10/11/2013	62.69 - 72.69	218.03	40.58	177.45
		1/31/2014	62.69 - 72.69	218.03	40.21	177.82
		5/29/2014	62.69 - 72.69	218.03	39.31	178.72
		10/31/2014	62.69 - 72.69	218.03	40.17	177.86
		1/27/2015	62.69 - 72.69	218.03	39.40	178.63
		4/10/2015	62.69 - 72.69	218.03	40.06	177.97
		7/10/2015	62.69 - 72.69	218.03	39.10	178.93
		10/6/2015	62.69 - 72.69	218.03	39.79	178.24
		4/12/2016	62.69 - 72.69	218.03	38.86	179.17
		10/5/2016	62.69 - 72.69	218.03	39.01	179.02
		11/16/2017	62.69 - 72.69	218.03	44.29	173.74
		7/2/2018	62.69 - 72.69	218.03	43.00	175.03
		12/13/2018	62.69 - 72.69	218.03	40.27	177.76
		6/10/2019	62.69 - 72.69	218.03	44.52	173.51
35AWW02	Deep	10/22/2013	128.59 - 138.59	218.05	42.30	175.75
		4/13/2016	128.59 - 138.59	218.05	42.26	175.79
		10/4/2016	128.59 - 138.59	218.05	42.70	175.35
35AWW03	Shallow	2/1/2014	11.75 - 21.75	219.66	DRY	NC
		5/29/2014	11.75 - 21.75	219.66	DRY	NC
		10/30/2014	11.75 - 21.75	219.66	DRY	NC
		7/9/2015	11.75 - 21.75	219.66	DRY	NC
		4/13/2016	11.75 - 21.75	219.66	DRY	NC
		10/4/2016	11.75 - 21.75	219.66	DRY	NC
		11/16/2017	11.75 - 21.75	219.66	DRY	NC
35AWW05	Intermediate	10/16/2013	62.4 - 72.4	221.41	43.70	177.71
		2/1/2014	62.4 - 72.4	221.41	37.70	183.71
		5/22/2014	62.4 - 72.4	221.41	43.12	178.29
		10/21/2014	62.4 - 72.4	221.41	43.60	177.81
		1/23/2015	62.4 - 72.4	221.41	42.90	178.51
		4/8/2015	62.4 - 72.4	221.41	42.55	178.86
		7/10/2015	62.4 - 72.4	221.41	42.67	178.74
		10/5/2015	62.4 - 72.4	221.41	43.31	178.10
		4/14/2016	62.4 - 72.4	221.41	41.40	180.01
		10/5/2016	62.4 - 72.4	221.41	42.43	178.98
		11/13/2017	62.4 - 72.4	221.41	45.72	175.69
		7/2/2018	62.4 - 72.4	221.41	45.47	175.94
		12/12/2018	62.4 - 72.4	221.41	43.67	177.74
		6/10/2019	62.4 - 72.4	221.41	46.20	175.21

Table 1
Groundwater Elevation Data
LHAAP-58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Well Identification	Aquifer	Sampling Date	Screen Intervals (ft from Top of Casing)	Top of Casing Elevation (ft)	Depth to Water (ft from Top of Casing)	Groundwater Elevation (ft above msl)
35AWW06	Shallow	10/15/2013	19.05 - 29.05	220.43	21.50	198.93
		1/30/2014	19.05 - 29.05	220.43	21.14	199.29
		5/21/2014	19.05 - 29.05	220.43	20.65	199.78
		10/29/2014	19.05 - 29.05	220.43	20.55	199.88
		1/28/2015	19.05 - 29.05	220.43	20.58	199.85
		4/15/2015	19.05 - 29.05	220.43	18.95	201.48
		7/7/2015	19.05 - 29.05	220.43	19.47	200.96
		10/7/2015	19.05 - 29.05	220.43	19.97	200.46
		4/11/2016	19.05 - 29.05	220.43	19.95	200.48
		10/3/2016	19.05 - 29.05	220.43	19.53	200.90
		11/14/2017	19.05 - 29.05	220.43	19.78	200.65
		7/18/2018	19.05 - 29.05	220.43	19.67	200.76
		9/26/2018	19.05 - 29.05	220.43	20.35	200.08
		12/11/2018	19.05 - 29.05	220.43	19.96	200.47
		3/19/2019	19.05 - 29.05	220.43	19.50	200.93
		6/4/2019	19.05 - 29.05	220.43	18.95	201.48
35AWW07R	Shallow	10/16/2013	21.55 - 31.25	212.11	27.90	184.21
		2/3/2014	21.55 - 31.25	212.11	28.90	183.21
		5/29/2014	21.55 - 31.25	212.11	25.83	186.28
		10/30/2014	21.55 - 31.26	212.11	26.55	185.56
		7/10/2015	21.55 - 31.26	212.11	24.08	188.03
		4/13/2016	21.55 - 31.26	212.11	24.34	187.77
		10/4/2016	21.55 - 31.26	212.11	24.82	187.29
		11/17/2017	21.55 - 31.26	212.11	26.14	185.97
35AWW08	Shallow	10/9/2013	21.83 - 31.83	216.95	29.80	187.15
		1/29/2014	21.83 - 31.83	216.95	29.30	187.65
		5/20/2014	21.83 - 31.83	216.95	29.55	187.40
		10/27/2014	21.83 - 31.83	216.95	29.43	187.52
		1/20/2015	21.83 - 31.83	216.95	29.45	187.50
		4/14/2015	21.83 - 31.83	216.95	29.35	187.60
		7/7/2015	21.83 - 31.83	216.95	29.05	187.90
		10/7/2015	21.83 - 31.83	216.95	29.41	187.54
		4/12/2016	21.83 - 31.83	216.95	29.20	187.75
		10/3/2016	21.83 - 31.83	216.95	29.00	187.95
		11/15/2017	21.83 - 31.83	216.95	29.35	187.60
		7/18/2018	21.83 - 31.83	216.95	29.45	187.50
		12/11/2018	21.83 - 31.83	216.95	29.55	187.40
		6/3/2019	21.83 - 31.83	216.95	28.95	188.00
35AWW09	Shallow	10/10/2013	26.69 - 41.29	217.47	32.21	185.26
		1/29/2014	26.69 - 41.29	217.47	32.32	185.15
		5/20/2014	26.69 - 41.29	217.47	29.87	187.60
		10/27/2014	26.69 - 41.29	217.47	32.15	185.32
		1/21/2015	26.69 - 41.29	217.47	32.04	185.43
		4/14/2015	26.69 - 41.29	217.47	31.38	186.09
		7/7/2015	26.69 - 41.29	217.47	30.87	186.60
		10/7/2015	26.69 - 41.29	217.47	31.46	186.01
		4/12/2016	26.69 - 41.29	217.47	31.02	186.45
		10/3/2016	26.69 - 41.29	217.47	31.00	186.47
		11/15/2017	26.69 - 41.29	217.47	31.91	185.56
		7/16/2018	26.69 - 41.29	217.47	32.22	185.25
		12/11/2018	26.69 - 41.29	217.47	32.21	185.26
		6/3/2019	26.69 - 41.29	217.47	31.60	185.87
35AWW10	Shallow	10/10/2013	18.16 - 32.76	220.76	20.15	200.61
		1/29/2014	18.16 - 32.76	220.76	18.85	201.91
		5/20/2014	18.16 - 32.76	220.76	17.10	203.66
		10/28/2014	18.16 - 32.76	220.76	19.55	201.21
		1/27/2015	18.16 - 32.76	220.76	17.78	202.98
		4/14/2015	18.16 - 32.76	220.76	16.45	204.31
		7/7/2015	18.16 - 32.76	220.76	17.17	203.59
		10/7/2015	18.16 - 32.76	220.76	19.45	201.31
		4/13/2016	18.16 - 32.76	220.76	17.41	203.35
		10/3/2016	18.16 - 32.76	220.76	18.98	201.78
		11/15/2017	18.16 - 32.76	220.76	19.68	201.08
		7/12/2018	18.16 - 32.76	220.76	18.95	201.81
		12/12/2018	18.16 - 32.76	220.76	18.75	202.01
		6/4/2019	18.16 - 32.76	220.76	16.05	204.71

Table 1
Groundwater Elevation Data
LHAAP-58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Well Identification	Aquifer	Sampling Date	Screen Intervals (ft from Top of Casing)	Top of Casing Elevation (ft)	Depth to Water (ft from Top of Casing)	Groundwater Elevation (ft above msl)
35AWW11	Shallow	10/15/2013	22.24 - 36.84	220.15	31.36	188.79
		2/3/2014	22.24 - 36.84	220.15	31.80	188.35
		5/21/2014	22.24 - 36.84	220.15	31.55	188.60
		10/29/2014	22.24 - 36.84	220.15	31.73	188.42
		1/27/2015	22.24 - 36.84	220.15	31.60	188.55
		4/14/2015	22.24 - 36.84	220.15	31.25	188.90
		7/8/2015	22.24 - 36.84	220.15	30.72	189.43
		10/7/2015	22.24 - 36.84	220.15	31.20	188.95
		4/12/2016	22.24 - 36.84	220.15	31.03	189.12
		10/3/2016	22.24 - 36.84	220.15	30.48	189.67
		11/14/2017	22.24 - 36.84	220.15	30.91	189.24
		7/16/2018	22.24 - 36.84	220.15	30.60	189.55
		9/27/2018	22.24 - 36.84	220.15	31.10	189.05
		12/11/2018	22.24 - 36.84	220.15	31.05	189.10
		3/19/2019	22.24 - 36.84	220.15	30.00	190.15
		6/3/2019	22.24 - 36.84	220.15	29.27	190.88
35AWW12	Shallow	10/18/2013	22.17 - 36.77	215.99	30.05	185.94
		1/31/2014	22.17 - 36.77	215.99	28.10	187.89
		5/29/2014	22.17 - 36.77	215.99	29.00	186.99
		10/30/2014	22.17 - 36.77	215.99	30.11	185.88
		1/28/2015	22.17 - 36.77	215.99	29.45	186.54
		4/7/2015	22.17 - 36.77	215.99	28.70	187.29
		7/9/2015	22.17 - 36.77	215.99	28.22	187.77
		10/5/2015	22.17 - 36.77	215.99	29.35	186.64
		4/12/2016	22.17 - 36.77	215.99	28.54	187.45
		10/5/2016	22.17 - 36.77	215.99	28.87	187.12
		11/16/2017	22.17 - 36.77	215.99	29.97	186.02
		6/29/2018	22.17 - 36.77	215.99	30.05	185.94
		12/14/2018	22.17 - 36.77	215.99	29.66	186.33
		6/10/2019	22.17 - 36.77	215.99	28.59	187.40
35AWW13	Shallow	10/11/2013	24.72 - 39.32	219.12	25.07	194.05
		2/3/2014	24.72 - 39.32	219.12	24.91	194.21
		5/22/2014	24.72 - 39.32	219.12	23.80	195.32
		10/21/2014	24.72 - 39.32	219.12	24.85	194.27
		1/23/2015	24.72 - 39.32	219.12	24.70	194.42
		4/8/2015	24.72 - 39.32	219.12	23.72	195.40
		7/9/2015	24.72 - 39.32	219.12	23.39	195.73
		10/6/2015	24.72 - 39.32	219.12	24.61	194.51
		4/13/2016	24.72 - 39.32	219.12	24.10	195.02
		10/6/2016	24.72 - 39.32	219.12	24.41	194.71
		11/16/2017	24.72 - 39.32	219.12	25.06	194.06
		6/29/2018	24.72 - 39.32	219.12	24.37	194.75
		12/11/2018	24.72 - 39.32	219.12	25.03	194.09
		6/7/2019	24.72 - 39.32	219.12	23.08	196.04
35AWW14	Shallow	10/18/2013	17.06 - 31.76	218.41	30.80	187.61
		1/31/2014	17.06 - 31.76	218.41	30.95	187.46
		5/28/2014	17.06 - 31.76	218.41	30.57	187.84
		10/29/2014	17.06 - 31.76	218.41	31.00	187.41
		1/20/2015	17.06 - 31.76	218.41	30.85	187.56
		4/7/2015	17.06 - 31.76	218.41	30.48	187.93
		7/8/2015	17.06 - 31.76	218.41	29.75	188.66
		10/1/2015	17.06 - 31.76	218.41	30.19	188.22
		4/12/2016	17.06 - 31.76	218.41	29.67	188.74
		10/5/2016	17.06 - 31.76	218.41	29.31	189.10
		11/16/2017	17.06 - 31.76	218.41	29.63	188.78
		7/18/2018	17.06 - 31.76	218.41	29.58	188.83
		12/13/2018	17.06 - 31.76	218.41	29.55	188.86
		6/7/2019	17.06 - 31.76	218.41	28.65	189.76

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Groundwater Elevation Data
LHAAP-58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Well Identification	Aquifer	Sampling Date	Screen Intervals (ft from Top of Casing)	Top of Casing Elevation (ft)	Depth to Water (ft from Top of Casing)	Groundwater Elevation (ft above msl)
35AWW15	Shallow	10/16/2013	25.67 - 40.37	222.97	20.65	202.32
		2/1/2014	25.67 - 40.37	222.97	20.40	202.57
		5/28/2014	25.67 - 40.37	222.97	19.64	203.33
		10/21/2014	25.67 - 40.37	222.97	20.18	202.79
		1/23/2015	25.67 - 40.37	222.97	20.15	202.82
		4/10/2015	25.67 - 40.37	222.97	19.31	203.66
		7/10/2015	25.67 - 40.37	222.97	18.95	204.02
		10/6/2015	25.67 - 40.37	222.97	19.56	203.41
		4/14/2016	25.67 - 40.37	222.97	19.51	203.46
		10/5/2016	25.67 - 40.37	222.97	19.34	203.63
		11/16/2017	25.67 - 40.37	222.97	19.72	203.25
		7/18/2018	25.67 - 40.37	222.97	19.50	203.47
		12/12/2018	25.67 - 40.37	222.97	16.55	206.42
		6/7/2019	25.67 - 40.37	222.97	17.77	205.20
35AWW16	Shallow	10/22/2013	21.75 - 36.45	220.88	19.58	201.30
		1/31/2014	21.75 - 36.45	220.88	19.28	201.60
		5/28/2014	21.75 - 36.45	220.88	18.60	202.28
		10/30/2014	21.75 - 36.45	220.88	19.96	200.92
		1/27/2015	21.75 - 36.45	220.88	18.90	201.98
		4/7/2015	21.75 - 36.45	220.88	18.22	202.66
		7/9/2015	21.75 - 36.45	220.88	17.79	203.09
		10/6/2015	21.75 - 36.45	220.88	18.20	202.68
		4/12/2016	21.75 - 36.45	220.88	18.43	202.45
		10/4/2016	21.75 - 36.45	220.88	17.90	202.98
		11/13/2017	21.75 - 36.45	220.88	18.52	202.36
		6/29/2018	21.75 - 36.45	220.88	18.10	202.78
		12/12/2018	21.75 - 36.45	220.88	18.26	202.62
		6/10/2019	21.75 - 36.45	220.88	17.30	203.58
35AWW17	Shallow	10/18/2013	26.97 - 41.67	221.44	28.00	193.44
		2/1/2014	26.97 - 41.67	221.44	36.90	184.54
		5/29/2014	26.97 - 41.67	221.44	26.60	194.84
		10/31/2014	26.97 - 41.67	221.44	26.80	194.64
		1/28/2015	26.97 - 41.67	221.44	26.00	195.44
		4/10/2015	26.97 - 41.67	221.44	25.65	195.79
		7/10/2015	26.97 - 41.67	221.44	25.42	196.02
		10/5/2015	26.97 - 41.67	221.44	25.93	195.51
		4/11/2016	26.97 - 41.67	221.44	25.60	195.84
		10/3/2016	26.97 - 41.67	221.44	25.30	196.14
		11/13/2017	26.97 - 41.67	221.44	24.87	196.57
		6/29/2018	26.97 - 41.67	221.44	25.07	196.37
		12/17/2018	26.97 - 41.67	221.44	24.78	196.66
		6/10/2019	26.97 - 41.67	221.44	24.28	197.16
35AWW18	Shallow	10/18/2013	26.85 - 41.55	221.75	28.35	193.40
		2/1/2014	26.85 - 41.55	221.75	27.90	193.85
		5/29/2014	26.85 - 41.55	221.75	27.65	194.10
		10/31/2014	26.85 - 41.55	221.75	27.50	194.25
		1/28/2015	26.85 - 41.55	221.75	27.11	194.64
		4/10/2015	26.85 - 41.55	221.75	25.90	195.85
		7/10/2015	26.85 - 41.55	221.75	26.42	195.33
		10/5/2015	26.85 - 41.55	221.75	26.67	195.08
		4/11/2016	26.85 - 41.55	221.75	26.40	195.35
		10/5/2016	26.85 - 41.55	221.75	25.93	195.82
		11/13/2017	26.85 - 41.55	221.75	25.85	195.90
		6/29/2018	26.85 - 41.55	221.75	24.55	197.20
		12/17/2018	26.85 - 41.55	221.75	25.59	196.16
		6/4/2019	26.85 - 41.55	221.75	24.85	196.90

Table 1
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Well Identification	Aquifer	Sampling Date	Screen Intervals (ft from Top of Casing)	Top of Casing Elevation (ft)	Depth to Water (ft from Top of Casing)	Groundwater Elevation (ft above msl)
35AWW19	Shallow	10/22/2013	16.99 - 31.09	219.71	30.65	189.06
		1/31/2014	16.99 - 31.09	219.71	30.68	189.03
		5/28/2014	16.99 - 31.09	219.71	30.30	189.41
		10/29/2014	16.99 - 31.09	219.71	30.45	189.26
		1/20/2015	16.99 - 31.09	219.71	30.15	189.56
		4/7/2015	16.99 - 31.09	219.71	29.84	189.87
		7/8/2015	16.99 - 31.09	219.71	29.16	190.55
		10/1/2015	16.99 - 31.09	219.71	29.46	190.25
		4/12/2016	16.99 - 31.09	219.71	28.87	190.84
		10/5/2016	16.99 - 31.09	219.71	28.13	191.58
		11/17/2017	16.99 - 31.09	219.71	27.81	191.90
		7/18/2018	16.99 - 31.09	219.71	27.37	192.34
		9/27/2018	16.99 - 31.09	219.71	27.79	191.92
		12/10/2018	16.99 - 31.09	219.71	27.58	192.13
		3/19/2019	16.99 - 31.09	219.71	27.00	192.71
		6/3/2019	16.99 - 31.09	219.71	26.45	193.26
35AWW20	Shallow	10/15/2013	20.94 - 35.64	223.05	21.12	201.93
		2/3/2014	20.94 - 35.64	223.05	23.12	199.93
		5/21/2014	20.94 - 35.64	223.05	20.18	202.87
		10/29/2014	20.94 - 35.64	223.05	20.50	202.55
		1/27/2015	20.94 - 35.64	223.05	20.50	202.55
		4/15/2015	20.94 - 35.64	223.05	19.45	203.60
		7/8/2015	20.94 - 35.64	223.05	18.95	204.10
		10/8/2015	20.94 - 35.64	223.05	19.67	203.38
		4/13/2016	20.94 - 35.64	223.05	19.69	203.36
		10/4/2016	20.94 - 35.64	223.05	19.38	203.67
		11/14/2017	20.94 - 35.64	223.05	19.87	203.18
		7/16/2018	20.94 - 35.64	223.05	19.31	203.74
		9/26/2018	20.94 - 35.64	223.05	19.75	203.30
		12/10/2018	20.94 - 35.64	223.05	20.03	203.02
		3/19/2019	20.94 - 35.64	223.05	18.76	204.29
		6/4/2019	20.94 - 35.64	223.05	17.95	205.10
35AWW21	Shallow	10/16/2013	27.56 - 42.26	219.05	34.36	184.69
		2/4/2014	27.56 - 42.26	219.05	33.55	185.50
		5/22/2014	27.56 - 42.26	219.05	32.40	186.65
		10/21/2014	27.56 - 42.26	219.05	33.90	185.15
		1/23/2015	27.56 - 42.26	219.05	33.06	185.99
		4/8/2015	27.56 - 42.26	219.05	31.73	187.32
		7/9/2015	27.56 - 42.26	219.05	31.11	187.94
		10/6/2015	27.56 - 42.26	219.05	32.74	186.31
		4/13/2016	27.56 - 42.26	219.05	31.44	187.61
		10/4/2016	27.56 - 42.26	219.05	32.10	186.95
		11/13/2017	27.56 - 42.26	219.05	33.77	185.28
		6/29/2018	27.56 - 42.26	219.05	33.77	185.28
		12/13/2018	27.56 - 42.26	219.05	32.90	186.15
		6/10/2019	27.56 - 42.26	219.05	31.38	187.67
35AWW22	Shallow	10/22/2013	22.27 - 36.77	219.14	32.13	187.01
		1/31/2014	22.27 - 36.77	219.14	32.08	187.06
		5/28/2014	22.27 - 36.77	219.14	32.00	187.14
		10/29/2014	22.27 - 36.77	219.14	32.45	186.69
		1/20/2015	22.27 - 36.77	219.14	33.32	185.82
		4/8/2015	22.27 - 36.77	219.14	32.09	187.05
		7/9/2015	22.27 - 36.77	219.14	31.72	187.42
		10/5/2015	22.27 - 36.77	219.14	32.30	186.84
		4/12/2016	22.27 - 36.77	219.14	32.00	187.14
		10/5/2016	22.27 - 36.77	219.14	31.91	187.23
		11/17/2017	22.27 - 36.77	219.14	32.47	186.67
		7/18/2018	22.27 - 36.77	219.14	33.80	185.34
		12/14/2018	22.27 - 36.77	219.14	32.72	186.42
		6/10/2019	22.27 - 36.77	219.14	32.40	186.74
35AWW23	Shallow	7/17/2018	25.2 - 40.2	223.07	23.55	199.52
		12/10/2018	25.2 - 40.2	223.07	20.71	202.36
		6/3/2019	25.2 - 40.2	223.07	23.97	199.10
35AWW24	Shallow	7/17/2018	22.10 - 32.10	219.04	26.60	192.44
		9/27/2018	22.10 - 32.10	219.04	20.11	198.93
		12/10/2018	22.10 - 32.10	219.04	26.75	192.29
		3/19/2019	22.10 - 32.10	219.04	26.06	192.98
		6/3/2019	22.10 - 32.10	219.04	25.47	193.57

Table 1
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Well Identification	Aquifer	Sampling Date	Screen Intervals (ft from Top of Casing)	Top of Casing Elevation (ft)	Depth to Water (ft from Top of Casing)	Groundwater Elevation (ft above msl)
LHSMW03	Shallow	10/9/2013	22.54 - 35.54	217.26	DRY	NC
		2/3/2014	22.54 - 35.54	217.26	31.00	186.26
		5/28/2014	22.54 - 35.54	217.26	29.40	187.86
		10/29/2014	22.54 - 35.54	217.26	31.20	186.06
		7/8/2015	22.54 - 35.54	217.26	28.21	189.05
		4/13/2016	22.54 - 35.54	217.26	28.75	188.51
		10/4/2016	22.54 - 35.54	217.26	29.51	187.75
		11/17/2017	22.54 - 35.54	217.26	31.36	185.90
LHSMW04	Shallow	10/9/2013	21.11 - 31.11	216.95	DRY	NC
		1/31/2014	21.11 - 31.11	216.95	DRY	NC
		5/20/2014	21.11 - 31.11	216.95	DRY	NC
		10/30/2014	21.11 - 31.11	216.95	DRY	NC
		1/20/2015	21.11 - 31.11	216.95	DRY	NC
		4/7/2015	21.11 - 31.11	216.95	DRY	NC
		7/8/2015	21.11 - 31.11	216.95	DRY	NC
		10/1/2015	21.11 - 31.11	216.95	DRY	NC
		3/28/2016	21.11 - 31.11	216.95	29.72	187.23
		4/12/2016	21.11 - 31.11	216.95	29.65	187.30
		10/4/2016	21.11 - 31.11	216.95	DRY	NC
		11/16/2017	21.11 - 31.11	216.95	DRY	NC
		7/17/2018	21.11 - 31.11	216.95	DRY	NC
		12/11/2018	21.11 - 31.11	216.95	DRY	NC
		6/4/2019	21.11 - 31.11	216.95	DRY	NC
LHSMW05	Shallow	10/9/2013	14.08 - 24.08	217.59	DRY	NC
		1/31/2014	14.08 - 24.08	217.59	DRY	NC
		5/20/2014	14.08 - 24.08	217.59	DRY	NC
		10/30/2014	14.08 - 24.08	217.59	DRY	NC
		1/20/2015	14.08 - 24.08	217.59	DRY	NC
		4/7/2015	14.08 - 24.08	217.59	DRY	NC
		7/10/2015	14.08 - 24.08	217.59	DRY	NC
		10/1/2015	14.08 - 24.08	217.59	DRY	NC
		4/12/2016	14.08 - 24.08	217.59	DRY	NC
		10/4/2016	14.08 - 24.08	217.59	DRY	NC
LHSMW06	Shallow	10/16/2013	13.32 - 23.32	223.18	20.97	202.21
		1/30/2014	13.32 - 23.32	223.18	20.50	202.68
		5/28/2014	13.32 - 23.32	223.18	19.30	203.88
		10/29/2014	13.32 - 23.32	223.18	19.81	203.37
		1/20/2015	13.32 - 23.32	223.18	19.92	203.26
		4/7/2015	13.32 - 23.32	223.18	18.92	204.26
		7/8/2015	13.32 - 23.32	223.18	18.21	204.97
		10/1/2015	13.32 - 23.32	223.18	18.98	204.20
		4/12/2016	13.32 - 23.32	223.18	19.11	204.07
		10/5/2016	13.32 - 23.32	223.18	18.91	204.27
		11/17/2017	13.32 - 23.32	223.18	19.31	203.87
		7/2/2018	13.32 - 23.32	223.18	18.80	204.38
		12/13/2018	13.32 - 23.32	223.18	19.18	204.00
		6/7/2019	13.32 - 23.32	223.18	16.93	206.25
LHSMW07	Shallow	10/15/2013	19.73 - 29.73	221.27	20.55	200.72
		1/30/2014	19.73 - 29.73	221.27	20.25	201.02
		5/22/2014	19.73 - 29.73	221.27	19.55	201.72
		10/29/2014	19.73 - 29.73	221.27	19.63	201.64
		1/28/2015	19.73 - 29.73	221.27	20.53	200.74
		4/15/2015	19.73 - 29.73	221.27	18.75	202.52
		7/7/2015	19.73 - 29.73	221.27	18.27	203.00
		10/8/2015	19.73 - 29.73	221.27	18.94	202.33
		4/14/2016	19.73 - 29.73	221.27	18.97	202.30
		10/4/2016	19.73 - 29.73	221.27	18.58	202.69
		11/14/2017	19.73 - 29.73	221.27	19.00	202.27
		7/17/2018	19.73 - 29.73	221.27	18.75	202.52
		9/26/2018	19.73 - 29.73	221.27	19.07	202.20
		12/10/2018	19.73 - 29.73	221.27	19.21	202.06
		3/19/2019	19.73 - 29.73	221.27	18.32	202.95
		6/3/2019	19.73 - 29.73	221.27	17.68	203.59

Notes:
ft - feet
msl = mean sea level
NA - not available
NC - not calculated
NM - not measured

Table 2, Eastern Plume Semi-Annual Analytical Data, December 2018 and June 2019
LHAAP 58, Longhorn Army Ammunition Plant, Karnack, Texas
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Location Identification: / Sample Date:	Units	MCL/MSC	03WW01_121218 12/12/18	03WW01_060419 6/4/19	35AWW01_121318 12/13/18	35AWW01_061019 6/10/19	35AWW05_121218 12/12/18	35AWW05_061019 6/10/19	35AWW08_121218 12/12/18	35AWW08_060419 6/4/19	35AWW09_121118 12/11/18	35AWW09_060319 6/3/19	35AWW10_121218 12/12/18	35AWW10_121218_a 12/12/18	35AWW10_060419 6/4/19	35AWW10_060419_a 6/4/19
Location Description			Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - SW, outside the site boundary.	Site 58 - SW, outside the site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - ESE, inside site boundary.	Site 58 - ESE, inside site boundary. Duplicate	Site 58 - ESE, inside site boundary.	Site 58 - ESE, inside site boundary. Duplicate
Location Depth			Shallow	Shallow	Intermediate	Intermediate	Intermediate	Intermediate	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Lab Package			HS18120736	HS19060185	HS18120913	HS19060573	HS18120736	HS19060573	HS18120736	HS19060185	HS18120642/HS18120736	HS19060123	HS18120736	HS18120736	HS19060185	HS19060185
Alkalinity (SM2320B)																
Alkalinity, Total	mg/L	NV	**862**	NA	NA	NA	NA	NA	**3,420**	NA	**282**	NA	**50.4**	**55.1**	NA	NA
Phosphorus (365.3)																
Phosphorus	mg/L	NV	**3.05**	NA	NA	NA	NA	NA	**2.43**	NA	**0.112**	NA	**0.244**	**0.253**	NA	NA
Total Organic Carbon (415.1/SM5310C)																
Total Organic Carbon	mg/L	NV	**42.2**	**66.1**	NA	NA	NA	NA	**392**	**306**	**4.5**	**3.96**	**3.97**	**4.03**	**4.69**	**4.11**
Metals (6020A)																
Total Iron	mg/L	NV	**32.9**	NA	NA	NA	NA	NA	**39.9**	NA	**0.553**	NA	**0.340 J**	**0.166 J**	NA	NA
Total Manganese	mg/L	14	**4.82**	NA	NA	NA	NA	NA	**9.01**	NA	**0.128**	NA	**0.0474**	**0.0530**	NA	NA
Dissolved Iron	mg/L	NV	**32.1**	NA	NA	NA	NA	NA	**38.2**	NA	**0.437**	NA	**0.332 J**	**0.227 J**	NA	NA
Dissolved Manganese	mg/L	14	**4.22**	NA	NA	NA	NA	NA	**8.96**	NA	**0.14**	NA	**0.0512**	**0.0567**	NA	NA
Total Arsenic	mg/L	0.01	NA	**0.0133**	< 0.00100 U	NA	NA	NA	**0.0593**	**0.116**	**0.000964 J**	**0.00308**	NA	NA	NA	NA
Volatile Organic Compounds (8260C)																
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	5	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	10,000	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	**1.2**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethene	µg/L	7	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloropropene	µg/L	2.9	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromoethane	µg/L	0.05	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	µg/L	600	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloroethane	µg/L	5	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloropropane	µg/L	5	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichloropropane	µg/L	29	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	µg/L	75	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2,2-Dichloropropane	µg/L	42	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Butanone	µg/L	61,000	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 UJ	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
2-Chlorotoluene	µg/L	2,000	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Hexanone	µg/L	6,100	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
4-Chlorotoluene	µg/L	2,000	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	µg/L	10,000	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Methyl-2-pentanone	µg/L	8,200	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 UJ	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Acetone	µg/L	92,000	**25**	< 5.0 U	< 2.0 U	< 1.0 U	< 2.0 U	< 1.0 U	**76**	13 UB	**2.1**	< 1.0 U	< 2.0 U	< 2.0 U	< 1.0 U	2.7 UB
Benzene	µg/L	5	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromobenzene	µg/L	2,000	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromochloromethane	µg/L	4,100	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromodichloromethane	µg/L	4.6	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromoform	µg/L	36	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromomethane	µg/L	140	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Carbon disulfide	µg/L	10,000	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Carbon tetrachloride	µg/L	5	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	100	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroethane	µg/L	41,000	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroform	µg/L	1,000	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloromethane	µg/L	220	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 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	**22**	**41**	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	**8.9 J**	< 2.5 U	**0.94 J**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromochloromethane	µg/L	34	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromomethane	µg/L	380	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dichlorodifluoromethane	µg/L	20,000	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	µg/L	700	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U

Table 2, Eastern Plume Semi-Annual Analytical Data, December 2018 and June 2019
LHAAP 58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Location Identification: / Sample Date:	Units	MCL/MSC	03WW01_121218 12/12/18	03WW01_060419 6/4/19	35AWW01_121318 12/13/18	35AWW01_061019 6/10/19	35AWW05_121218 12/12/18	35AWW05_061019 6/10/19	35AWW08_121218 12/12/18	35AWW08_060419 6/4/19	35AWW09_121118 12/11/18	35AWW09_060319 6/3/19	35AWW10_121218 12/12/18	35AWW10_121218_a 12/12/18	35AWW10_060419 6/4/19	35AWW10_060419_a 6/4/19
Location Description			Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - SW, outside the site boundary.	Site 58 - SW, outside the site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.	Site 58 - ESE, inside site boundary.	Site 58 - ESE, inside site boundary. Duplicate	Site 58 - ESE, inside site boundary.	Site 58 - ESE, inside site boundary. Duplicate
Location Depth			Shallow	Shallow	Intermediate	Intermediate	Intermediate	Intermediate	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Lab Package			HS18120736	HS19060185	HS18120913	HS19060573	HS18120736	HS19060573	HS18120736	HS19060185	HS18120642/HS18120736	HS19060123	HS18120736	HS18120736	HS19060185	HS19060185
Hexachlorobutadiene	µg/L	20	< 0.5 U	< 5.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 5.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 0.5 U	< 1.0 U	< 1.0 U
Isopropylbenzene	µg/L	10,000	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	10,000	< 0.5 U	< 5.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 5.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 0.5 U	< 1.0 U	< 1.0 U
Methylene chloride	µg/L	5	< 0.5 U	< 5.0 U	< 0.5 U	< 1.0 UJ	< 0.5 U	< 1.0 U	< 0.5 U	< 5.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 0.5 U	< 1.0 U	< 1.0 U
n-Butylbenzene	µg/L	4,100	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Propylbenzene	µg/L	4,100	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Naphthalene	µg/L	2,000	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	µg/L	10,000	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
sec-Butylbenzene	µg/L	4,100	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Styrene	µg/L	100	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
tert-Butylbenzene	µg/L	4,100	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Tetrachloroethene	µg/L	5	**15**	**3.2 J**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**4.8 J**	**450**	**130**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Toluene	µg/L	1,000	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	µg/L	100	**0.62 J**	< 2.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,3-Dichloropropene	µg/L	29	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichloroethene	µg/L	5	**5.7**	**2.9 J**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**12**	**13**	**150**	**38**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichlorofluoromethane	µg/L	31,000	< 0.5 U	< 2.5 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Vinyl chloride	µg/L	2	**7.6**	**11**	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Volatile Fatty Acids (HPLC-METACIDS)																
Acetic Acid	mg/L	NV	< 2.0 U	NA	NA	NA	NA	NA	**120**	**20**	< 2.0 U	< 1.0 U	< 2.0 U	< 2.0 U	< 1.0 U	< 1.0 U
Butyric Acid	mg/L	NV	< 1.0 U	NA	NA	NA	NA	NA	< 1.0 U	< 2.0 U	< 1.0 U	< 2.0 U	< 1.0 U	< 1.0 U	< 2.0 U	< 2.0 U
Lactic Acid	mg/L	NV	< 1.0 U	NA	NA	NA	NA	NA	< 1.0 U	**12**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Propionic Acid	mg/L	51	< 1.0 U	NA	NA	NA	NA	NA	**9.5**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Pyruvic Acid	mg/L	NV	< 0.10 U	NA	NA	NA	NA	NA	**0.48**	< 0.5 U	< 0.10 U	< 0.5 U	< 0.10 U	< 0.10 U	< 0.50 U	< 0.50 U
Anions (9056A)																
Chloride	mg/L	NV	**336**	**809**	NA	NA	NA	NA	**2,240**	**2,510**	**1,320**	**1,340**	**4.83**	**5.17**	**6.59**	**6.56**
Nitrate	mg/L	10	< 0.100 U	**0.196 J**	NA	NA	NA	NA	**0.147 J**	**0.219 J**	< 0.100 U	< 0.500 U	**0.131**	**0.159**	**0.0497 J**	**0.0480 J**
Nitrite	mg/L	1	< 0.100 U	NA	NA	NA	NA	NA	< 0.100 U	NA	< 0.100 U	NA	< 0.100 U	< 0.100 U	NA	NA
Sulfate	mg/L	NV	**42.8**	**239**	NA	NA	NA	NA	**4.76**	**1.42 J**	**903**	**908**	**50.3**	**53.4**	**68.4**	**68.2**
Dissolved Gases (RSK-175)																
Carbon Dioxide	µg/L	NV	**390,000**	**520,000**	NA	NA	NA	NA	**290,000**	**260,000**	**420,000**	**620,000**	**430,000**	**450,000**	**670,000**	**620,000**
Ethane	µg/L	NV	< 0.47 U	< 0.47 U	NA	NA	NA	NA	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U
Ethene	µg/L	NV	**2.3**	**1.6**	NA	NA	NA	NA	< 0.55 U	**4.1**	< 0.55 U	< 0.55 U	**2.8**	< 0.55 U	< 0.55 U	< 0.55 U
Methane	µg/L	NV	**1,800**	**2,900**	NA	NA	NA	NA	< 1.0 U	**3,000**	**1,000**	**2.3**	**3,500**	< 1.0 U	< 1.0 U	< 1.0 U
Ferrous Iron (SM3500Fe)																
Ferrous Iron	mg/L	NV	**27.5 J**	NA	NA	NA	NA	NA	**21 J**	NA	**0.13 J**	NA	**0.09 J**	**0.07 J**	NA	NA
Sulfide (376.1)																
Sulfide	mg/L	NV	< 1.0 U	NA	NA	NA	NA	NA	< 1.0 U	NA	< 1.0 U	NA	< 1.0 U	< 1.0 U	NA	NA
Dechlorinating Bacteria																
BAV1 Vinyl Chloride Reductase	cells/mL	NV	< 0.80 U	< 0.50 U	NA	NA	NA	NA	< 3.1 U	< 3.0 U	< 0.90 U	< 0.7 U	< 0.80 U	NA	< 0.5 U	NA
Dehalobacter spp.	cells/mL	NV	**599**	**292**	NA	NA	NA	NA	**173,000**	**139,000**	< 8.6 U	**73.3**	**13.6**	NA	**261**	NA
Dehalococoides	cells/mL	NV	**10,100**	**6,040**	NA	NA	NA	NA	**1,200,000**	**3,790,000**	< 0.90 U	**5.8**	**15.8**	NA	**96.6**	NA
tceA Reductase	cells/mL	NV	**6.2**	**2.1**	NA	NA	NA	NA	**313,000**	**480,000**	< 0.90 U	< 0.7 U	**1.1**	NA	**6.5**	NA
Vinyl Chloride Reductase	cells/mL	NV	**24,400**	**2,020**	NA	NA	NA	NA	**366,000**	**265,000**	< 0.90 U	< 0.7 U	**15.2**	NA	**6.4**	NA

Notes:

Blue highlighting indicates concentrations above the MCL/MSC

MCL/MSC-Maximum Contaminant Limit/Medium-Specific Concentration

NA - Not Analyzed, NV - No Value

µg/L - micrograms per liter

mg/L - milligrams per liter

J - Estimated: Between the method detection limit and reporting limit and/or due to discrepancies in meeting certain analyte-specific quality control criteria.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

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

Table 2, Eastern Plume Semi-Annual Analytical Data, December 2018 and June 2019
LHAAP 58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Location Identification: / Sample Date:	Units	MCL/MSC	35AWW12_121418 12/14/18	35AWW12_061019 6/10/19	35AWW12_061019a 6/10/19	35AWW13_121118 12/11/18	35AWW13_060719 6/7/19	35AWW14_121318 12/13/18	35AWW14_060719 6/7/19	35AWW16_121218 12/12/18	35AWW16_061019 6/10/19	35AWW17_121718 12/17/18	35AWW17_061019 6/10/19	35AWW18_121718 12/17/18	35AWW18_121718_a 12/17/18	35AWW18_060419 6/4/19
Location Description			Site 58 - E, outside site boundary.	Site 58 - E, outside site boundary.	Site 58 - E, outside site boundary. Field duplicate.	Site 58 - SE, outside site boundary.	Site 58 - SE, outside site boundary.	Site 58 - SE, outside site boundary.	Site 58 - SE, outside site boundary.	Site 58 - SW, outside site boundary, near Building 744-A.	Site 58 - SW, outside site boundary, near Building 744-A.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - SSW, outside site boundary.	Site 58 - SSW, outside site boundary. Duplicate	Site 58 - SSW, outside site boundary.
Location Depth			Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Lab Package			HS18120913	HS19060573	HS19060573	HS18120642	HS19060461	HS18120913	HS19060461	HS18120736	HS19060573	HS18121030	HS19060573	HS18121030	HS18121030	HS19060185
Alkalinity (SM2320B)																
Alkalinity, Total	mg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phosphorus (365.3)																
Phosphorus	mg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (415.1/SM5310C)																
Total Organic Carbon	mg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Metals (6020A)																
Total Iron	mg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Manganese	mg/L	14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Iron	mg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Manganese	mg/L	14	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total Arsenic	mg/L	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds (8260C)																
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**15**	**11**	< 0.5 U	**1.4**	< 0.5 U	< 0.5 U	**0.70 J**	**0.73 J**	**0.76 J**
1,1-Dichloroethene	µg/L	7	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**10**	**12**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**2.0**	**2.3**	**3.5**
1,1-Dichloropropene	µg/L	2.9	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromoethane	µg/L	0.05	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	µg/L	600	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 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	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichloropropane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 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
1,3-Dichloropropane	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	µg/L	75	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2,2-Dichloropropane	µg/L	42	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Butanone	µg/L	61,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
2-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 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
2-Hexanone	µg/L	6,100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
4-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 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
4-Isopropyltoluene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Methyl-2-pentanone	µg/L	8,200	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Acetone	µg/L	92,000	3.2 UB	< 1.0 U	< 1.0 U	< 2.0 U	< 1.0 U	< 2.0 U	< 1.0 U	< 2.0 U	< 1.0 U	< 2.0 U	< 1.0 U	< 2.0 U	< 2.0 U	< 1.0 U
Benzene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromobenzene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromochloromethane	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromodichloromethane	µg/L	4.6	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromoform	µg/L	36	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromomethane	µg/L	140	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Carbon disulfide	µg/L	10,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Carbon tetrachloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroethane	µg/L	41,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroform	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloromethane	µg/L	220	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 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	**4.6**	**5.2**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromochloromethane	µg/L	34	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromomethane	µg/L	380	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dichlorodifluoromethane	µg/L	20,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	µg/L	700	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U

Table 2, Eastern Plume Semi-Annual Analytical Data, December 2018 and June 2019
LHAAP 58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Location Identification: / Sample Date:	Units	MCL/MSC	35AWW12_121418 12/14/18	35AWW12_061019 6/10/19	35AWW12_061019a 6/10/19	35AWW13_121118 12/11/18	35AWW13_060719 6/7/19	35AWW14_121318 12/13/18	35AWW14_060719 6/7/19	35AWW16_121218 12/12/18	35AWW16_061019 6/10/19	35AWW17_121718 12/17/18	35AWW17_061019 6/10/19	35AWW18_121718 12/17/18	35AWW18_121718_a 12/17/18	35AWW18_060419 6/4/19
Location Description			Site 58 - E, outside site boundary.	Site 58 - E, outside site boundary.	Site 58 - E, outside site boundary. Field duplicate.	Site 58 - SE, outside site boundary.	Site 58 - SE, outside site boundary.	Site 58 - SE, outside site boundary.	Site 58 - SE, outside site boundary.	Site 58 - SW, outside site boundary, near Building 744-A.	Site 58 - SW, outside site boundary, near Building 744-A.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - SSW, outside site boundary.	Site 58 - SSW, outside site boundary. Duplicate	Site 58 - SSW, outside site boundary.
Location Depth			Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Lab Package			HS18120913	HS19060573	HS19060573	HS18120642	HS19060461	HS18120913	HS19060461	HS18120736	HS19060573	HS18121030	HS19060573	HS18121030	HS18121030	HS19060185
Hexachlorobutadiene	µg/L	20	< 0.5 U	< 1.0 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 0.5 U	< 1.0 U
Isopropylbenzene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	10,000	< 0.5 U	< 1.0 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 0.5 U	< 1.0 U
Methylene chloride	µg/L	5	< 0.5 U	< 1.0 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 0.5 U	< 1.0 U
n-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Propylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Naphthalene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 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
sec-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Styrene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
tert-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 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
Tetrachloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Toluene	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,3-Dichloropropene	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**9.4**	**12**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichlorofluoromethane	µg/L	31,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Vinyl chloride	µg/L	2	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**1.3**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Volatile Fatty Acids (HPLC-METACIDS)																
Acetic Acid	mg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butyric Acid	mg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lactic Acid	mg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Propionic Acid	mg/L	51	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyruvic Acid	mg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anions (9056A)																
Chloride	mg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrate	mg/L	10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nitrite	mg/L	1	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfate	mg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dissolved Gases (RSK-175)																
Carbon Dioxide	µg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethene	µg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methane	µg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron (SM3500Fe)																
Ferrous Iron	mg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide (376.1)																
Sulfide	mg/L	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dechlorinating Bacteria																
BAV1 Vinyl Chloride Reductase	cells/mL	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalobacter spp.	cells/mL	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dehalococoides	cells/mL	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tceA Reductase	cells/mL	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride Reductase	cells/mL	NV	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

Blue highlighting indicates concentrations above the MCL/MSC

MCL/MSC-Maximum Contaminant Limit/Medium-Specific Concentration

NA - Not Analyzed, NV - No Value

µg/L - micrograms per liter

mg/L - milligrams per liter

J - Estimated: Between the method detection limit and reporting limit and/or due to discrepancies in meeting certain analyte-specific quality control criteria.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

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

Table 2, Eastern Plume Semi-Annual Analytical Data, December 2018 and June 2019
LHAAP 58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Location Identification: / Sample Date:	Units	MCL/MSC	34AWW21_121318 12/13/18	34AWW21_061019 6/10/19	34AWW21_061019_a 6/10/19	35AWW22_121418 12/14/18	35AWW22_061019 6/10/19	35ASW03_121718 12/17/18	35ASW03_060719 6/7/19
Location Description			Site 58 - ESE, outside site boundary, beside Building 725.	Site 58 - ESE, outside site boundary, beside Building 725.	Site 58 - ESE, outside site boundary, beside Building 725. Field Duplicate.	Site 58 - ENE, outside site boundary.	Site 58 - ENE, outside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.
Location Depth			Shallow	Shallow		Shallow	Shallow	Surface Water	Surface Water
Lab Package			HS18120913	HS19060573	HS19060573	HS18120913	HS19060573	HS18121030	HS19060461
Alkalinity (SM2320B)									
Alkalinity, Total	mg/L	NV	NA	NA	NA	NA	NA	NA	NA
Phosphorus (365.3)									
Phosphorus	mg/L	NV	NA	NA	NA	NA	NA	NA	NA
Total Organic Carbon (415.1/SM5310C)									
Total Organic Carbon	mg/L	NV	NA	NA	NA	NA	NA	NA	NA
Metals (6020A)									
Total Iron	mg/L	NV	NA	NA	NA	NA	NA	NA	NA
Total Manganese	mg/L	14	NA	NA	NA	NA	NA	NA	NA
Dissolved Iron	mg/L	NV	NA	NA	NA	NA	NA	NA	NA
Dissolved Manganese	mg/L	14	NA	NA	NA	NA	NA	NA	NA
Total Arsenic	mg/L	0.01	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds (8260C)									
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
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
1,1-Dichloropropene	µg/L	2.9	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromoethane	µg/L	0.05	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	µg/L	600	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
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
1,2-Dichloropropane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichloropropane	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	µg/L	75	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2,2-Dichloropropane	µg/L	42	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Butanone	µg/L	61,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
2-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Hexanone	µg/L	6,100	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
4-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Methyl-2-pentanone	µg/L	8,200	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Acetone	µg/L	92,000	< 2.0 U	< 1.0 U	< 1.0 U	< 2.0 U	< 1.0 U	**4.5**	< 2.0 U
Benzene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromobenzene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromochloromethane	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromodichloromethane	µg/L	4.6	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromoform	µg/L	36	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromomethane	µg/L	140	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Carbon disulfide	µg/L	10,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Carbon tetrachloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroethane	µg/L	41,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroform	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloromethane	µg/L	220	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,2-Dichloroethene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromochloromethane	µg/L	34	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromomethane	µg/L	380	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dichlorodifluoromethane	µg/L	20,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	µg/L	700	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U

Table 2, Eastern Plume Semi-Annual Analytical Data, December 2018 and June 2019
LHAAP 58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Location Identification: / Sample Date:	Units	MCL/MSC	34AWW21_121318 12/13/18	34AWW21_061019 6/10/19	34AWW21_061019_a 6/10/19	35AWW22_121418 12/14/18	35AWW22_061019 6/10/19	35ASW03_121718 12/17/18	35ASW03_060719 6/7/19
Location Description			Site 58 - ESE, outside site boundary, beside Building 725.	Site 58 - ESE, outside site boundary, beside Building 725.	Site 58 - ESE, outside site boundary, beside Building 725. Field Duplicate.	Site 58 - ENE, outside site boundary.	Site 58 - ENE, outside site boundary.	Site 58 - E, inside site boundary.	Site 58 - E, inside site boundary.
Location Depth			Shallow	Shallow		Shallow	Shallow	Surface Water	Surface Water
Lab Package			HS18120913	HS19060573	HS19060573	HS18120913	HS19060573	HS18121030	HS19060461
Hexachlorobutadiene	µg/L	20	< 0.5 U	< 1.0 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U
Isopropylbenzene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	10,000	< 0.5 U	< 1.0 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U
Methylene chloride	µg/L	5	< 0.5 U	< 1.0 U	< 1.0 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U
n-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Propylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Naphthalene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
sec-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Styrene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
tert-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Tetrachloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Toluene	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,3-Dichloropropene	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichlorofluoromethane	µg/L	31,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
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
Volatile Fatty Acids (HPLC-METACIDS)									
Acetic Acid	mg/L	NV	NA	NA	NA	NA	NA	NA	NA
Butyric Acid	mg/L	NV	NA	NA	NA	NA	NA	NA	NA
Lactic Acid	mg/L	NV	NA	NA	NA	NA	NA	NA	NA
Propionic Acid	mg/L	51	NA	NA	NA	NA	NA	NA	NA
Pyruvic Acid	mg/L	NV	NA	NA	NA	NA	NA	NA	NA
Anions (9056A)									
Chloride	mg/L	NV	NA	NA	NA	NA	NA	NA	NA
Nitrate	mg/L	10	NA	NA	NA	NA	NA	NA	NA
Nitrite	mg/L	1	NA	NA	NA	NA	NA	NA	NA
Sulfate	mg/L	NV	NA	NA	NA	NA	NA	NA	NA
Dissolved Gases (RSK-175)									
Carbon Dioxide	µg/L	NV	NA	NA	NA	NA	NA	NA	NA
Ethane	µg/L	NV	NA	NA	NA	NA	NA	NA	NA
Ethene	µg/L	NV	NA	NA	NA	NA	NA	NA	NA
Methane	µg/L	NV	NA	NA	NA	NA	NA	NA	NA
Ferrous Iron (SM3500Fe)									
Ferrous Iron	mg/L	NV	NA	NA	NA	NA	NA	NA	NA
Sulfide (376.1)									
Sulfide	mg/L	NV	NA	NA	NA	NA	NA	NA	NA
Dechlorinating Bacteria									
BAV1 Vinyl Chloride Reductase	cells/mL	NV	NA	NA	NA	NA	NA	NA	NA
Dehalobacter spp.	cells/mL	NV	NA	NA	NA	NA	NA	NA	NA
Dehalococoides	cells/mL	NV	NA	NA	NA	NA	NA	NA	NA
tceA Reductase	cells/mL	NV	NA	NA	NA	NA	NA	NA	NA
Vinyl Chloride Reductase	cells/mL	NV	NA	NA	NA	NA	NA	NA	NA

Notes:

Blue highlighting indicates concentrations above the MCL/MSC

MCL/MSC-Maximum Contaminant Limit/Medium-Specific Concentration

NA - Not Analyzed, NV - No Value

µg/L - micrograms per liter

mg/L - milligrams per liter

J - Estimated: Between the method detection limit and reporting limit and/or due to discrepancies in meeting certain analyte-specific quality control criteria.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

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

Table 3 - Western Plume Analytical Data, September 2018, December 2018, March 2019, and June 2019
LHAAP 58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Location Identification: / Sample Date:	Units	MCL/MSC	35AWW06_092618 9/26/18	35AWW06_121118 12/11/18	35AWW06_031919 03/19/19	35AWW06_031919_a 03/19/19	35AWW06_060419 6/4/19	35AWW11_092718 9/27/18	35AWW11_121118 12/11/18	35AWW11_031919 03/19/19	35AWW11_060319 6/3/19	35AWW15_121218 12/12/18	35AWW15_060719 6/7/19
Location Description			Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary. Duplicate	Site 58 - SW, outside site boundary.	Site 58 - SE, inside site boundary.	Site 58 - SE, inside site boundary.	Site 58 - SE, inside site boundary.	Site 58 - SE, inside site boundary.	Site 58 - W, inside site boundary.	Site 58 - W, inside site boundary.
Location Depth			Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Lab Package			HS18091438-01	HS18120642	HS19031013	HS19031013	HS19060185	HS18091510-03	HS18120642	HS19031013	HS19060123	HS18120736	HS19060461
Alkalinity (SM2320B)													
Alkalinity, Total	mg/L	NV	**775**	**1,210**	NA	NA	NA	**1,190**	**1,430**	NA	NA	NA	NA
Phosphorus (365.3)													
Phosphorus	mg/L	NV	**2.67**	**0.467**	NA	NA	NA	**0.341**	**0.169**	NA	NA	NA	NA
Total Organic Carbon (415.1/SM5310C)													
Total Organic Carbon	mg/L	NV	**2,860**	**685**	**407**	**386**	**331**	**1,120**	**701**	**485**	**94.6**	NA	NA
Metals (6020A)													
Total Iron	mg/L	NV	**27.9**	**91**	NA	NA	NA	**31.7**	**59**	NA	NA	NA	NA
Total Manganese	mg/L	14	**9.44**	**8.52**	NA	NA	NA	**6.21**	**8**	NA	NA	NA	NA
Dissolved Iron	mg/L	NV	**26.5**	**85.8**	NA	NA	NA	**31.7**	**55.3**	NA	NA	NA	NA
Dissolved Manganese	mg/L	14	**9.26**	**9.29**	NA	NA	NA	**6.53**	**7.91**	NA	NA	NA	NA
Total Arsenic	mg/L	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Volatile Organic Compounds (8260C)													
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	10,000	< 0.5 U	**1.3**	< 0.5 U	< 0.5 U	< 0.5 U	**1.0**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethene	µg/L	7	< 0.5 U	**3.4**	< 0.5 U	**1.4**	< 0.5 U	**2.3**	**1.6**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloropropene	µg/L	2.9	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromoethane	µg/L	0.05	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	µg/L	600	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 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	< 0.5 U
1,2-Dichloropropane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichloropropane	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	µg/L	75	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2,2-Dichloropropane	µg/L	42	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Butanone	µg/L	61,000	**210**	**120**	**62**	**59**	< 1.0 U	**330**	**200**	**240**	**70**	< 1.0 U	< 1.0 U
2-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Hexanone	µg/L	6,100	**1.7 J**	**18**	**6.6**	**5.9**	**1.8 J**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
4-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Methyl-2-pentanone	µg/L	8,200	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Acetone	µg/L	92,000	**6,600**	**420**	**250**	**240**	**220**	**590**	**190**	**260**	**77**	**1.9 J**	< 1.0 U
Benzene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U
Bromobenzene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromochloromethane	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromodichloromethane	µg/L	4.6	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromoform	µg/L	36	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromomethane	µg/L	140	< 0.5 UJ	< 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
Carbon disulfide	µg/L	10,000	**2.6**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**5.0**	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Carbon tetrachloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroethane	µg/L	41,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroform	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloromethane	µg/L	220	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,2-Dichloroethene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromochloromethane	µg/L	34	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromomethane	µg/L	380	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Dichlorodifluoromethane	µg/L	20,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	µg/L	700	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U

Table 3 - Western Plume Analytical Data, September 2018, December 2018, March 2019, and June 2019
LHAAP 58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Location Identification: / Sample Date:	Units	MCL/MSC	35AWW06_092618 9/26/18	35AWW06_121118 12/11/18	35AWW06_031919 03/19/19	35AWW06_031919_a 03/19/19	35AWW06_060419 6/4/19	35AWW11_092718 9/27/18	35AWW11_121118 12/11/18	35AWW11_031919 03/19/19	35AWW11_060319 6/3/19	35AWW15_121218 12/12/18	35AWW15_060719 6/7/19
Location Description			Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary. Duplicate	Site 58 - SW, outside site boundary.	Site 58 - SE, inside site boundary.	Site 58 - SE, inside site boundary.	Site 58 - SE, inside site boundary.	Site 58 - SE, inside site boundary.	Site 58 - W, inside site boundary.	Site 58 - W, inside site boundary.
Location Depth			Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Lab Package			HS18091438-01	HS18120642	HS19031013	HS19031013	HS19060185	HS18091510-03	HS18120642	HS19031013	HS19060123	HS18120736	HS19060461
Hexachlorobutadiene	µg/L	20	< 0.5 U	< 0.5 U	< 1.0 U	< 1.0 U	< 1.0 U	< 0.5 U	< 0.5 U	< 1.0 U	< 1.0 U	< 0.5 U	< 1.0 U
Isopropylbenzene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	10,000	< 1.0 U	< 0.5 U	< 1.0 U	< 1.0 U	< 1.0 U	< 0.5 U	< 0.5 U	< 1.0 U	< 1.0 U	< 0.5 U	< 1.0 U
Methylene chloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 1.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 1.0 U	< 0.5 U	< 1.0 U
Naphthalene	µg/L	2,000	< 0.5 U	**1.1**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**0.87 J**	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Propylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
sec-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Styrene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
tert-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Tetrachloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Toluene	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,3-Dichloropropene	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichlorofluoromethane	µg/L	31,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U
Vinyl chloride		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	< 0.5 U
Volatile Fatty Acids (HPLC-METACIDS)													
Acetic Acid	mg/L	NV	**1,400**	**920**	**250**	**230**	**120**	**1,100**	**540**	**180**	**110**	NA	NA
Butyric Acid	mg/L	NV	**1,400**	**97**	**61**	**56**	**7.7 J**	< 10 U	< 5.0 U	< 5.0 U	**3.1 J**	NA	NA
Lactic Acid	mg/L	NV	< 10 U	< 10 U	< 2.5 U	< 2.5 U	< 2.5 U	< 10 U	< 5.0 U	< 5.0 U	< 1.0 U	NA	NA
Propionic Acid	mg/L	51	**600**	**390**	**320**	**310**	**380**	**520**	**420**	**620**	**170**	NA	NA
Pyruvic Acid	mg/L	NV	**0.20 J**	< 1.0 U	< 0.25 UJ	< 0.25 UJ	< 1.3 U	< 1.0 U	< 0.5 U	< 0.50 UJ	< 0.5 U	NA	NA
Anions (9056A)													
Chloride	mg/L	NV	**910**	**858**	**919**	**900**	**964**	**2,110**	**2,120**	**2,150**	**1,920**	NA	NA
Nitrate	mg/L	10	< 0.200 U	< 0.200 U	< 0.500 U	< 0.500 U	**0.180 J**	< 0.200 U	< 0.200 U	< 0.500 U	< 0.500 U	NA	NA
Nitrite	mg/L	1	< 0.200 U	< 0.200 U	NA	NA	NA	< 0.200 U	< 0.200 U	NA	NA	NA	NA
Sulfate	mg/L	NV	**508**	**13.4**	**2.33 J**	**2.13 J**	**2.08 J**	**285**	**127**	**172**	**210**	NA	NA
Dissolved Gases (RSK-175)													
Carbon Dioxide	µg/L	NV	**860,000**	**790,000**	**720,000**	**670,000**	**750,000**	**320,000**	**820,000**	**940,000**	**750,000**	NA	NA
Ethane	µg/L	NV	< 0.47 UJ	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	**0.63**	< 0.47 U	< 0.47 U	< 0.47 U	NA	NA
Ethene	µg/L	NV	< 0.55 UJ	**0.44 J**	< 0.55 U	< 0.55 U	< 0.55 U	**2.1**	< 0.55 U	< 0.55 U	< 0.55 U	NA	NA
Methane	µg/L	NV	**3.0 J**	**890**	**3,100**	**2,900**	**1,500**	**1,300**	**5.5**	**450**	**590**	NA	NA
Ferrous Iron (SM3500Fe)													
Ferrous Iron	mg/L	NV	**27.8 J**	**88.1 J**	NA	NA	NA	**36.5 J**	**20.6 J**	NA	NA	NA	NA
Sulfide (376.1)													
Sulfide	mg/L	NV	**1.96 J**	< 1.0 U	NA	NA	NA	**22.4**	**7.84**	NA	NA	NA	NA
Dechlorinating Bacteria													
BAV1 Vinyl Chloride Reductase	cells/mL	NV	< 2.50 U	< 0.90 U	< 0.80 U	NA	**0.80 J**	< 0.70 U	< 0.50 U	< 0.90 U	< 0.5 U	NA	NA
Dehalobacter spp.	cells/mL	NV	**705,000**	**144,000**	**21,200**	NA	**159**	**394,000**	**220,000**	**818,000**	**2,570,000**	NA	NA
Dehalococoides	cells/mL	NV	**3.60**	**2.50**	**12.3**	NA	**26.8**	**2.10**	**10.6**	**231**	**2,100**	NA	NA
tceA Reductase	cells/mL	NV	< 2.50 U	**1.30**	< 0.80 U	NA	< 1.6 U	< 0.70 U	**0.2 J**	< 0.90 U	< 0.5 U	NA	NA
Vinyl Chloride Reductase	cells/mL	NV	**1.40 J**	< 0.90 U	**0.20 J**	NA	**0.90 J**	**1.10**	< 0.50 U	**42.2**	**174**	NA	NA

Notes:

Blue Highlighting Indicates concentrations above the MCL/MSC

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

NA - Not Analyzed, NV - No Value

µg/L - micrograms per liter

mg/L - milligrams per liter

J - Estimated: Between the method detection limit and reporting limit and/or due to discrepancies in meeting certain analyte-specific quality control criteria.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

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

Table 3 - Western Plume Analytical Data, September 2018, December 2018, March 2019, and June 2019
LHAAP 58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Location Identification: / Sample Date:	Units	MCL/MSC	35AWW19_092718 9/27/18	35AWW19_121018 12/10/18	35AWW19_031919 03/19/19	35AWW19_060319 6/3/19	35AWW20_092618 9/26/18	35AWW20_092618-a 9/26/18	35AWW20_121018 12/10/18	35AWW20_031919 03/19/19	35AWW20_060419 6/4/19	35AWW23_121018 12/10/18	35AWW23_060319 6/3/19
Location Description			Site 58 - S, outside site boundary.	Site 58 - S, outside site boundary.	Site 58 - S, outside site boundary.	Site 58 - S, outside site boundary.	Site 58 - SW, inside site boundary.	Site 58 - SE, outside site boundary.	Site 58 - SW, inside site boundary.	Site 58 - SW, inside site boundary.	Site 58 - SW, inside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.
Location Depth			Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Lab Package			HS18091510-02	HS18120569	HS19031013	HS19060123	HS18091438-02	HS18091438-03	HS18120569	HS19031013	HS19060185	HS18120569	HS19060123
Alkalinity (SM2320B)													
Alkalinity, Total	mg/L	NV	**213**	**198**	NA	NA	**1,450**	**1,470**	**1,190**	NA	NA	**1,110**	NA
Phosphorus (365.3)													
Phosphorus	mg/L	NV	**0.0340 J**	**0.101**	NA	NA	**0.144**	**0.192**	**0.101**	NA	NA	**1.08**	NA
Total Organic Carbon (415.1/SM5310C)													
Total Organic Carbon	mg/L	NV	**2.21**	**2.17**	**2.20**	**1.88**	**53**	**53**	**19**	**12**	**12.9**	**879**	**1,360**
Metals (6020A)													
Total Iron	mg/L	NV	**4.24**	**4.63**	NA	NA	**1.40**	**1.49**	**5.32**	NA	NA	**50.8**	NA
Total Manganese	mg/L	14	**6.39**	**6.65**	NA	NA	**6.23**	**6.15**	**6.19**	NA	NA	**8.04**	NA
Dissolved Iron	mg/L	NV	**4.22**	**4.75**	NA	NA	**1.33**	**1.41**	**4.93**	NA	NA	**46.4**	NA
Dissolved Manganese	mg/L	14	**6.27**	**6.88**	NA	NA	**6.00**	**6.26**	**5.32**	NA	NA	**7.73**	NA
Total Arsenic	mg/L	0.01	NA	NA	NA	NA	NA	NA	NA	NA	**0.00194 J**	NA	NA
Volatile Organic Compounds (8260C)													
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**48**	**44**	**88**	**38 J**	**45**	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	10,000	**1.8**	**1.8**	**0.97 J**	**0.65 J**	**200**	**170**	**690**	**190**	**270**	**1.6**	< 0.5 U
1,1-Dichloroethene	µg/L	7	**8.8**	**7.5**	**3.6**	**2.6**	**1,100**	**970**	**2,700**	**1,500**	**1,800**	**2.5**	< 0.5 U
1,1-Dichloropropene	µg/L	2.9	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	**22**	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U
1,2-Dibromoethane	µg/L	0.05	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	µg/L	600	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**10**	**9.3**	**20**	**7.6 J**	**13**	< 0.5 U	< 0.5 U
1,2-Dichloroethane	µg/L	5	**2.4**	**2.1**	**1.5**	**1.1**	**14**	**13**	**26**	**14 J**	**21**	< 0.5 U	< 0.5 U
1,2-Dichloropropane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**0.99 J**	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
1,3-Dichloropropane	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	µg/L	75	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**3.5**	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
2,2-Dichloropropane	µg/L	42	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
2-Butanone	µg/L	61,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 5.0 U	**300**	**220**
2-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
2-Hexanone	µg/L	6,100	< 1.0 U	< 1.0 UJ	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 1.0 U	< 5.0 U	**6.0 J**	< 1.0 U
4-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
4-Methyl-2-pentanone	µg/L	8,200	< 1.0 U	< 1.0 UJ	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 1.0 U	< 5.0 U	**3.9 J**	< 1.0 U
Acetone	µg/L	92,000	< 2.0 U	< 2.0 U	< 2.0 U	< 1.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 5.0 U	**120**	**210**
Benzene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	**3.3**	**2.9**	**9.0**	**3.0 J**	**4.4 J**	< 0.5 U	< 0.5 U
Bromobenzene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
Bromochloromethane	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
Bromodichloromethane	µg/L	4.6	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
Bromoform	µg/L	36	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	**1.8**	< 0.5 U
Bromomethane	µg/L	140	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 2.5 U	< 0.5 UJ	< 0.5 U
Carbon disulfide	µg/L	10,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 5.0 U	< 1.0 U	< 1.0 U
Carbon tetrachloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
Chloroethane	µg/L	41,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U
Chloroform	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
Chloromethane	µg/L	220	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 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	**45**	**40**	**120**	**49 J**	**79**	**20**	**4.3**
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 UJ	< 2.5 U	**3.3 J**	< 0.5 U
Dibromochloromethane	µg/L	34	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
Dibromomethane	µg/L	380	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
Dichlorodifluoromethane	µg/L	20,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	µg/L	700	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U

Table 3 - Western Plume Analytical Data, September 2018, December 2018, March 2019, and June 2019
LHAAP 58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Location Identification: / Sample Date:	Units	MCL/MSC	35AWW19_092718 9/27/18	35AWW19_121018 12/10/18	35AWW19_031919 03/19/19	35AWW19_060319 6/3/19	35AWW20_092618 9/26/18	35AWW20_092618-a 9/26/18	35AWW20_121018 12/10/18	35AWW20_031919 03/19/19	35AWW20_060419 6/4/19	35AWW23_121018 12/10/18	35AWW23_060319 6/3/19
Location Description			Site 58 - S, outside site boundary.	Site 58 - S, outside site boundary.	Site 58 - S, outside site boundary.	Site 58 - S, outside site boundary.	Site 58 - SW, inside site boundary.	Site 58 - SE, outside site boundary.	Site 58 - SW, inside site boundary.	Site 58 - SW, inside site boundary.	Site 58 - SW, inside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.
Location Depth			Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Lab Package			HS18091510-02	HS18120569	HS19031013	HS19060123	HS18091438-02	HS18091438-03	HS18120569	HS19031013	HS19060185	HS18120569	HS19060123
Hexachlorobutadiene	µg/L	20	< 0.5 U	< 0.5 U	< 1.0 U	< 1.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 1.0 UJ	< 5.0 U	< 0.5 U	< 1.0 U
Isopropylbenzene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	10,000	< 1.0 U	< 0.5 U	< 1.0 U	< 1.0 U	< 1.0 U	< 0.5 U	< 0.5 U	< 1.0 UJ	< 5.0 U	< 0.5 U	< 1.0 U
Methylene chloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 1.0 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 5.0 U	< 0.5 U	< 1.0 U
Naphthalene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
n-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
n-Propylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U
o-Xylene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
sec-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
Styrene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
tert-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
Tetrachloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**0.81 J**	**0.71 J**	**1.3**	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
Toluene	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	< 0.5 U	< 0.5 U
trans-1,2-Dichloroethene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**1.8**	**1.7**	**6.1**	**4.9 J**	**13**	< 0.5 U	< 0.5 U
trans-1,3-Dichloropropene	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 UJ	< 2.5 U	**4.7**	< 0.5 U
Trichloroethene	µg/L	5	**0.59 J**	**0.59 J**	< 0.5 U	< 0.5 U	**170**	**150**	**570**	**180**	**230**	**5.3**	**1.8**
Trichlorofluoromethane	µg/L	31,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 2.5 U	< 0.5 U	< 0.5 U
Vinyl chloride		2	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**110**	**54 J**	**140**	< 0.5 U	< 0.5 U
Volatile Fatty Acids (HPLC-METACIDS)													
Acetic Acid	mg/L	NV	< 2.0 U	< 2.0 U	< 2.0 U	< 1.0 U	**110**	**100**	**8.3**	< 2.0 U	< 1.0 U	**570**	**430**
Butyric Acid	mg/L	NV	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 U	**140**	**370 J**
Lactic Acid	mg/L	NV	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**1.3 J**	< 1.0 U	< 1.0 U	< 10.0 U	< 10 U
Propionic Acid	mg/L	51	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**850**	**1,000**
Pyruvic Acid	mg/L	NV	< 0.10 U	< 0.10 U	< 0.10 UJ	< 0.50 U	< 0.10 U	< 0.10 U	< 0.10 U	< 0.10 UJ	< 0.50 U	< 1.0 U	< 5.0 U
Anions (9056A)													
Chloride	mg/L	NV	**1,230**	**1,190**	**1,140**	**1,080**	**1,220**	**1,220**	**1,010**	**1,090**	**1,180**	**578**	**732**
Nitrate	mg/L	10	< 0.200 U	< 0.200 U	< 0.500 U	< 0.500 U	< 0.200 U	< 0.200 U	< 0.200 U	< 0.500 U	**0.194 J**	< 0.200 U	< 0.500 U
Nitrite	mg/L	1	< 0.200 U	< 0.200 U	NA	NA	< 0.200 U	< 0.200 U	< 0.200 U	NA	NA	< 0.200 U	NA
Sulfate	mg/L	NV	**989**	**998**	**994**	**966**	**922**	**894**	**1,010**	**1,120**	**1,240**	**4.19**	**14.1**
Dissolved Gases (RSK-175)													
Carbon Dioxide	µg/L	NV	**250,000**	**330,000**	**790,000**	**560,000**	**740,000**	**770,000**	**720,000**	**890,000**	**730,000**	**810,000**	**750,000**
Ethane	µg/L	NV	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 UJ	**0.19 J**	< 0.47 U	< 0.47 U
Ethene	µg/L	NV	**0.32 J**	< 0.55 U	< 0.55 U	< 0.55 U	**0.66 J**	**0.50 J**	**1.3**	**0.94 J**	**1.3**	< 0.55 U	< 0.55 U
Methane	µg/L	NV	**27**	**5.7**	**1.3 J**	**1.4**	**37**	**30**	**440**	**840 J**	**920**	**2,200**	**1,300**
Ferrous Iron (SM3500Fe)													
Ferrous Iron	mg/L	NV	**3.99 J**	**4.19 J**	NA	NA	**1.38 J**	**1.41 J**	**5.01 J**	NA	NA	**50 J**	NA
Sulfide (376.1)													
Sulfide	mg/L	NV	< 1.0 U	< 1.00 U	NA	NA	**17**	**13**	**21.4**	NA	NA	< 1.00 U	NA
Dechlorinating Bacteria													
BAV1 Vinyl Chloride Reductase	cells/mL	NV	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 1.30 U	NA	< 1.90 U	< 1.50 U	**2,370**	**5.4**	**2.5 J**
Dehalobacter spp.	cells/mL	NV	**148,000**	**99,000**	**91.5**	**62,700**	**3,770,000**	NA	**283,000**	**14,000**	< 21.7 U	< 25.0 U	< 38.5 U
Dehalococoides	cells/mL	NV	**0.80**	**0.50 J**	< 0.50 U	**3.30**	< 1.30 U	NA	< 1.90 U	< 1.50 U	**15,500**	**149**	**652**
tceA Reductase	cells/mL	NV	**0.10 J**	< 0.50 U	< 0.50 U	< 0.50 U	< 1.30 U	NA	< 1.90 U	< 1.50 U	< 2.20 U	< 2.50 U	< 3.8 U
Vinyl Chloride Reductase	cells/mL	NV	< 0.50 U	< 0.50 U	< 0.50 U	**0.10 J**	< 1.30 U	NA	< 1.90 U	< 1.50 U	< 2.20 U	**60.7**	**72.7**

Notes:

Blue Highlighting Indicates concentrations above the MCL/MSC

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

NA - Not Analyzed, NV - No Value

µg/L - micrograms per liter

mg/L - milligrams per liter

J - Estimated: Between the method detection limit and reporting limit and/or due to discrepancies in meeting certain analyte-specific quality control criteria.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

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

Table 3 - Western Plume Analytical Data, September 2018, December 2018, March 2019, and June 2019
LHAAP 58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Location Identification: / Sample Date:	Units	MCL/MSC	35AWW24_092718 9/27/18	35AWW24_121018 12/10/18	35AWW24_031919 03/19/19	35AWW24_060319 6/3/19	LHSMW06_121318 12/13/18	LHSMW06_121318_a 12/13/18	LHSMW06_060719 6/7/19	LHSMW07_092618 9/26/18	LHSMW07_121018 12/10/18	LHSMW07_031919 03/19/19	LHSMW07_060319 6/3/19
Location Description			Downgradient Western Plume well	Downgradient Western Plume well	Downgradient Western Plume well	Downgradient Western Plume well	Site 58 - SW, inside site boundary, beside Building 715.	Site 58 - SW, inside site boundary, beside Building 715. Duplicate	Site 58 - SW, inside site boundary, beside Building 715.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.
Location Depth			Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Lab Package			HS18091510-01	HS18120569	HS19031013	HS19060123	HS18120913	HS18120913	HS19060461	HS18091438-04	HS18120569	HS19031013	HS19060123
Alkalinity (SM2320B)													
Alkalinity, Total	mg/L	NV	**50.8**	**45.9**	NA	NA	NA	NA	NA	**2,060**	**1,640**	NA	NA
Phosphorus (365.3)													
Phosphorus	mg/L	NV	**0.0620**	**0.316**	NA	NA	NA	NA	NA	**0.331**	**0.125**	NA	NA
Total Organic Carbon (415.1/SM5310C)													
Total Organic Carbon	mg/L	NV	**0.87**	**1.67**	**1.68 J**	**1.55 J**	NA	NA	NA	**14.2**	**7.53**	**4.11**	**4.13**
Metals (6020A)													
Total Iron	mg/L	NV	**1.06 J**	**11.4**	NA	NA	NA	NA	NA	**1.78**	**0.773**	NA	NA
Total Manganese	mg/L	14	**0.108**	**0.134**	NA	NA	NA	NA	NA	**9.5**	**9.4**	NA	NA
Dissolved Iron	mg/L	NV	**6.55 J**	**11.1**	NA	NA	NA	NA	NA	**1.85**	**0.785**	NA	NA
Dissolved Manganese	mg/L	14	**0.127 J**	**0.142**	NA	NA	NA	NA	NA	**9.56**	**9.06**	NA	NA
Total Arsenic	mg/L	0.01	NA	NA	NA	NA	< 0.00100 U	< 0.00100 U	**0.00123 J**	NA	NA	NA	NA
Volatile Organic Compounds (8260C)													
1,1,1,2-Tetrachloroethane	µg/L	110	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,1-Trichloroethane	µg/L	200	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	µg/L	14	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**0.73 J**	< 0.5 U	< 0.5 U	< 0.5 U
1,1-Dichloroethane	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**8.2**	**8.1**	**2.2**	**11**	**42**	**15**	**9.6**
1,1-Dichloroethene	µg/L	7	< 0.5 U	< 0.5 U	**0.81 J**	< 0.5 U	**19**	**20**	**4.3**	**3.1**	< 0.5 U	< 0.5 U	**16**
1,1-Dichloropropene	µg/L	2.9	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	µg/L	310	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,3-Trichloropropane	µg/L	0.041	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trichlorobenzene	µg/L	70	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2,4-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromo-3-chloropropane	µg/L	0.2	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dibromoethane	µg/L	0.05	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	µg/L	600	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 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	**0.92 J**	**1.9**	**0.95 J**	**0.62 J**
1,2-Dichloropropane	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3,5-Trimethylbenzene	µg/L	5,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	µg/L	3,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,3-Dichloropropane	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	µg/L	75	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
2,2-Dichloropropane	µg/L	42	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Butanone	µg/L	61,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	**5.3**	< 1.0 U	< 1.0 U	< 1.0 U
2-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
2-Hexanone	µg/L	6,100	< 1.0 U	< 1.0 UJ	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 1.0 U	< 1.0 U
4-Chlorotoluene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Isopropyltoluene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
4-Methyl-2-pentanone	µg/L	8,200	< 1.0 U	< 1.0 UJ	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 UJ	< 1.0 U	< 1.0 U
Acetone	µg/L	92,000	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 2.0 U	< 1.0 U	**12**	< 2.0 U	< 2.0 U	**3.4**
Benzene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 UJ	< 0.5 U
Bromobenzene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromochloromethane	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromodichloromethane	µg/L	4.6	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromoform	µg/L	36	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Bromomethane	µg/L	140	< 0.5 UJ	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 UJ	< 0.5 U	< 0.5 U
Carbon disulfide	µg/L	10,000	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U
Carbon tetrachloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Chlorobenzene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroethane	µg/L	41,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**0.75 J**	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloroform	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Chloromethane	µg/L	220	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 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	**55**	**55**	**29**	**1.1**	< 0.5 U	< 0.5 U	**0.70 J**
cis-1,3-Dichloropropene	µg/L	5.3	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 UJ	< 0.5 U	< 0.5 U
Dibromochloromethane	µg/L	34	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Dibromomethane	µg/L	380	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Dichlorodifluoromethane	µg/L	20,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Ethylbenzene	µg/L	700	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U

Table 3 - Western Plume Analytical Data, September 2018, December 2018, March 2019, and June 2019
LHAAP 58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Location Identification: / Sample Date:	Units	MCL/MSC	35AWW24_092718 9/27/18	35AWW24_121018 12/10/18	35AWW24_031919 03/19/19	35AWW24_060319 6/3/19	LHSMW06_121318 12/13/18	LHSMW06_121318_a 12/13/18	LHSMW06_060719 6/7/19	LHSMW07_092618 9/26/18	LHSMW07_121018 12/10/18	LHSMW07_031919 03/19/19	LHSMW07_060319 6/3/19
Location Description			Downgradient Western Plume well	Downgradient Western Plume well	Downgradient Western Plume well	Downgradient Western Plume well	Site 58 - SW, inside site boundary, beside Building 715.	Site 58 - SW, inside site boundary, beside Building 715. Duplicate	Site 58 - SW, inside site boundary, beside Building 715.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.	Site 58 - SW, outside site boundary.
Location Depth			Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow	Shallow
Lab Package			HS18091510-01	HS18120569	HS19031013	HS19060123	HS18120913	HS18120913	HS19060461	HS18091438-04	HS18120569	HS19031013	HS19060123
Hexachlorobutadiene	µg/L	20	< 0.5 U	< 0.5 U	< 1.0 U	< 1.0 U	< 0.5 U	< 0.5 U	< 1.0 U	< 0.50 U	< 0.5 U	< 1.0 U	< 1.0 U
Isopropylbenzene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
m,p-Xylene	µg/L	10,000	< 0.5 U	< 0.5 U	< 1.0 U	< 1.0 U	< 0.5 U	< 0.5 U	< 1.0 U	< 1.0 U	< 0.5 U	< 1.0 U	< 1.0 U
Methylene chloride	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 1.0 U	< 0.5 U	< 0.5 U	< 1.0 U	< 0.50 U	< 0.5 U	< 0.5 U	< 1.0 U
Naphthalene	µg/L	2,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
n-Propylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
o-Xylene	µg/L	10,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
sec-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Styrene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
tert-Butylbenzene	µg/L	4,100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Tetrachloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**1.6**	**1.5**	**1.4**	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Toluene	µg/L	1,000	< 0.5 U	< 0.5 U	< 0.5 UJ	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 UJ	< 0.5 U
trans-1,2-Dichloroethene	µg/L	100	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**0.91 J**	**0.94 J**	**0.46 J**	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
trans-1,3-Dichloropropene	µg/L	29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Trichloroethene	µg/L	5	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**16**	**16**	**7.5**	**2.4**	< 0.5 U	**1.1**	**1.8**
Trichlorofluoromethane	µg/L	31,000	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Vinyl chloride		2	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	**5.0**	**5.0**	**1.2**	< 0.50 U	< 0.5 U	< 0.5 U	< 0.5 U
Volatile Fatty Acids (HPLC-METACIDS)													
Acetic Acid	mg/L	NV	< 2.0 U	< 2.0 U	< 2.0 U	< 1.0 U	NA	NA	NA	**140**	< 2.0 U	< 2.0 U	< 1.0 U
Butyric Acid	mg/L	NV	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 U	NA	NA	NA	< 1.0 U	< 1.0 U	< 1.0 U	< 2.0 U
Lactic Acid	mg/L	NV	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	NA	NA	NA	< 1.0 U	**1.3 J**	< 1.0 U	< 1.0 U
Propionic Acid	mg/L	51	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	NA	NA	NA	**0.78 J**	< 1.0 U	< 1.0 U	< 1.0 U
Pyruvic Acid	mg/L	NV	< 0.10 U	< 0.10 U	< 0.10 UJ	< 0.50 U	NA	NA	NA	< 0.10 U	< 0.10 U	< 0.10 UJ	< 0.50 U
Anions (9056A)													
Chloride	mg/L	NV	**110**	**109**	**115**	**106**	NA	NA	NA	**2,180**	**2,030**	**1,980**	**1,780**
Nitrate	mg/L	10	< 0.100 U	**0.157 J**	< 0.100 U	< 0.100 U	NA	NA	NA	< 0.200 U	< 0.200 U	< 0.500 U	< 0.500 U
Nitrite	mg/L	1	< 0.100 U	< 0.100 U	NA	NA	NA	NA	NA	< 0.200 U	< 0.200 U	NA	NA
Sulfate	mg/L	NV	**69.9**	**69.9**	**70**	**74.9**	NA	NA	NA	**1,120**	**1,530**	**2,390**	**2,470**
Dissolved Gases (RSK-175)													
Carbon Dioxide	µg/L	NV	**330,000**	**660,000**	**680,000**	**530,000**	NA	NA	NA	**760,000**	**460,000**	**440,000**	**660,000**
Ethane	µg/L	NV	< 0.47 U	< 0.47 U	< 0.47 U	< 0.47 U	NA	NA	NA	< 0.47 U	**0.46 J**	**0.52 J**	**0.20 J**
Ethene	µg/L	NV	< 0.55 U	< 0.55 U	< 0.55 U	< 0.55 U	NA	NA	NA	**4.0**	**28**	**25**	**3.9**
Methane	µg/L	NV	**190**	**68**	**7.8**	**4.2**	NA	NA	NA	**27**	**170**	**270**	**78**
Ferrous Iron (SM3500Fe)													
Ferrous Iron	mg/L	NV	**0.31 J**	**0.54 J**	NA	NA	NA	NA	NA	**0.93 J**	**0.43 J**	NA	NA
Sulfide (376.1)													
Sulfide	mg/L	NV	< 1.0 U	< 1.00 U	NA	NA	NA	NA	NA	**26**	**14.8**	NA	NA
Dechlorinating Bacteria													
BAV1 Vinyl Chloride Reductase	cells/mL	NV	< 0.50 U	< 1.20 U	< 0.80 U	< 0.5 U	NA	NA	NA	**0.80 J**	< 2.10 U	**2.5**	< 1.0 U
Dehalobacter spp.	cells/mL	NV	**4.6 J**	**1.50 J**	< 8.30 U	**24.7**	NA	NA	NA	**3,540,000**	**166,000**	**61,400**	< 9.5 U
Dehalococoides	cells/mL	NV	< 0.50 U	< 1.20 U	< 0.80 U	**0.90**	NA	NA	NA	**11,600**	**6,080**	**10,000**	**7,580**
tceA Reductase	cells/mL	NV	< 0.50 U	< 1.20 U	< 0.80 U	< 0.5 U	NA	NA	NA	< 1.60 U	< 2.10 U	< 1.40 U	< 1.0 U
Vinyl Chloride Reductase	cells/mL	NV	< 0.50 U	< 1.20 U	< 0.80 U	< 0.5 U	NA	NA	NA	**5,990**	**8,040**	**4,840**	**1,620**

Notes:

Blue Highlighting Indicates concentrations above the MCL/MSC

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

NA - Not Analyzed, NV - No Value

µg/L - micrograms per liter

mg/L - milligrams per liter

J - Estimated: Between the method detection limit and reporting limit and/or due to discrepancies in meeting certain analyte-specific quality control criteria.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

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

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	03WW01-112408 11/24/2008	03WW01-110509 5/9/2011	03WW01-082013 8/20/2013	03WW01-101013 10/10/2013	03WW01-12914 1/29/2014	03WW01-052114 5/21/2014	03WW01-102814 10/28/2014	03WW01-012115 1/21/2015	03WW01-041515 4/15/2015	03WW01-070815 7/8/2015	03WW01-100815 10/8/2015	03WW01-041316 4/13/2016	03WW01-100416 10/4/2016
1,1-DICHLOROETHENE	µg/L	7	<20 U	<2.5 U	<2 U	<5 U	<10 U	<10 U	<100 U	<100 U	<50 U	<100 U	<100 U	<25 U	<10 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<20 U	1.1 J	0.978 J	<2.5 U	<5 U	3.3 J	<50 U	<50 U	21.4 J	<50 U	<50 U	117	<5 U
TETRACHLOROETHENE	µg/L	5	2,570	418	368	172 J	172	154	48.6 J	32.8 J	15.9 J	31.4 J	36.4 J	6.49 J	<5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<20 U	<2.5 U	<1 U	<2.5 U	<5 U	<5 U	<50 U	<50 U	<25 U	<50 U	<50 U	<12.5 U	<5 U
TRICHLOROETHENE	µg/L	5	196	69.1	94.8	42.1 J	58.4	71.2	223	216	131	65.6 J	51.8 J	<12.5 U	<5 U
VINYL CHLORIDE	µg/L	2	<20 U	<2.5 U	<1 U	<2.5 U	<5 U	<5 U	<50 U	<50 U	<25 U	<50 U	<50 U	<12.5 U	<5 U

Notes:

Blue Highlighting Indicates Analyte Detected Above MCL

J - Estimated value; analyte concentration was less than the limit of quantification

MCL - Maximum Contaminant Level

NA - not analyzed

U - Analyte was not detected.

UJ - The analysis was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample. 'UJ' not detects are not definite; the analyte may be present.

µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: / Sample Date:	Units	MCL	03WW01-111517 11/15/2017	03WW01-071818 7/18/2018	35ASW03-101713 10/17/2013	35ASW03-020314 2/3/2014	35ASW03-052814 5/28/2014	35ASW03-012315 1/23/2015	35ASW03-041015 4/10/2015	35ASW03-041316 4/13/2016	35AWW01-981108 11/8/1998	35AWW01-981108FD 11/8/1998	35AWW01-040909 9/9/2004	35AWW01-020608 2/6/2008	35AWW01-111908 11/19/2008
1,1-DICHLOROETHENE	µg/L	7	<2.5 U	<0.5 UJ	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<5 U	<1 U	<1 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<2.5 U	5.3 J	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<1 U	<1 U	<5 U	<1 U	<1 U
TETRACHLOROETHENE	µg/L	5	<2.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<1 U	<1 U	<5 U	<1 U	<1 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<2.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<1 U	<1 U	<5 U	<1 U	<1 U
TRICHLOROETHENE	µg/L	5	<2.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	0.259 J	<0.5 U	<1 U	<1 U	<5 U	<1 U	<1 U
VINYL CHLORIDE	µg/L	2	<2.5 U	4.8 J	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<1 U	<1 U	<5 U	<1 U	<1 U

Notes:

Blue Highlighting Indicates Analyte Detected Above MCL

J - Estimated value; analyte concentration was less than the limit of quantification

MCL - Maximum Contaminant Level

NA - not analyzed

U - Analyte was not detected.

UJ - The analysis was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample. 'UJ' not detects are not definite; the analyte may be present.

µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW01-101113 10/11/2013	35AWW01-013114 1/31/2014	35AWW01FD-013114 1/31/2014	35AWW01-052914 5/29/2014	35AWW01-103114 10/31/2014	35AWW01-012715 1/27/2015	35AWW01-041015 4/10/2015	35AWW01FD-041015 4/10/2015	35AWW01-071015 7/10/2015	35AWW01FD-071015 7/10/2015	35AWW01-100615 10/6/2015	35AWW01FD-100615 10/6/2015	35AWW01-041216 4/12/2016
1,1-DICHLOROETHENE	µg/L	7	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Notes:

Blue Highlighting Indicates Analyte Detected Above MCL

J - Estimated value; analyte concentration was less than the limit of quantification

MCL - Maximum Contaminant Level

NA - not analyzed

U - Analyte was not detected.

UJ - The analysis was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample. 'UJ' not detects are not definite; the analyte may be present.

µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW01FD-041216 4/12/2016	35AWW01-100516 10/5/2016	35WW01-111617 11/16/2017	35AWW01-070218 7/2/2018	35AWW02-981108 11/8/1998	35AWW02-040910 9/10/2004	35AWW02-112608 11/26/2008	35AWW02-112608-FD 11/26/2008	35AWW02-102213 10/22/2013	35AWW05-040908 9/8/2004	35AWW05-112108 11/21/2008	35AWW05-101613 10/16/2013	35AWW05-020114 2/1/2014
1,1-DICHLOROETHENE	µg/L	7	<1 U	<1 U	<0.5 U	<0.5 U	<1 U	<5 U	<1 U	<1 U	<1 U	<5 U	0.551 J	<1 U	<1 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<1 U	<5 U	<1 U	<1 U	<0.5 U	<5 U	<1 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<1 U	<5 U	<1 U	<1 U	<0.5 U	<5 U	<1 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<1 U	<5 U	<1 U	<1 U	<0.5 U	<5 U	<1 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<1 U	<5 U	<1 U	<1 U	<0.5 U	<5 U	<1 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<1 U	<5 U	<1 U	<1 U	<0.5 U	<5 U	<1 U	<0.5 U	<0.5 U

Notes:

Blue Highlighting Indicates Analyte Detected Above MCL

J - Estimated value; analyte concentration was less than the limit of quantification

MCL - Maximum Contaminant Level

NA - not analyzed

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µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW05-052214 5/22/2014	35AWW05FD-052214 5/22/2014	35AWW05-102114 10/21/2014	35AWW05-012315 1/23/2015	35AWW05FD-012315 1/23/2015	35AWW05-040815 4/8/2015	35AWW05-071015 7/10/2015	35AWW05-100515 10/2/2015	35AWW05-041416 4/14/2016	35AWW05-100516 10/5/2016	35AWW05-111317 11/13/2017	35AWW05-070218 7/2/2018	35AWW05-070218_a 7/2/2018
1,1-DICHLOROETHENE	µg/L	7	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<0.5 U	<0.5 U	<0.5 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Notes:

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µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW06-120308 12/3/2008	35AWW06-110509 5/9/2011	35AWW06-101513 10/15/2013	35AWW06-013014 1/30/2014	35AWW06-052114 5/21/2014	35AWW06-102914 10/29/2014	35AWW06-012815 1/28/2015	35AWW06-041515 4/15/2015	35AWW06-070715 7/7/2015	35AWW06-100715 10/7/2015	35AWW06-041116 4/11/2016	35AWW06-100316 10/3/2016	35AWW06-111417 11/14/2017
1,1-DICHLOROETHENE	µg/L	7	57.6	21.3	15.8	14.2	12	16	13.5	4.17	18.6	12.8	13	7.48	3.9
CIS-1,2-DICHLOROETHENE	µg/L	70	0.37 J	<1 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	7.19	<1 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<1 U	<1 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	0.811 J	<1 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	<1 U	<1 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Notes:

Blue Highlighting Indicates Analyte Detected Above MCL

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µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW06-71818 7/18/2018	35AWW07R-101613 10/16/2013	35AWW08-112408 11/24/2008	35AWW08-110509 5/9/2011	35AWW08-082013 8/20/2013	35AWW08-101013 10/10/2013	35AWW08-012914 1/29/2014	35AWW08-052014 5/20/2014	35AWW08-102714 10/27/2014	35AWW08-012115 1/21/2015	35AWW08-041515 4/15/2015	35AWW08-070815 7/8/2015	35AWW08-100815 10/8/2015
1,1-DICHLOROETHENE	µg/L	7	<0.5 UJ	<1 U	<100 U	<25 U	<10 U	<10 U	<10 U	<10 U	<50 U	<50 U	<50 U	<100 U	<25 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 UJ	0.709 J	<100 U	13.4 J	9.35 J	<5 U	55.9	47.2	38.6 J	27.2 J	30.7 J	73.5 J	79.6
TETRACHLOROETHENE	µg/L	5	<0.5 UJ	0.586 J	9,590	6,480	1,640	603 J	599	204	112	119	110	110	79
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 UJ	<0.5 U	<100 U	<25 U	<5 U	<5 U	<5 U	2.82 J	<25 U	<25 U	<25 U	<50 U	<12.5 U
TRICHLOROETHENE	µg/L	5	<0.5 UJ	1.03	675	1,150	544	149 J	895	953	653	491	607	746	581
VINYL CHLORIDE	µg/L	2	<0.5 UJ	<0.5 U	<100 U	<25 U	<5 U	<5 U	<5 U	<5 U	<25 U	<25 U	<25 U	<50 U	<12.5 U

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µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW08-041316 4/13/2016	35AWW08-100416 10/4/2016	35AWW08-111517 11/15/2017	35AWW08-071818 7/18/2018	35AWW09-082913 8/29/2013	35AWW09-101013 10/10/2013	35AWW09-012914 1/29/2014	35AWW09-052014 5/20/2014	35AWW09-102714 10/27/2014	35AWW09-012115 1/21/2015	35AWW09-041415 4/14/2015	35AWW09-070715 7/7/2015	35AWW09-100715 10/7/2015
1,1-DICHLOROETHENE	µg/L	7	<25 U	<10 U	<5 U	<2.5 UJ	<1 U	<1 UJ	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
CIS-1,2-DICHLOROETHENE	µg/L	70	60.9	41.7	38	12 J	<0.5 U	<0.5 UJ	0.317 J	0.502 J	0.703 J	0.486 J	0.483 J	0.622 J	0.717 J
TETRACHLOROETHENE	µg/L	5	80.1	36.9	12	<2.5 UJ	21.9	57.6 J	125	128	254	183	155	194	283
TRANS-1,2-DICHLOROETHENE	µg/L	100	<12.5 U	<5 U	<5 U	<2.5 U	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	234	235	33	19 J	11.9	8.97 J	37.3	41.7	93	64.3	45	59.5	81.3
VINYL CHLORIDE	µg/L	2	14.2 J	7.46 J	<5 U	9.0 J	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

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Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW09-041216 4/12/2016	35AWW09-100316 10/3/2016	35AWW09-100316 10/3/2016	35AWW09-111517 11/15/2017	35AWW09-071618 7/12/2018	35AWW10-082913 8/29/2013	35AWW10-101013 10/10/2013	35AWW10-012914 1/29/2014	35AWW10-052014 5/20/2014	35AWW10-102814 10/28/2014	35AWW10-012715 1/27/2015	35AWW10-041415 4/14/2015	35AWW10-070715 7/7/2015
1,1-DICHLOROETHENE	µg/L	7	<1 U	<1 U	<1 U	<0.5 U	2.7	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
CIS-1,2-DICHLOROETHENE	µg/L	70	0.515 J	0.437 J	0.437 J	0.78 J	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	172	173	173	350	140	<0.5 U	<0.5 U	<0.5 U	0.401 J	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	55.7	48.2	48.2	97	51	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

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Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW10-100715 10/7/2015	35AWW10-041316 4/13/2016	35AWW10-100316 10/3/2016	35AWW10-111517 11/15/2017	35AWW10-071218 07/12/2018	35AWW11-101513 10/15/2013	35AWW11-020314 2/3/2014	35AWW11-052114 5/21/2014	35AWW11-102914 10/29/2014	35AWW11-012715 1/27/2015	35AWW11-041415 4/14/2015	35AWW11-070815 7/8/2015	35AWW11-100715 10/7/2015
1,1-DICHLOROETHENE	µg/L	7	<1 U	<1 U	<1 U	<0.5 U	<0.5 U	7.7	10.1	11.6	21.9	12.5	13.5	16.8	14.7
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	0.292 J	<0.5 U
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	0.442 J	<0.5 U	<0.5 U	0.369 J	<0.5 U	0.273 J	<0.5 U	<0.5 U

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Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW11-041216 4/12/2016	35AWW11-100316 10/3/2016	35AWW11-111417 11/14/2017	35AWW11-071618 07/16/2018	35AWW12-101813 10/18/2013	35AWW12FD-101813 10/18/2013	35AWW12-013114 1/31/2014	35AWW12FD-013114 1/31/2014	35AWW12-052914 5/29/2014	35AWW12-103014 10/30/2014	35AWW12-012815 1/28/2015	35AWW12-040715 4/7/2015	35AWW12FD-040715 4/7/2015
1,1-DICHLOROETHENE	µg/L	7	21.3	16	12	9	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	0.343 J	0.326 J	0.279 J	0.251 J
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	0.532 J	0.328 J	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

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Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: / Sample Date:	Units	MCL	35AWW12-070915 7/9/2015	35AWW12-100515 10/5/2015	35AWW12FD-100515 10/5/2015	35AWW12-041216 4/12/2016	35AWW12-100516 10/5/2016	35AWW12FD-100516 10/5/2016	35AWW12-111617 11/16/2017	35AWW12-062918 06/29/2018	35AWW13-101113 10/11/2013	35AWW13FD-101113 10/11/2013	35AWW13-020314 2/3/2014	35AWW13-052214 5/22/2014	35AWW13-102114 10/21/2014
1,1-DICHLOROETHENE	µg/L	7	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<0.5 U	<0.5 U	<1 U	<1 U	<1 U	<1 U	<1 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	<0.5 U	0.511 J	0.426 J	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Notes:

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Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW13FD-102114 10/21/2014	35AWW13-012315 1/23/2015	35AWW13-040815 4/8/2015	35AWW13-070915 7/9/2015	35AWW13-100615 10/6/2015	35AWW13-041316 4/13/2016	35AWW13-100616 10/6/2016	35AWW13-111617 11/16/2017	35AWW13-062818 06/29/2018	35AWW14-101813 10/18/2013	35AWW14-013114 1/31/2014	35AWW14-052814 5/28/2014	35AWW14FD-052814 5/28/2014
1,1-DICHLOROETHENE	µg/L	7	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<0.5 U	<0.5 U	1.63 J	1.63 J	1.22 J	1.07 J
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	2.04	1.75	1.46	1.47
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	0.663 J	0.669 J	0.612 J	0.565 J
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	0.272 J	<0.5 U	<0.5 U	<0.5 U

Notes:

Blue Highlighting Indicates Analyte Detected Above MCL

J - Estimated value; analyte concentration was less than the limit of quantification

MCL - Maximum Contaminant Level

NA - not analyzed

U - Analyte was not detected.

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µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW14-103014 10/30/2014	35AWW14-012115 1/21/2015	35AWW14-040715 4/7/2015	35AWW14-070915 7/9/2015	35AWW14-100215 10/2/2015	35AWW14-041316 4/13/2016	35AWW14-100616 10/6/2016	35AWW14-111717 11/17/2017	35AWW14-071818 07/18/2018	35AWW15-101613 10/16/2013	35AWW15FD-101613 10/16/2013	35AWW15-020114 2/1/2014	35AWW15-052814 5/28/2014
1,1-DICHLOROETHENE	µg/L	7	1.57 J	1.8 J	1.78 J	1.7 J	2.47	3.25	10.4	8.7	9.7 J	<1 U	<1 U	<1 U	<1 U
CIS-1,2-DICHLOROETHENE	µg/L	70	1.94	1.91	2.08	1.7	1.96	1.78	5.09	3.5	4.0 J	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	0.806 J	0.707 J	0.786 J	0.632 J	1.06	1.79	10.2	7.4	8.4 J	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	0.303 J	0.303 J	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Notes:

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µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW15-102114 10/21/2014	35AWW15-012315 1/23/2015	35AWW15-041015 4/10/2015	35AWW15-071015 7/10/2015	35AWW15-100615 10/6/2015	35AWW15-041416 4/14/2016	35AWW15-100516 10/5/2016	35AWW15-111617 11/16/2017	35AWW15-071818 07/18/2018	35AWW15-071818_a 07/18/2018	35AWW16-102213 10/22/2013	35AWW16-013114 1/31/2014	35AWW16-052814 5/28/2014
1,1-DICHLOROETHENE	µg/L	7	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<0.5 U	<0.5 UJ	<0.5 UJ	<1 U	<1 U	<1 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 UJ	<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 UJ	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U

Notes:

Blue Highlighting Indicates Analyte Detected Above MCL

J - Estimated value; analyte concentration was less than the limit of quantification

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Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW16-103014 10/30/2014	35AWW16-012715 1/27/2015	35AWW16FD-012715 1/27/2015	35AWW16-040715 4/7/2015	35AWW16-070915 7/9/2015	35AWW16FD-070915 7/9/2015	35AWW16-100615 10/6/2015	35AWW16-041216 4/12/2016	35AWW16-100416 10/4/2016	35AWW16FD-100416 10/4/2016	35AWW16-111317 11/13/2017	35AWW16-111317_a 11/13/2017	35AWW16-062918 06/29/2018
1,1-DICHLOROETHENE	µg/L	7	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<0.5 U	<0.5 U	<0.5 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Notes:

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µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW16-062918_a 06/29/2018	35AWW17-101813 10/18/2013	35AWW17-020114 2/1/2014	35AWW17-052914 5/29/2014	35AWW17-103114 10/31/2014	35AWW17-012815 1/28/2015	35AWW17-041015 4/10/2015	35AWW17-071015 7/10/2015	35AWW17-100515 10/2/2015	35AWW17-041116 4/11/2016	35AWW17-100316 10/3/2016	35AWW17-111317 11/13/2017	35AWW17-062918 06/29/2018
1,1-DICHLOROETHENE	µg/L	7	<0.5 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 UJ	<1 U	<1 U	<1 U	<0.5 U	<0.5 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Notes:

Blue Highlighting Indicates Analyte Detected Above MCL

J - Estimated value; analyte concentration was less than the limit of quantification

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µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW18-101813 10/18/2013	35AWW18-020114 2/1/2014	35AWW18-052914 5/29/2014	35AWW18-103114 10/31/2014	35AWW18-012815 1/28/2015	35AWW18-041015 4/10/2015	35AWW18-071015 7/10/2015	35AWW18-100515 10/2/2015	35AWW18-041116 4/11/2016	35AWW18FD-041116 4/11/2016	35AWW18-100516 10/5/2016	35AWW18-111317 11/13/2017	35AWW18-062918 06/29/2018
1,1-DICHLOROETHENE	µg/L	7	<1 U	<1 U	<1 U	0.792 J	0.726 J	0.78 J	<1 UJ	<1 U	2.13	2.09	0.97 J	<0.5 U	1.2
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Notes:

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Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW19-102213 10/22/2013	35AWW19-013114 1/31/2014	35AWW19-052814 5/28/2014	35AWW19-103014 10/30/2014	35AWW19-012115 1/21/2015	35AWW19-040715 4/7/2015	35AWW19-070915 7/9/2015	35AWW19FD-070915 7/9/2015	35AWW19-100215 10/2/2015	35AWW19-041216 4/13/2016	35AWW19-100616 10/6/2016	35AWW19-111717 11/17/2017	35AWW19-071818 07/18/2018
1,1-DICHLOROETHENE	µg/L	7	6.45	9.31	9.98	10.9	17.4	17.5	13.4	11.7	14.7	13.5	12.9	7.7	13 J
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 UJ
TRICHLOROETHENE	µg/L	5	0.379 J	0.619 J	0.596 J	0.81 J	0.941 J	1.13	0.807 J	0.751 J	0.939 J	0.899 J	0.754 J	<0.5 U	<0.5 UJ
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	<0.5 U	<0.5 U	<0.5 UJ

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Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: / Sample Date:	Units	MCL	35AWW20-101513 10/15/2013	35AWW20-020314 2/3/2014	35AWW20-052114 5/21/2014	35AWW20-102914 10/29/2014	35AWW20-012715 1/27/2015	35AWW20-041515 4/15/2015	35AWW20-070815 7/8/2015	35AWW20-100815 10/8/2015	35AWW20-041316 4/13/2016	35AWW20-100416 10/4/2016	35AWW20-111417 11/14/2017	35AWW20-111417_a 11/14/2017	35AWW20-071618 07/16/2018
1,1-DICHLOROETHENE	µg/L	7	3,230	2,950	5,060	4,910	5,660	4,640	4,780	3,630	5,460	3,440	1,900	2,000	1,400
CIS-1,2-DICHLOROETHENE	µg/L	70	110	87.7	110	119	123	120	118	105	126	115	53	50	69
TETRACHLOROETHENE	µg/L	5	1.65	1.53	<10 U	<10 U	<10 U	<12.5 U	<12.5 U	<12.5 U	<12.5 U	<10 U	0.80 J	0.77 J	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	3.77	3.52	<10 U	<10 U	<10 U	<12.5 U	<12.5 U	<12.5 U	5.16 J	<10 U	6.7	5.6	2.9
TRICHLOROETHENE	µg/L	5	513	479	695	843	820	718	636	582	707	594	320	320	270
VINYL CHLORIDE	µg/L	2	105	62.4	65.7	102	122	90.6	151	126	216	166	78	75	71

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Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW21-101613 10/16/2013	35AWW21-020414 2/4/2014	35AWW21-052214 5/22/2014	35AWW21-102114 10/21/2014	35AWW21-012315 1/23/2015	35AWW21-040815 4/8/2015	35AWW21-070915 7/9/2015	35AWW21-100615 10/6/2015	35AWW21-041316 4/13/2016	35AWW21FD-041316 4/13/2016	35AWW21-100416 10/4/2016	35AWW21FD-100416 10/4/2016	35AWW21-111317 11/13/2017
1,1-DICHLOROETHENE	µg/L	7	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<0.5 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

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Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW21-062918 06/29/2018	35AWW22-102213 10/22/2013	35AWW22-013114 1/31/2014	35AWW22-052914 5/29/2014	35AWW22-103014 10/30/2014	35AWW22FD-103014 10/30/2014	35AWW22-012115 1/21/2015	35AWW22FD-012115 1/21/2015	35AWW22-040715 4/7/2015	35AWW22-070915 7/9/2015	35AWW22-100515 10/5/2015	35AWW22-041316 4/13/2016	35AWW22-100616 10/6/2016
1,1-DICHLOROETHENE	µg/L	7	<0.5 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	µg/L	2	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

Notes:

Blue Highlighting Indicates Analyte Detected Above MCL

J - Estimated value; analyte concentration was less than the limit of quantification

MCL - Maximum Contaminant Level

NA - not analyzed

U - Analyte was not detected.

UJ - The analysis was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample. 'UJ' not detects are not definite; the analyte may be present.

µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	35AWW22-111717 11/17/2017	35AWW22-071818 07/18/2018	35AWW23-071718 07/17/2018	35AWW24-071718 07/17/2018	LHSMW04-941201 12/1/1994	LHSMW04-960812 8/12/1996	LHSMW04-980513 5/13/1998	LHSMW04-040909 9/9/2004	LHSMW04-FEB2007 2/20/2007	LHSMW04-013008 1/30/2008	LHSMW04-112508 11/25/2008	LHSMW04-032916 3/29/2016	LHSMW04-041316 4/13/2016
1,1-DICHLOROETHENE	µg/L	7	<0.5 U	<0.5 UJ	2.1	<0.5 U	<5 U	<0.2 U	<1 U	<5 U	<2 U	<1 U	<1 U	<1 U	<2.5 U
CIS-1,2-DICHLOROETHENE	µg/L	70	<0.5 U	<0.5 UJ	12	<0.5 U	NA	<0.2 U	<1 U	<5 U	<2 U	<1 U	0.292 J	0.666 J	0.851 J
TETRACHLOROETHENE	µg/L	5	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	<5 U	<0.25 U	<1 U	<5 U	6.4	8.74	25.7	419	397
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	NA	<0.29 U	<1 U	<5 U	<2 U	<1 U	<1 U	<0.5 U	<1.25 U
TRICHLOROETHENE	µg/L	5	<0.5 U	<0.5 UJ	2.6	<0.5 U	<5 U	<0.25 U	<1 U	<5 U	4.6	5.74	11.3	106	86.1
VINYL CHLORIDE	µg/L	2	<0.5 U	<0.5 UJ	<0.5 U	<0.5 U	NA	<0.24 U	<1 U	<5 U	<2 U	<1 U	<1 U	<0.5 U	<1.25 U

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MCL - Maximum Contaminant Level

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µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: / Sample Date:	Units	MCL	LHSMW05-941201 12/1/1994	LHSMW05-960131 1/31/1996	LHSMW05-960812 8/12/1996	LHSMW05-980513 5/13/1998	LHSMW05-040909 9/9/2004	LHSMW06-941201 12/1/1994	LHSMW06-960813 8/13/1996	LHSMW06-980513 5/13/1998	LHSMW06-040908 9/8/2004	LHSMW06-FEB2007 2/21/2007	LHSMW06-111908 11/19/2008	LHSMW06-101713 10/17/2013	LHSMW06-013114 1/31/2014	LHSMW06-052814 5/28/2014
1,1-DICHLOROETHENE	µg/L	7	<5 U	<1 U	<0.2 U	<40 U	<5 U	<5 U	2	1.3	<5 U	<2 U	<1 U	1.23 J	0.884 J	1.68 J
CIS-1,2-DICHLOROETHENE	µg/L	70	NA	<1 U	0.21	<40 U	<5 U	NA	0.98	1.4	<5 U	5.1	2.26	4.01	1.85	2.59
TETRACHLOROETHENE	µg/L	5	870	4,884	2,700	4,900	5,100 J	<5 U	0.27	0.69	2 J	<2 U	<1 U	0.663 J	<0.5 U	0.255 J
TRANS-1,2-DICHLOROETHENE	µg/L	100	NA	<1 U	<0.29 U	<40 U	<5 U	NA	<0.29 U	<1 U	<5 U	<2 U	<1 U	<0.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	49	99	39.7	160	230 J	<5 U	0.43	0.53	<5 U	0.77 J	0.486 J	1.87	0.751 J	1.41
VINYL CHLORIDE	µg/L	2	NA	<1 U	<0.24 U	<40 U	<5 U	NA	0.62	<1 U	<5 U	<2 U	<1 U	0.627 J	0.5 J	0.597 J

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µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: / Sample Date:	Units	MCL	LHSMW06-103014 10/30/2014	LHSMW06-012115 1/21/2015	LHSMW06-040715 4/7/2015	LHSMW06-070915 7/9/2015	LHSMW06-100215 10/2/2015	LHSMW06-041316 4/13/2016	LHSMW06-100616 10/6/2016	LHSMW06-111717 11/17/2017	LHSMW06-070218 07/02/2018	LHSMW07-941201 12/1/1994	LHSMW07-941201FD 12/1/1994	LHSMW07-960131 1/31/1996	LHSMW07-960812 8/12/1996	LHSMW07-980513 5/13/1998	LHSMW07-040908 9/8/2004
1,1-DICHLOROETHENE	µg/L	7	4.03	3.28	5.95	8.2	12.1	13.7	19.2	12.0	2.3	750	660	1,341	311	950	590 J
CIS-1,2-DICHLOROETHENE	µg/L	70	5.2	3.25	5.52	7.24	10.4	11.9	19	14	12	NA	NA	NA	2.5	11	6
TETRACHLOROETHENE	µg/L	5	0.381 J	0.255 J	0.454 J	0.443 J	0.518 J	0.563 J	0.9 J	<0.5 U	<0.5 U	<5 U	<5 U	7	2.7	<1 U	<5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	0.391 J	<0.5 U	<0.5 U	NA	NA	NA	<0.29 U	0.73	<5 U
TRICHLOROETHENE	µg/L	5	2.77	1.75	3.02	3.23	5.66	6.5	9.06	5.8	2.8	16	19	24	5.9	25	24
VINYL CHLORIDE	µg/L	2	1.15	0.924 J	0.967 J	1.36	2.1	2.38	2.94	2.2	<0.5 U	NA	NA	10	1.1	7.2	9

Notes:

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µg/L - micrograms per liter

Table 4
Historical Monitoring Well COC Concentrations
LHAAP-58, Longhorn Army Ammunition Plan, Karnack, Texas
Year 5 RA(O) Report

Sample Identification: Sample Date:	Units	MCL	LHSMW07-FEB2007 2/21/2007	LHSMW07-111908 11/21/2008	LHSMW07-110509 5/9/2011	LHSMW07-101513 10/15/2013	LHSMW07-013014 1/30/2014	LHSMW07-052214 5/22/2014	LHSMW07-102914 10/29/2014	LHSMW07-012815 1/28/2015	LHSMW07-041515 4/15/2015	LHSMW07-070715 7/7/2015	LHSMW07-100815 10/8/2015	LHSMW07-041416 4/14/2016	LHSMW07-100416 10/4/2016	LHSMW07-111417 11/14/2017	LHSMW07-071718 07/17/2018
1,1-DICHLOROETHENE	µg/L	7	394	576	669	396	334	558 J	1,140	1,300	1,660	2,100	1,210	1,250	701	600	56
CIS-1,2-DICHLOROETHENE	µg/L	70	3.6	7.96	10.1	6.1	4.66	7.17	21	19.3	31.4	32.4	22.5	19.6	22.1	11	5.0
TETRACHLOROETHENE	µg/L	5	<2 U	<1 U	0.253 J	<0.5 U	<1 U	<0.5 U	<1 U	<2.5 U	<5 U	<2.5 U	<2.5 U	0.397 J	<2.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	µg/L	100	<2 U	0.421 J	0.384 J	0.282 J	<1 U	0.296 J	1.06 J	<2.5 U	<5 U	1.29 J	<2.5 U	0.681 J	<2.5 U	<0.5 U	<0.5 U
TRICHLOROETHENE	µg/L	5	15.8	25	41.3	23.9	17.6	23.1	78.1	64.3	82.1	118	84.9	67.5	71.6	39.0	12
VINYL CHLORIDE	µg/L	2	3	14.4	9.47	15.9	5.43	7.98	35.4	28.8	34.1	69.4 J	37.1	10.8	21.8	15.0	<0.5 U

Notes:

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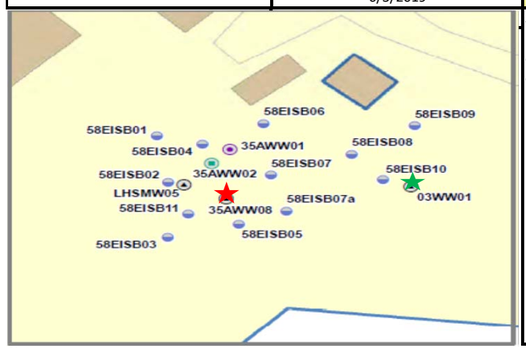
UJ - The analysis was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample. 'UJ' not detects are not definite; the analyte may be present.

µg/L - micrograms per liter

Table 5
Enhanced In-situ Bioremediation Performance Data Summary - Eastern Plume
LHAAP-58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Monitoring Location	Sample Date	Field Parameters					Electron Donor	cVOCs				Dissolved Gases				Wet Chemistry						Dechlorinating Bacteria	
		pH	DO	ORP	Spec Cond	Turb	TOC	PCE	TCE	cDCE	VC	Ethane	Methane	Ethene	CO_2	Fe^{2+}	NO_3	NO_2	SO_4	Cl^-	Alk	DHC	DHBt
		SU	mg/L	mV	ms/cm	NTU	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	cells/mL	cells/mL
35AWW08	8/20/2013	6.05	NR	NR	8.23	26.9	16.5	1,640	544	9.35 J	< 5 U	< 2 U	10.1	< 2 U	143,000	0.04	< 4 U	< 4 U	1,480	2,510	174	< 0.9 U	< 5.3 U
	10/10/2013	6.7	NR	NR	47.7	4.1	66,400	603 J	149 J	<5	< 5 U	< 2 U	5.38	< 2 U	NA	52.4	12.3 J	<20	703	905	35,600	3.6	1,300
	1/29/2014	6.68	NR	NR	23.4	79.8	43,500	599	895	55.9	< 5 U	< 2 U	345	< 2 U	428,000	144	< 10 U	< 10 U	285	2,190	27,700	< 0.8 U	12,900
	5/20/2014	5.57	NR	NR	18.2	90.4	16,900	204	953	47.2	< 5 U	< 2 U	NA	< 2 U	NA	< 800 U	< 10 U	< 10 U	262	1,590	18,300	4,880	574,000
	10/27/2014	6.86	NR	NR	19.5	213	13,900	112	653	38.6 J	< 25 U	< 2 U	4,420	< 2 U	505,000	478	< 20 U	< 20 U	< 100 U	2,020	11,800 J	70.4	3,050,000 J
	1/21/2015	6.82	NR	NR	18.1	225	6,030	119	491	27.2 J	< 25 U	< 40 U	2,540	< 40 U	152,000 J	10.9 J	< 3 U	< 3 U	< 15 U	1,900	20,400	NA	NA
	4/15/2015	8.06	NR	NR	16.4	448	8,330	110	607	30.7 J	< 25 U	< 20 U	3,380	< 20 U	249,000	< 80 U	< 2 U	< 2 U	< 10 U	2,250	18,800 J	NA	NA
	7/8/2015	8.07	NR	NR	13.9	325	2,540	110	746	73.5 J	< 50 U	< 20 U	5,600	< 20 U	370,000	123	< 2 U	< 2 U	< 10 U	2,250	10,100 J	NA	NA
	10/8/2015	7.22	NR	NR	11.3	300	2,240	79	581	79.6	< 12.5 U	< 20 U	5,510	< 20 U	374,000	21.1	< 5 U	< 5 U	< 25 U	2,130 J	20,600	448	72,900
	4/13/2016	6.86	NR	-162	13.9	74.6	NA	80.1	234	60.9	14.2 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/4/2016	6.92	NR	NR	11.8	50.4	918	36.9	235	41.7	7.46 J	< 20 U	7,350	< 20 U	424,000	17.6	< 2 U	< 2 U	< 10 U	2000	9,160 J	25,600,000	625,000
	11/15/2017	6.58	NR[3]	NR[3]	11.8	63.6	581	12	33	38	< 5 U	< 0.23 U	670	0.56 J	190,000	17.4 J	0.249	< 0.05 U	2.03	2,060	4,360	3,060,000	< 38.5 U
	7/18/2018	7.15	NR[3]	NR[3]	14.9	31.4	484 J	< 2.5 UJ	19 J	12 J	9.0 J	< 0.47 U	920	0.49 J	350,000	13.7 J	< 0.200 UJ	< 0.200 UJ	0.9	2460	3,050 J	1,410,000	47,000
	12/11/2018	7.28	NR[3]	NR[3]	10.9	82.5	392	< 0.5 U	12	8.9 J	< 0.5 U	< 0.47 U	< 1.0 U	< 0.55 U	290,000	21 J	0.147 J	< 0.100 U	4.76	2,240	3,420	1,200,000	173,000
	6/3/2019	8.67	NR[3]	NR[3]	9.93	86.9	306	4.8 J	13	< 2.5 U	< 2.5 U	< 0.47 U	3,000	4.1	260,000	NA	0.219 J	NA	1.42 J	2510	NA	3,790,000	139,000
03WW01	8/20/2013	6.18	NR	NR	3.64	33	10.5	368	94.8	0.978 J	< 1 U	< 2 U	3.22	< 2 U	143,000	0.04	< 1 U	< 1 U	534	892	142	1.2	0.4 J
	10/10/2013	6.55	NR	NR	39.2	10	49,200	172	42.1	< 2.5 U	< 2.5 U	< 2 U	4.35	< 2 U	NA	35.4	< 20 U	< 20 U	487	398	39,700	< 2.1 U	15.7 J
	1/29/2014	6.58	NR	NR	20.2	256	30,200	172	58.4	< 5 U	< 5 U	< 2 U	5.09	< 2 U	337,000	110	< 10 U	< 10 U	457	906	27,500	< 0.9 U	639,000
	5/21/2014	5.52	NR	NR	16	152	29,100	154	71.2	3.3 J	< 5 U	< 2 U	479	< 2 U	564,000	0.0217	< 10 U	< 10 U	376	780	25,700	2,870	2,700,000
	10/28/2014	5.87	NR	NR	14.2	171	8,440	48.6 J	223	< 50 U	< 50 U	< 2 U	910	< 2 U	564,000 J	107	< 1 U	< 1 U	11	940	12,300 J	10.9	192,000
	1/21/2015	6.51	NR	NR	13.6	93.3	7,720	32.8 J	216	< 50 U	< 50 U	< 10 U	393	< 10 U	333,000	40.6	< 2 U	< 2 U	10.2	881	19,000 J	NA	NA
	4/15/2015	7.11	NR	NR	12.8	387	7,800	15.9 J	131	21.4 J	< 25 U	< 20 U	3,170	< 20 U	396,000	27.8 J	< 1 U	< 1 U	18	976	24,100	NA	NA
	7/8/2015	7.62	NR	NR	11.8	847	3,640	31.4 J	65.6 J	< 50 U	< 50 U	< 20 U	16,100	< 20 U	408,000	96.1	< 1 U	< 1 U	3.62 J	1,020	12,400 J	NA	NA
	10/8/2015	6.65	NR	NR	11.4	525	1,700	36.4 J	51.8 J	< 50 U	< 50 U	< 20 U	5,880	< 20 U	500,000	0.835	< 5 U	< 5 U	< 25 U	1,200	20,300	78	8,800
	4/13/2016	7.19	NR	-127	7.99	127	NA	6.49 J	<12.5U	117	< 12.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	10/4/2016	6.81	NR	NR	6.38	70	292	< 5 U	< 5 U	< 5 U	< 5 U	<20	5,950	< 20 U	657,000	8.02	< 1 U	< 1 U	< 5 U	762	5,500 J	9,460,000	53,300
	11/15/2017	7.25	NR[3]	NR[3]	6.59	135	191	< 2.5 U	< 2.5 U	< 2.5 U	< 2.5 U	< 0.23 U	620	1.2	310,000	18.9 J	< 0.05 U	< 0.05 U	40.8	1,020	3,310	35,300	< 20.8 U
	7/18/2018	6.8	NR[3]	NR[3]	6.23	9.5	118 J	< 0.5 UJ	< 0.5 UJ	5.3 J	4.8 J	< 0.47 U	590	0.89 J	490,000	40 J	< 0.200 UJ	< 0.200 UJ	161	977	2,290	7.5	6
	12/11/2018	6.24	NR[3]	NR[3]	2	54.1	42	15	5.7	22	7.6	< 0.47 U	1,800	2.3	390,000	27.5 J	< 0.100 U	< 0.100 U	42.8	336	862	10,100	599
	6/3/2019	8.1	NR[3]	NR[3]	4.95	14.8	66	3.2 J	2.9 J	41	11	< 0.47 U	2,900	1.6	520,000	NA	0.196 J	NA	239	809	NA	6,040	292



Slight decrease in pH noted during May 2014 sampling event, potentially related to excessive substrate fermentation and organic acid production, need to monitor closely. System has continued to self buffer over time.

-Initial spike in TOC indicates effective substrate distribution.
-Residual electron donor present to support desired biogeochemical reactions.
-Declining TOC concentrations over time indicative of substrate consumption.
-Electron donor nearly depleated.

PCE is degrading fully to VC. Residual degradation products of TCE, cDCE, and VC continue to degrade.

Reduced methane and ethene indicates slowing of reductive dechlorination due to limited substrate and eletron acceptors remaining.

Increasing sulfate concentration indicates that reductive dechlorination is starting to stall.

-Initial spike in dechlorinating bacteria counts suggest effective distribution of the bioaugmentation culture.
-Sustained elevated counts indicate survival and possible proliferation of the bioaugmentation culture.
-Elevated dechlorinating bacteria counts in 2016 indicate rapid proliferation is ongoing.

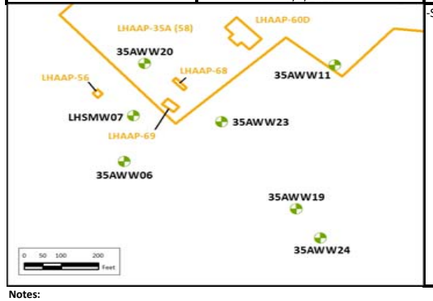
Notes:

1. Electron donor injections completed in Sept. 2013
2. Bioaugmentation performed in Nov. 2013
3. Data recorded but not used since bailer was used to collect the sample.

pH = potential of hydrogen
SU = standard units
DO = dissolved oxygen
mg/L = milligrams per liter
ORP = oxidation-reduction potential
mV = millivolts
Spec Cond = specific conductivity
ms/cm = millisiemens per centimeter
Turb = turbidity
NTU = nephelometric turbidity units
TOC = total organic carbon
cVOC = chlorinated volatile organic compounds
PCE = tetrachloroethene
TCE = trichloroethene
cDCE = cis-1,2-dichloroethene
VC = vinyl chloride
µg/L = micrograms per liter
CO_2 = carbon dioxide
Fe^{2+} = ferrous iron
NO_3 = nitrate
NO_2 = nitrite
SO_4 = sulfate
Cl^- = chloride
Alk = alkalinity
DHC = dehalococcoides
DHBt = dehalobacter spp.
cells/mL = cells per milliliter
NA = not analyzed
NR = not recorded
U - Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection
U - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
J - Estimated: Between the method detection limit and reporting limit and/or due to discrepancies in meeting certain analyte-specific quality control criteria.

Table 6
Enhanced In-situ Bioremediation Performance Data Summary-Western Plume
LHAAP-58, Longhorn Army Ammunition Plant, Karnack, Texas
Year 5 RA(O) Report

Monitoring Location	Sample Date	Field Parameters					Electron Donor	cVOCs				Dissolved Gases				Wet Chemistry						Dechlorinating Bacteria	
		pH	DO	ORP	Spec Cond	Turb	TOC	PCE	TCE	cDCE	VC	Ethane	Methane	Ethene	CO_2	Fe^{2+}	NO_3	NO_2	SO_4	Cl^-	Alk	DHC	DHBt
		SU	mg/L	mV	ms/cm	NTU	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	cells/mL	cells/mL
LHSMW07	11/14/2017	5.94	0.09	159	11	40.9	6.81	< 0.5 U	39	11	15	< 0.23 U	18	< 0.22 U	220,000	0.4 J	< 0.0500 U	< 0.100 U	2,940	2,540	750	NA	NA
	3/7/2018	6.1	0.65	180	12.1	5.1	6.67	< 1.0 U	34	11	5	< 0.47 U	3	< 0.55 U	350,000	0.07 J	< 0.0500 U	< 0.0500 U	2,700	2,420	757	11.8	< 4.8 U
	7/17/2018	6.23	0	-389	14.1	13.2	321	< 0.5 U	12	5	< 0.5 U	< 0.47 U	1.4	< 0.55 U	540,000	2.58 J	< 0.200 U	< 0.200 U	1,090	2,270	1,990	17.2	6,570,000
	9/26-27/2018	5.99	0	-222	9.24	20.3	14.2	< 0.50 U	2.4	1.1	< 0.50 U	< 0.47 U	27	4.0	760,000	0.93 J	< 0.200 U	< 0.200 U	1,120	2,180	2,060	11,600	3,540,000
	12/10/2018	6.7	0.02	-324	10.8	10.7	7.53	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	0.46 J	170	28	460,000	0.43 J	< 0.200 U	< 0.200 U	1,530	2,030	1,640	6,080	166,000
	3/19/2019	6.57	0.17	-311	11	27.5	4.11	< 0.5 U	1.1	< 0.5 U	< 0.5 U	0.52 J	270	25	440,000	NA	< 0.500 U	NA	2,390	1,980	NA	10,000	61,400
	6/3/2019	6.27	0.07	-96	10.4	17.5	4.13	< 0.5 U	1.8	0.70 J	< 0.5 U	0.20 J	78	3.9	660,000	NA	< 0.500 U	NA	2,470	1,780	NA	7,580	< 9.5 U
35AWW06	11/14/2017	5.86	0.06	197	5.87	8.7	2.29	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.23 U	0.32 J	< 0.22 U	200,000	0.09 J	2.12	< 0.0500 U	1,560	1,040	666	NA	NA
	3/8/2018	5.67	0.26	136	5.91	4.4	2.32	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 0.47 U	< 1.0 U	< 0.55 U	500,000 J	0.12 J	< 0.0500 U	< 0.0500 U	1,480	1,000	666	1.5	291
	7/2/2018	4.9	0	-35	5.86	96.7	4,200 J	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.47 U	< 1.0 U	0.58 J	780,000 J	14 J	< 0.200 UJ	< 0.200 UJ	811	904	386	< 1.8 U	52,900
	9/26-27/2018	4.75	0	78	4.95	55.5	2860	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 UJ	3.0 J	< 0.55 UJ	860,000	27.8 J	< 0.200 U	< 0.200 U	508	910	775	3.60	705,000
	12/11/2018	5.9	0.02	-177	5.2	36.8	685	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	890	0.44 J	790,000	88.1 J	< 0.200 U	< 0.200 U	13.4	858	1,210	2.50	144,000
	3/19/2019	6.39	0.16	-234	5.09	31.8	407	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	3,100	< 0.55 U	720,000	NA	< 0.500 U	NA	2.33 J	919	NA	12.3	21,200
	6/4/2019	6.61	0.06	-99	5.15	46.1	331	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	1,500	< 0.55 U	750,000	NA	0.180 J	NA	2.08 J	964	NA	26.8	159
35AWW11	11/14/2017	5.64	0.37	278	8.88	65.2	5.05	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.23 U	< 0.63 U	< 0.22 U	230,000	0.08 J	< 0.0500 U	< 0.0500 U	1,290	2,650	452	NA	NA
	3/7/2018	5.94	0.59	211	9.49	90.8	5.28	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 0.47 U	16	0.38 J	360,000	0.10 J	< 0.0500 U	< 0.0500 U	1,260	2,530	446	0.6	< 5.0 U
	7/16/2018	5.31	0	-56	8.77	15.5	1,650	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	0.80 J	< 0.55 U	450,000	27.6 J	< 0.100 U	< 0.100 U	652	2,440	649	4.60	910,000
	9/26-27/2018	5.64	0	-194	8.4	116	1,120	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	0.63	1,300	2.1	320,000	36.5 J	< 0.200 U	< 0.200 U	285	2,110	1,190	2.10	394,000
	12/11/2018	6.02	0.05	-247	9.31	14.2	701	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	5.5	< 0.55 U	820,000	20.6 J	< 0.200 U	< 0.200 U	127	2,120	1,430	10.6	220,000
	3/19/2019	5.92	0.11	-142	9	36.2	485	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	450	< 0.55 U	940,000	NA	< 0.500 U	NA	172	2,150	NA	231	818,000
	6/3/2019	5.7	0.09	-136	7.81	54.6	94.6	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	590	< 0.55 U	750,000	NA	< 0.500 U	NA	210	1,920	NA	2100	2,570,000
35AWW19	11/17/2017	5.27	NR[3]	NR[3]	5.97	26.5	NA	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	3/8/2018	5.28	NA	NA	6.08	26.4	2.51	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 0.47 U	< 1.0 U	< 0.55 U	97,000	1.10 J	< 0.0500 U	< 0.0500 U	1,220	1,430	159	0.4 J	< 11.9 U
	7/18/2019	6.08	NR[3]	NR[3]	5.67	12	2.38 J	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.5 UJ	< 0.47 U	0.65 J	< 0.55 U	180,000 J	2.78 J	< 0.200 UJ	< 0.200 UJ	983	1,370	199	0.30 J	20,400
	9/26-27/2018	5.77	0.01	42	5.46	36.1	2.21	< 0.5 U	0.59 J	< 0.5 U	< 0.5 U	< 0.47 U	27	0.32 J	250,000	3.99 J	< 0.200 U	< 0.200 U	989	1,230	213	0.8	148,000
	12/10/2018	5.94	0.04	-72	5.7	5.2	2.17	< 0.5 U	0.59 J	< 0.5 U	< 0.5 U	< 0.47 U	5.7	< 0.55 U	330,000	4.19 J	< 0.200 U	< 0.200 U	998	1,190	198	0.50 J	99,000
	3/19/2019	5.37	0.14	70	5.67	80.1	2.20	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	1.3 J	< 0.55 U	790,000	NA	< 0.500 U	NA	994	1,140	NA	< 0.50 U	91.5
	6/3/2019	5.69	0.05	93	5.46	16.6	1.88	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	1.4	< 0.55 U	560,000	NA	< 0.500 U	NA	966	1080	NA	3.30	62,700
35AWW20	11/14/2017	5.97	0.04	138	7.71	27.5	13.8	0.80 J	320	53	78	< 0.23 U	18	0.41 J	230,000	0.45 J	< 0.0500 U	< 0.0500 U	2,150	1,730	834	NA	NA
	3/7/2018	6.16	0.6	106	7.97	21.3	14.5	< 5.0 U	330	76	110	< 0.47 U	< 1.3 U	< 0.55 U	370,000	0.69 J	< 0.0500 U	< 0.0500 U	1,840	1,510	848	5.5	1,120
	7/16/2018	6.18	0	-357	7.19	0	43	< 0.5 U	270	69	71	< 0.47 U	0.93 J	< 0.55 U	360,000	1.18 J	< 0.100 U	< 0.100 U	882	1,420	1,450	1.50	5,970,000
	9/26-27/2018	5.95	0	-206	6.34	11.1	53	0.81 J	170	45	< 0.5 U	< 0.47 U	37	0.66 J	770,000	1.41 J	< 0.200 U	< 0.200 U	922	1,220	1,470	< 1.30 U	3,770,000
	12/10/2018	6.21	0.07	-270	7.14	48.1	19	1.3	570	120	110	< 0.47 U	440	1.3	720,000	5.01 J	< 0.200 U	< 0.200 U	1,010	1,010	1,190	< 1.90 U	283,000
	3/19/2019	6.26	0.11	-247	6.94	28.1	12	< 0.5 UJ	180	49 J	54 J	< 0.47 UJ	840	1.94 J	890,000	NA	< 0.500 U	NA	1,120	1,090	NA	< 1.50 U	14,000
	6/4/2019	6.65	0.1	-56	6.79	47.1	12.9	< 2.5 U	230	79	140	0.19 J	920	1.3	730,000	NA	0.194 J	NA	1,240	1,180	NA	15,500	< 21.7 U
35AWW23	3/8/2018	5.92	0.76	185	3.58	89.5	3.31	< 1.0 U	27	21	3.1	< 0.47 U	< 1.0 U	< 0.55 U	500,000	0.13 J	1.2	< 0.0500 U	761	487	608	< 0.5 U	< 4.8 U
	7/17/2018	5.67	0	-167	3.4	178	856	< 0.5 U	2.6	12	< 0.5 U	< 0.47 U	49	0.38 J	370,000	25.1 J	< 0.100 U	< 0.100 U	< 0.500 U	482	914	45.1	9,530
	9/26-27/2018	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	12/10/2018	5.6	0.05	-86	3.99	32.5	879	< 0.5 U	5.3	20	< 0.5 U	< 0.47 U	2,200	< 0.55 U	810,000	50 J	< 0.200 U	< 0.200 U	4.19	578	1,110	149	< 25.0 U
	3/19/2019	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	6/3/2019	5.74	0.02	-50	4.86	47.7	1,360	< 0.5 U	1.8	4.3	< 0.5 U	< 0.47 U	1,300	< 0.55 U	750,000	NA	< 0.500 U	NA	14.1	732	NA	652	< 38.5 U
35AWW24	3/8/2018	5.31	0.66	224	0.487	99.5	1.45	< 1.0 U	< 1.0 U	< 1.0 U	< 1.0 U	< 0.47 U	< 1.0 U	< 0.55 U	290,000	0.33 J	0.11	< 0.0500 U	85.7	119	66.5	< 2.0 U	79.9
	7/17/2018	4.98	0	71	0.484	449	1.58	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	< 1.0 U	< 0.55 U	430,000	0.16 J	0.0640 J	< 0.100 U	73.6	117	52.4	< 1.90 U	137
	9/26-27/2018	4.52	0	252	0.584	352	0.87	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	190	< 0.55 U	330,000	0.31 J	< 0.100 U	< 0.100 U	69.9	110	50.8	< 0.50 U	4.6 J
	12/10/2018	4.41	0.05	38	0.489	514	1.67	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	68	< 0.55 U	660,000	0.54 J	0.157 J	< 0.100 U	69.9	109	45.9	< 1.20 U	1.50 J
	3/19/2019	4.79	0.08	154	0.485	213	1.68 J	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	7.8	< 0.55 U	680,000	NA	< 0.100 U	NA	70	115	NA	< 0.80 U	< 8.30 U
	6/3/2019	4.53	0.06	347	0.574	74	1.55 J	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.47 U	4.2	< 0.55 U	530,000	NA	< 0.100 U	NA	74.9	106	NA	0.90	24.7



-Slight increase in pH following injection is favorable.

-Initial spike in TOC indicates effective substrate distribution to several of the areas.

-Decreasing concentrations of cVOCs.
-Additional time/monitoring necessary to observe complete dechlorination at 35AWW20.

-Increased carbon dioxide indicates metabolism of the injected substrate is occurring.

-Decreasing sulfate concentration indicates the onset/development of reducing conditions conducive to reductive dechlorination.

-Initial spike in dechlorinating bacteria counts suggest effective distribution of the bioaugmentation culture.

Notes:
1. Electron donor injections completed in March 2018
2. Bioaugmentation performed in April 2018
3. Data recorded but not used since bailer was used to collect the sample.

pH = potential of hydrogen
SU = standard units
DO = dissolved oxygen
mg/L = milligrams per liter
ORP = oxidation-reduction potential
mV = millivolts
Spec Cond = specific conductivity
ms/cm = millisiemens per centimeter
Turb = turbidity
NTU = nephelometric turbidity units
TOC = total organic carbon
cVOC = chlorinated volatile organic compounds
PCE = tetrachloroethene
TCE = trichloroethene
cDCE = cis-1,2-dichloroethene
VC = vinyl chloride
µg/L = micrograms per liter
CO_2 = carbon dioxide
Fe^{2+} = ferrous iron
NO_3 = nitrate
NO_2 = nitrite
SO_4 = sulfate
Cl^- = chloride
Alk = alkalinity
DHC = dehalococcoides
DHBt = dehalobacter spp.
cells/mL = cells per milliliter
NA = not analyzed
NR = not recorded
U - Undetected: The analyte was analyzed for, but not detected and reported to the limit of detection
U - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
J - Estimated: Between the method detection limit and reporting limit and/or due to discrepancies in meeting certain analyte-specific quality control criteria.

APPENDIX A
ANNUAL LAND USE CONTROL COMPLIANCE CERTIFICATION DOCUMENTATION

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Annual Land Use Control Compliance Certification Documentation

In accordance with the Remedial Design dated September 2011, for LHAAP-58, a certification of site was conducted by Bhate Environmental Associates, Inc. on MAY 13, 2019.

A summary of land use control mechanism is as follows:

- Groundwater restriction – restriction of the use of groundwater to environmental monitoring and testing until cleanup levels are met

A Summary of compliance with land use and restriction covenants is as follows:

- No use of groundwater, installation of new groundwater wells, or tampering with existing wells at LHAAP-58.

I, the undersigned, do document that the certification was performed as indicated above, and that the above information is true and correct to the best of my knowledge, information and belief.

Date: MAY 13, 2019

Name/Title: SCOTT BEESINGER / SENIOR FIELD TECH

Signature: Scott Beesinger

APPENDIX B
PHOTOGRAPHIC LOG

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Longhorn Army Ammunition Plant Site LHAAP-58 Photograph Log June 2019



Photo 1: 03WW01 in good condition.



Photo 2: Surface water sampling location 35ASW03.

Longhorn Army Ammunition Plant Site LHAAP-58 Photograph Log June 2019



Photo 3: S35AWW01 in good condition.



Photo 4: 35AWW05 in good condition.

Longhorn Army Ammunition Plant Site LHAAP-58 Photograph Log June 2019



Photo 5: 35AWW06 in good condition.



Photo 6: 35AWW08 in good condition.

Longhorn Army Ammunition Plant Site LHAAP-58 Photograph Log June 2019



Photo 7: 35AWW09 in good condition.



Photo 8: 35AWW10 in good condition.

Longhorn Army Ammunition Plant Site LHAAP-58 Photograph Log June 2019



Photo 9: 35AWW11 in good condition.



Photo 10: 35AWW12 in good condition.

Longhorn Army Ammunition Plant Site LHAAP-58 Photograph Log June 2019



Photo 11: 35AWW13 in good condition.



Photo 12: 35AWW14 in good condition.

Longhorn Army Ammunition Plant Site LHAAP-58 Photograph Log June 2019



Photo 13: 35AWW15 in good condition.



Photo 14: 35AWW16 in good condition.

Longhorn Army Ammunition Plant Site LHAAP-58 Photograph Log June 2019



Photo 15: 35AWW17 in good condition.



Photo 16: 35AWW18 in good condition.

Longhorn Army Ammunition Plant Site LHAAP-58 Photograph Log June 2019



Photo 17: 35AWW19 in good condition.



Photo 18: 35AWW20 in good condition.

Longhorn Army Ammunition Plant Site LHAAP-58 Photograph Log June 2019



Photo 19: 35AWW21 in good condition.



Photo 20: 35AWW22 in good condition.

Longhorn Army Ammunition Plant Site LHAAP-58 Photograph Log June 2019



Photo 21: 35AWW23 in good condition.



Photo 22: 35AWW24 in good condition.

Longhorn Army Ammunition Plant Site LHAAP-58 Photograph Log June 2019



Photo 23: LHSMW04 needs painting.



Photo 24: LHSMW06 in good condition.

Longhorn Army Ammunition Plant Site LHAAP-58 Photograph Log June 2019



Photo 25: LHSMW07 needs painting.

APPENDIX C
MONITORING WELL SAMPLE COLLECTION FORMS

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bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

Page _____ of _____

LOCATION	Site: LHAAP - 58	Location ID: ~~35AWW06~~ 35AWW06	Date: 9/26/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba 21345	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 20.35
	Total Well Depth (ft) (C): 30.32	Water Column Thickness (ft) (C-B): 9.97	Well Volume (gal) (A*(C-B)): 6.50
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal): NA
	Weather: CLOUDY/OVERCAST	Well Condition: GOOD	Comments:

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
9/26/18	0850	20.42	.13	100	21.29	4.71	5.21	1.09	57.1	117	
	0855	20.49	.26	100	20.45	4.78	5.00	0.68	53.5	86	
	0900	20.53	.39	100	20.32	4.77	4.97	0.21	54.0	83	
	0905	20.55	.52	100	20.28	4.76	4.95	0.00	54.2	80	
	0910	20.57	.65	100	20.23	4.75	4.95	0.00	54.7	79	
	0915	20.58	.78	100	20.20	4.75	4.95	0.00	55.1	78	
	0920	20.58	.91	100	20.17	4.75	4.95	0.00	55.5	78	

Colorimeter Results					**No. Containers/Volume/Type**			**Preserv.**	**Filter (Y/N)**	**Method**	**Parameter(s)**
Time	**Analyte**	**Dilution**	**Result**	**Units**		3	40 ml glass	HCl	N		VOC
							MNA				

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: BSAWW06-092618 Sample Time: 0920

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35A WW11	Date: 9/27/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba 21345	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC / 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 31.10
	Total Well Depth (ft) (C): 37.95	Water Column Thickness (ft) (C-B): 6.85	Well Volume (gal) (A*(C-B)): 1.10
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal): NA
	Weather: Cloudy / overcast	Well Condition: Good	Comments:

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
9/27/18	1125	31.18	.13	100	19.41	5.67	8.21	0.65	71.2	-161	
	1130	31.25	.26	100	19.26	5.74	8.23	0.14	105	-190	
	1135	31.30	.39	100	19.21	5.66	8.39	0.00	113	-191	
	1140	31.33	.52	100	19.18	5.65	8.40	0.00	114	-192	
	1145	31.35	.65	100	19.15	5.64	8.40	0.00	115	-193	
	1150	31.36	.78	100	19.13	5.64	8.40	0.00	116	-194	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40 ml glass	HCl	N		VOC
		MNA				

Sample ID: 35AWW11-092718 Sample Time: 1150

00943683

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW19	Date: 9/27/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba 21345	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC / 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 27.79
	Total Well Depth (ft) (C): ~~33.42~~ 32.42	Water Column Thickness (ft) (C-B): 4.63	Well Volume (gal) (A*(C-B)): 0.74
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal): NA
	Weather: Cloudy / OVERCAST	Well Condition: GOOD	Comments:

CASING INFO	Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
	Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
9/27/18	1010	27.86	.13	100	19.31	5.54	5.37	0.96	52.3	72	
	1015	27.92	.26	100	19.62	5.62	5.43	0.29	41.8	50	
	1020	27.96	.39	100	19.63	5.75	5.46	0.02	37.9	43	
	1025	27.98	.52	100	19.64	5.76	5.46	0.02	37.2	43	
	1030	27.99	.65	100	19.65	5.77	5.46	0.01	36.7	42	
	1035	28.00	.78	100	19.65	5.77	5.46	0.01	36.1	42	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40ml glass	HCl	N		VOC
		MNA				

Sample ID: 35A WW19-092718 Sample Time: 1035

00943684

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GROUNDWATER SAMPLE COLLECTION FORM

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LOCATION	Site: LHAAP - 58	Location ID: 35AWW20	Date: 9/26/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba 21345	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): 2"	Unit Casing Volume (gal/lin ft) (A): 0.65	Initial Depth to Water (ft) (B): 19.75
	Total Well Depth (ft) (C): 36.08	Water Column Thickness (ft) (C-B): 16.33	Well Volume (gal) (A*(C-B)): 10.65
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal): NA
	Weather: CLOUDY/OVERCAST	Well Condition: GOOD	Comments:

CASING INFO	Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
	Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
9/26/18	1045	19.83	.13	100	23.73	6.01	6.32	0.77	12.6	-158	
	1050	19.89	.26	100	23.68	5.96	6.37	0.41	13.4	-186	
	1055	19.93	.39	100	23.63	5.94	6.32	0.20	12.8	-204	
	1100	19.96	.52	100	23.80	5.95	6.33	0.00	12.5	-204	
	1105	19.98	.65	100	23.86	5.95	6.34	0.00	12.1	-205	
	1110	19.99	.78	100	23.91	5.95	6.34	0.00	11.7	-206	
	1115	20.00	.91	100	23.95	5.95	6.34	0.00	11.1	-206	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40 ml GLASS	HCl	N		VOC
		MNA				

Sample ID: 35AWW20_092618 Sample Time: 1115

00943685

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GROUNDWATER SAMPLE COLLECTION FORM

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LOCATION	Site: LHAAP - 58	Location ID: 35AWW24	Date: 9/27/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba 21345	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC / 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 20.11
	Total Well Depth (ft) (C): 35.01	Water Column Thickness (ft) (C-B): 14.90	Well Volume (gal) (A*(C-B)): 2.38
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal): NA
	Weather: CLOUDY / OVERCAST	Well Condition: GOOD	Comments:

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
9/26/18	0905	20.19	.13	100	19.26	4.60	0.708	0.68	409	302	
	0910	20.25	.26	100	19.32	4.45	0.609	0.21	440	280	
	0915	20.30	.39	100	19.36	4.50	0.586	0.01	355	256	
	0920	20.33	.52	100	19.40	4.50	0.585	0.01	354	255	
	0925	20.35	.65	100	19.45	4.51	0.585	0.00	353	254	
	0930	20.36	.78	100	19.46	4.52	0.584	0.00	352	252	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40ml glass	HCL	N		VOC
		MNA				

Sample ID: 35AWW24_092718

Sample Time: 09:30

00943686

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GROUNDWATER SAMPLE COLLECTION FORM

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LOCATION	Site: LHAAP - 58	Location ID: LHSMW07	Date: 9/26/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba 21345	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 19.07
	Total Well Depth (ft) (C): 30.42	Water Column Thickness (ft) (C-B): 11.35	Well Volume (gal) (A*(C-B)): 7.40
	Ambient PID (ppm): NA	Well Mouth PID (ppm): NA	System Volume (gal): NA
	Weather: Cloudy	Well Condition: Good	Comments:

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
9/26/18	1205	19.15	.13	100	24.14	6.26	9.16	0.51	26.6	-242	
	1210	19.20	.26	100	22.50	6.10	9.18	0.19	24.3	-238	
	1215	19.23	.39	100	22.24	6.01	9.22	0.00	21.9	-225	
	1220	19.25	.52	100	22.19	6.00	9.23	0.00	21.4	-224	
	1225	19.26	.65	100	22.15	6.00	9.24	0.00	20.8	-223	
	1230	19.27	.78	100	22.11	5.99	9.24	0.00	20.3	-222	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40ml GLASS	HCl	N		VOC
		MNA				

Sample ID: LHSMW07_092618 Sample Time: 1230

00943687

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 03WW01	Date: 12/11/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 30.00
	Total Well Depth (ft) (C): 33.43	Water Column Thickness (ft) (C-B): 3.43	Well Volume (gal) (A*(C-B)): 0.55
	Screened Interval: 23.43-33.43	Weather: CLEAR / COOL	Ambient PID (ppm): NA
	Pump placement: NA BAILER	Well Condition: GOOD	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/11/18	1155	30.00		NA							BAILING WELL
12/11/18	1200	33.40	0.75	NA							BAILED 3/4 GALLON RANDRY
12/12/18	0820	30.00	NA	NA	17.77	6.24	2.00	9.44	54.1	-83	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40 mL glass	HCl	N		VOC
							MNA				

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: 03WW01-121218 Sample Time: 0820

00943688

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW01	Date: 12/13/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): SS 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 40.27
	Total Well Depth (ft) (C): 73.15	Water Column Thickness (ft) (C-B): 32.88	Well Volume (gal) (A*(C-B)): 21.44
	Screened Interval: 62.50 - 72.50	Weather: Cloudy / Rain	Ambient PID (ppm): NA
	Pump placement: 67.50	Well Condition: Good	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/13/18	1315	40.33	.13	100	19.84	6.35	0.592	0.67	135	41	
	1320	40.38	.26	100	20.36	6.25	0.583	0.31	87.3	55	
	1325	40.41	.39	100	20.42	6.28	0.579	0.14	75.1	54	
	1330	40.43	.52	100	20.49	6.28	0.578	0.14	74.5	54	
	1335	40.44	.65	100	20.55	6.29	0.578	0.13	73.9	53	
	1340	40.45	.78	100	20.61	6.29	0.578	0.13	73.5	53	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40 ml glass	HCl	N		VOC
						1	60 ml plastic	HNO3	N		ARSENIC

Conversions	Stabilization Criteria									
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%						
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%						
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW01-121318				Sample Time: 1340	

00943689

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW05	Date: 12/12/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 43.67
	Total Well Depth (ft) (C): 72.63	Water Column Thickness (ft) (C-B): 28.96	Well Volume (gal) (A*(C-B)): 18.88
	Screened Interval: 62.15-72.15	Weather: Cloudy / cool	Ambient PID (ppm): NA
	Pump placement: 67.15	Well Condition: Good	Well Mouth PID (ppm): NA

CASING INFO										
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/12/18	1310	43.72	.13	100	19.09	7.35	2.90	0.61	36.6	25	
	1315	43.76	.26	100	19.68	6.81	2.79	0.28	29.3	32	
	1320	43.79	.39	100	19.73	6.64	2.72	0.10	23.1	37	
	1325	43.81	.52	100	19.79	6.63	2.72	0.10	22.6	38	
	1330	43.82	.65	100	19.85	6.62	2.71	0.09	22.0	38	
	1335	43.83	.71	100	19.89	6.62	2.71	0.09	21.5	40	

Colorimeter Results					**No. Containers/Volume/Type**			**Preserv.**	**Filter (Y/N)**	**Method**	**Parameter(s)**
Time	**Analyte**	**Dilution**	**Result**	**Units**		3	40 ml glass	HCL	N		VOC

Conversions	**Stabilization Criteria**									
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%						
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%						
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW05-12/12/18				Sample Time: 1335	

00943690

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW06	Date: 12/11/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 19.96
	Total Well Depth (ft) (C): 30.37	Water Column Thickness (ft) (C-B): 10.41	Well Volume (gal) (A*(C-B)): 6.79
	Screened Interval: 20.50 - 30.50	Weather: CLEAR / COLD	Ambient PID (ppm): NA
	Pump placement: 25.50	Well Condition: GOOD	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/11/18	0830	20.04	.13	100	14.41	5.95	5.36	0.65	47.0	-157	
↓	0835	20.10	.26	100	16.03	5.93	5.21	0.27	45.8	-170	
	0840	20.13	.39	100	16.77	5.91	5.20	0.03	38.0	-175	
	0845	20.15	.52	100	16.86	5.90	5.20	0.02	37.7	-176	
	0850	20.16	.165	100	16.95	5.90	5.20	0.02	37.2	-176	
↓	0855	20.16	.78	100	17.05	5.90	5.20	0.02	36.8	-177	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40ml glass	HCL	N		VOC
							MNA				

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: 35AWW06-121118 Sample Time: 0855

00943691

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW08	Date: 12/11/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 29.55
	Total Well Depth (ft) (C): 33.35	Water Column Thickness (ft) (C-B): 3.80	Well Volume (gal) (A*(C-B)): 0.61
	Screened Interval: 23.35 - 33.35	Weather: CLEAR / COOL	Ambient PID (ppm): NA
	Pump placement: NA BAILER	Well Condition: GOOD	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/11/18	1207	29.55		NA							BAILING WELL
12/11/18	1212	33.30	1.0	NA							BAILED 1 GALLON RANDRY
12/12/18	0910	29.55	NA	NA	18.33	7.28	10.9	9.19	82.5	-168	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40 ml glass VOA	HCL	N		VOC

Conversions	Stabilization Criteria									
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%						
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%						
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW08_121218				Sample Time: 0910	

00943692

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW09	Date: 12/11/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 32.21
	Total Well Depth (ft) (C): 42.18	Water Column Thickness (ft) (C-B): 9.97	Well Volume (gal) (A*(C-B)): 1.60
	Screened Interval: 27.58 - 42.18	Weather: CLEAR / COLD	Ambient PID (ppm): NA
	Pump placement: 34.88	Well Condition: GOOD	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/11/18	1105	32.29	.13	100	17.00	6.50	5.51	0.87	87.7	27	
	1110	32.35	.26	100	18.07	6.23	5.60	0.50	56.50	60	
	1115	32.39	.39	100	18.29	6.13	5.68	0.41	39.4	77	
	1120	32.41	.52	100	18.37	6.12	5.68	0.40	38.8	28	
	1125	32.43	.65	100	18.44	6.12	5.69	0.39	38.1	79	
	1130	32.45	.78	100	18.50	6.11	5.69	0.39	37.4	80	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40 mL glass	HCl	N		VOC
							MNA				

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: 35AWW09-121118 Sample Time: 1130

00943693

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW10	Date: 12/12/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 18.75
	Total Well Depth (ft) (C): 33.73	Water Column Thickness (ft) (C-B): 14.98	Well Volume (gal) (A*(C-B)): 2.40
	Screened Interval: 19.13-33.73	Weather: Cloudy / Cool	Ambient PID (ppm): NA
	Pump placement: 26.43	Well Condition: GOOD	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/12/18	1000	18.83	.13	100	20.19	6.39	0.210	2.03	43.1	158	
	1005	18.89	.26	100	21.13	5.76	0.192	1.92	42.6	181	
	1010	18.93	.39	100	21.59	5.62	0.188	1.80	30.1	193	
	1015	18.95	.52	100	21.65	5.57	0.188	1.70	19.8	200	
	1020	18.97	.65	100	21.74	5.56	0.187	1.69	19.0	201	
	1025	18.98	.78	100	21.82	5.55	0.187	1.69	18.1	203	
	1030	18.98	.91	100	21.89	5.55	0.187	1.68	17.2	203	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		6	40 ml glass	HCL			VOC
							MNA				

Conversions	Stabilization Criteria					
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%		
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%		
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW10_121218	Sample Time: 1030

00943694

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW11	Date: 12/11/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 31.05
	Total Well Depth (ft) (C): 38.12	Water Column Thickness (ft) (C-B): 7.07	Well Volume (gal) (A*(C-B)): 1.13
	Screened Interval: 23.50 - 38.10	Weather: CLEAR / COLD	Ambient PID (ppm): NA
	Pump placement: 33.00	Well Condition: GOOD	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/11/18	1000	31.13	.13	100	14.68	5.98	9.16	0.73	48.8	-198	
	1005	31.18	.26	100	16.40	5.99	9.27	0.29	22.2	-244	
	1010	31.22	.39	100	16.81	6.00	9.30	0.06	16.1	-245	
	1015	31.25	.52	100	16.92	6.01	9.31	0.06	15.5	-246	
	1020	31.27	.65	100	17.04	6.01	9.31	0.05	14.9	-247	
	1025	31.28	.78	100	17.15	6.02	9.31	0.05	14.2	-247	

Colorimeter Results					**No. Containers/Volume/Type**			**Preserv.**	**Filter (Y/N)**	**Method**	**Parameter(s)**
Time	**Analyte**	**Dilution**	**Result**	**Units**		3	40ml glass	HCl	N		VOC
							MNA				

Conversions	**Stabilization Criteria**										
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%							
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%							
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW11_121118				Sample Time: 1025		

00943695

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW12	Date: 12/14/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 29.66
	Total Well Depth (ft) (C): 37.65	Water Column Thickness (ft) (C-B): 7.99	Well Volume (gal) (A*(C-B)): 1.28
	Screened Interval: 23.01 – 37.61	Weather: Cloudy/Rain	Ambient PID (ppm): NA
	Pump placement: 34.00	Well Condition: Good	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE 12/14/18	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
~~0945~~	0945	29.73	.13	100	17.75	5.39	2.10	0.40	10.6	259	
~~0950~~	0950	29.77	.26	100	18.11	5.30	2.10	0.27	9.5	274	
~~0955~~	0955	29.80	.39	100	18.19	5.32	2.10	0.23	7.9	274	
~~1000~~	1000	29.84	.52	100	18.23	5.36	2.10	0.19	7.7	273	
~~1005~~	1005	29.86	.65	100	18.26	5.39	2.10	0.14	7.4	273	
~~1010~~	1010	29.86	.78	100	18.31	5.43	2.10	0.09	7.1	273	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40ml glass	HCL	N		VOC

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: 35AWW12-12/14/18 Sample Time: 1010

00943696

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW13	Date: 12/11/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 25.03
	Total Well Depth (ft) (C): 40.30	Water Column Thickness (ft) (C-B): 15.27	Well Volume (gal) (A*(C-B)): 2.44
	Screened Interval: 25.68 - 40.28	Weather: Clear / Cool	Ambient PID (ppm): NA
	Pump placement: 32.98	Well Condition: Good	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/11/18	1235	25.10	.13	100	21.09	5.87	1.44	0.77	92.1	94	
	1240	25.16	.26	100	21.67	5.75	1.55	0.74	48.3	105	
	1245	25.20	.39	100	21.85	5.78	1.70	0.70	40.1	106	
	1250	25.23	.52	100	21.96	5.79	1.71	0.69	34.5	106	
	1255	25.25	.65	100	22.04	5.79	1.71	0.69	38.9	107	
	1300	25.26	.78	100	22.13	5.79	1.72	0.68	38.6	107	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40ml glass	HCl	N		VOC

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: 35AWW13-121118 Sample Time: 1300

00943697

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW14	Date: 12/13/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 29.55
	Total Well Depth (ft) (C): 32.48	Water Column Thickness (ft) (C-B): 2.93	Well Volume (gal) (A*(C-B)): 0.47
	Screened Interval: 17.76 - 32.46	Weather: Cloudy / Rain	Ambient PID (ppm): NA
	Pump placement:	Well Condition: Good	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/13/18	1010	29.55		NA							BAILING WELL
12/13/18	1014	32.45	.75	NA							BAILED .75 GALLONS RAN DRY
12/13/18	1400	29.55	NA	NA	19.46	6.65	6.71	8.48	4.3	-10	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40 ml glass	HCl	N		VOC

Conversions	Stabilization Criteria					
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%		
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%		
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW14_121318	Sample Time: 1400

00943698

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW15	Date: 12/12/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 16.55
	Total Well Depth (ft) (C): 41.48	Water Column Thickness (ft) (C-B): 24.93	Well Volume (gal) (A*(C-B)): 3.99
	Screened Interval: 26.78-41.48	Weather: Cloudy / cool	Ambient PID (ppm): NA
	Pump placement: 34.10	Well Condition: Good	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/12/18	1215	16.61	.13	100	20.68	6.77	13.9	0.59	141	45	
↓	1220	16.65	.26	100	21.65	6.39	13.9	0.21	116	88	
	1225	16.68	.39	100	21.65	6.35	13.9	0.07	99.5	89	
	1230	16.70	.52	100	21.66	6.34	13.9	0.06	98.6	90	
	1235	16.71	.65	100	21.65	6.34	13.9	0.06	97.8	91	
↓	1240	16.71	.71	100	21.66	6.34	13.9	0.06	97.2	92	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40 ml glass	HCl	N		VOC

Conversions	Stabilization Criteria					
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%		
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%		
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW15_121218	Sample Time: 1240

00943699

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW16	Date: 12/12/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 18.26
	Total Well Depth (ft) (C): 37.55	Water Column Thickness (ft) (C-B):	Well Volume (gal) (A*(C-B)):
	Screened Interval: 22.81 - 37.51	Weather: Cloudy / Cool	Ambient PID (ppm): NA
	Pump placement: 30.16	Well Condition: Good	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/12/18	1125	18.33	.13	100	19.57	6.67	12.1	0.71	102	48	
	1130	18.39	.26	100	19.80	6.51	12.2	0.25	80.3	43	
	1135	18.42	.39	100	19.84	6.53	12.1	0.09	74.1	41	
	1140	18.44	.52	100	19.87	6.53	12.0	0.09	73.5	40	
	1145	18.45	.65	100	19.90	6.53	12.0	0.08	72.9	40	
	1150	18.45	.71	100	19.93	6.53	12.0	0.08	72.3	39	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type	Preserv.	Filter (Y/N)	Method	Parameter(s)
3 40 ml glass	HCl	N		VOC

Sample ID: 35AWW16_12/2/18 Sample Time: 1150

00943700

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AMW17	Date: 12/17/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 24.78
	Total Well Depth (ft) (C): 42.50	Water Column Thickness (ft) (C-B): 17.72	Well Volume (gal) (A*(C-B)): 2.84
	Screened Interval: 22.78 - 42.48	Weather: CLEAR/COLD	Ambient PID (ppm): NA
	Pump placement: 32.63	Well Condition: GOOD	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/17/18	0840	24.85	.13	100	15.15	6.26	10.9	0.71	34.0	125	
	0845	24.90	.26	100	16.40	6.27	10.7	0.29	18.3	140	
	0850	24.94	.39	100	16.42	6.28	10.7	0.11	8.2	141	
	0855	24.97	.52	100	16.43	6.29	10.8	0.11	6.0	141	
	0900	24.99	.65	100	16.45	6.29	10.8	0.11	4.5	142	
	0905	25.01	.78	100	16.46	6.29	10.8	0.10	3.9	142	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40ml glass	HCl	N		VOC

Conversions	Stabilization Criteria					
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%		
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%		
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AMW17-121718	Sample Time: 0905

00943701

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW18	Date: 12/17/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 25.59
	Total Well Depth (ft) (C): 42.22	Water Column Thickness (ft) (C-B): 16.63	Well Volume (gal) (A*(C-B)): 2.66
	Screened Interval: 27.48 - 42.18	Weather: CLEAR / COLD	Ambient PID (ppm): NA
	Pump placement: 34.83	Well Condition: GOOD	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/17/18	0930	25.67	.13	100	17.04	6.43	11.00	0.55	151	41	
	0935	25.72	.26	100	17.50	6.27	10.9	0.22	114	63	
	0940	25.75	.39	100	17.58	6.27	10.9	0.08	93.6	77	
	0945	25.77	.52	100	17.65	6.28	10.9	0.08	92.8	78	
	0950	25.79	.65	100	17.71	6.28	10.9	0.09	92.0	79	
	0955	25.80	.78	100	17.77	6.28	10.9	0.08	91.5	80	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		6	40 ml glass	HCl	N		VOC

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: 35AWW18_121718 Sample Time: 0955

00943702

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW19	Date: 12/10/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 27.58
	Total Well Depth (ft) (C): 32.52	Water Column Thickness (ft) (C-B): 4.94	Well Volume (gal) (A*(C-B)): 0.79
	Screened Interval: 17.96 - 32.46	Weather: CLEAR / COLD	Ambient PID (ppm): NA
	Pump placement: 29.00	Well Condition: Good	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/10/18	1050	27.65	.13	100	18.48	5.81	5.82	0.63	40.1	-75	
	1055	27.71	.26	100	19.75	5.92	5.77	0.25	14.6	-78	
	1100	27.75	.39	100	19.80	5.93	5.72	0.05	8.3	-74	
	1105	27.77	.52	100	19.84	5.94	5.71	0.04	6.9	-73	
	1110	27.79	.65	100	19.88	5.94	5.71	0.04	6.1	-72	
	1115	27.81	.78	100	19.93	5.94	5.70	0.04	5.2	-72	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40 ml glass	HCl	N		VOC
							MNA				

Conversions	Stabilization Criteria									
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%						
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%						
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW19_121018				Sample Time: 1115	

00943703

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW20	Date: 12/10/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba 28364	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 20.03
	Total Well Depth (ft) (C): 36.15	Water Column Thickness (ft) (C-B): 16.12	Well Volume (gal) (A*(C-B)): 2.58
	Screened Interval: 21.42 - 36.12	Weather: Clear / Cold	Ambient PID (ppm): NA
	Pump placement: 28.77	Well Condition: Good	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/10/18	0845	20.10	.13	100	16.76	6.51	7.19	0.69	45.6	-247	
	0850	20.15	.26	100	18.60	6.40	7.22	0.23	53.6	-269	
	0855	20.18	.39	100	19.89	6.23	7.15	0.08	50.1	-269	
	0900	20.20	.52	100	19.97	6.22	7.15	0.08	49.5	-269	
	0905	20.22	.65	100	20.10	6.22	7.14	0.08	48.9	-270	
	0910	20.23	.78	100	20.16	6.21	7.14	0.07	48.1	-270	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40mL GLASS	HCl	N		VOC
							MNA				

Conversions	Stabilization Criteria					
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%		
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%		
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW20-121018	Sample Time: 0910

00943704

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW21	Date: 12/13/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 32.90
	Total Well Depth (ft) (C): 42.85	Water Column Thickness (ft) (C-B): 9.95	Well Volume (gal) (A*(C-B)): 1.59
	Screened Interval: 28.14 - 42.84	Weather: Cloudy / RAIN	Ambient PID (ppm): NA
	Pump placement: 35.49	Well Condition: Good	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/13/18	1130	32.97	.13	100	19.16	5.49	2.01	0.54	69.1	252	
↓	1135	33.04	.26	100	19.55	5.08	2.12	0.25	27.8	293	
	1140	33.09	.39	100	19.56	5.02	2.11	0.08	21.2	303	
	1145	33.12	.52	100	19.57	5.01	2.11	0.07	20.5	304	
	1150	33.14	.65	100	19.58	5.00	2.11	0.07	19.8	304	
↓	1155	33.15	.78	100	19.58	5.00	2.11	0.07	19.3	304	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		9	40 ml glass	HCl	N		VOC

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: 35AWW21-121318 Sample Time: 1155

00943705

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW22	Date: 12/14/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 32.72
	Total Well Depth (ft) (C): 37.92	Water Column Thickness (ft) (C-B): 5.20	Well Volume (gal) (A*(C-B)): 0.83
	Screened Interval: 23.28 - 37.78	Weather: Cloudy / cool	Ambient PID (ppm): NA
	Pump placement: 30.58	Well Condition: Good	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/14/18	0850	32.78	.13	100	17.55	6.38	8.69	0.54	29.1	180	
	0855	32.81	.26	100	17.47	6.28	8.69	0.25	15.8	189	
	0900	32.85	.39	100	17.51	6.21	8.69	0.09	9.6	193	
	0905	32.88	.52	100	17.54	6.20	8.69	0.09	7.9	195	
	0910	32.90	.65	100	17.58	6.19	8.70	0.08	7.1	196	
	0915	32.92	.78	100	17.62	6.19	8.70	0.08	6.7	197	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40 ml glass	HCL	N		VOC
Sample ID: 35AWW22-121418				Sample Time: 0915		

00943706

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW23	Date: 12/10/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 20.71
	Total Well Depth (ft) (C): 43.82	Water Column Thickness (ft) (C-B): 23.11	Well Volume (gal) (A*(C-B)): 3.70
	Screened Interval: 28.50 - 43.50	Weather: CLEAR / COOL	Ambient PID (ppm): NA
	Pump placement: 36.00	Well Condition: GOOD	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/10/18	1200	20.79	.13	100	18.31	5.65	4.09	0.59	45.7	-60	
	1205	20.85	.26	100	18.47	5.60	4.08	0.29	40.6	-67	
	1210	20.89	.39	100	18.54	5.52	4.03	0.14	32.9	-77	
	1215	20.92	.52	100	18.57	5.57	4.00	0.06	32.8	-83	
	1220	20.94	.65	100	18.60	5.58	4.00	0.06	32.7	-84	
	1225	20.95	.78	100	18.63	5.59	3.99	0.05	32.6	-85	
	1230	20.95	.91	100	18.65	5.60	3.99	0.05	32.5	-86	

Colorimeter Results					**No. Containers/Volume/Type**			**Preserv.**	**Filter (Y/N)**	**Method**	**Parameter(s)**
Time	**Analyte**	**Dilution**	**Result**	**Units**		3	40ml glass	HCl	N		VOC
							MNA				

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: 35AWW23-121018 Sample Time: 1230

00943707

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW24	Date: 12/10/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba 28364	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 26.75
	Total Well Depth (ft) (C): 35.10	Water Column Thickness (ft) (C-B): 8.35	Well Volume (gal) (A*(C-B)): 1.34
	Screened Interval: 24.68 - 34.68	Weather: CLEAR / COLD	Ambient PID (ppm): NA
	Pump placement: 29.68	Well Condition: GOOD	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/10/18	0950	26.83	.13	100	17.82	5.13	0.590	0.77	601	52	
	0955	26.89	.26	100	18.61	4.59	0.508	0.22	541	43	
	1000	26.92	.39	100	19.23	4.42	0.490	0.06	517	39	
	1005	26.94	.52	100	19.35	4.42	0.489	0.05	516	39	
	1010	26.96	.65	100	19.42	4.41	0.489	0.05	515	38	
	1015	26.98	.78	100	19.53	4.41	0.489	0.05	514	38	

Colorimeter Results					**No. Containers/Volume/Type**			**Preserv.**	**Filter (Y/N)**	**Method**	**Parameter(s)**
Time	**Analyte**	**Dilution**	**Result**	**Units**		3	40ml glass	HCL	N		VOC
							MNA				

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: 35AWW24-121018 Sample Time: 1015

00943708

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: LHSMW04	Date: 12/11/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 4	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 31.15
	Total Well Depth (ft) (C): 31.16	Water Column Thickness (ft) (C-B): .01	Well Volume (gal) (A*(C-B)): 0.0006
	Screened Interval: 21.14-31.14	Weather: CLEAR/COOL	Ambient PID (ppm): NA
	Pump placement: NA	Well Condition: GOOD	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
			DRY WELL								

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units							

Conversions	Stabilization Criteria										
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%							
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%							
	Cond	+/- 10%	ORP	+/- 10	Sample ID:				Sample Time:		

00943709

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: LHSmw06	Date: 12/13/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 19.18
	Total Well Depth (ft) (C): 23.55	Water Column Thickness (ft) (C-B): 4.37	Well Volume (gal) (A*(C-B)): 2.85
	Screened Interval: 13.53-23.53	Weather: Cloudy / RAIN	Ambient PID (ppm): NA
	Pump placement: 21.00	Well Condition: GOOD	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/13/18	1035	19.25	.13	100	18.93	6.37	2.99	0.63	9.8	106	
	1040	19.30	.26	100	19.43	6.34	2.54	0.29	7.2	125	
	1045	19.33	.39	100	19.50	6.30	2.49	0.11	7.0	134	
	1050	19.35	.52	100	19.56	6.30	2.49	0.11	6.6	135	
	1055	19.37	.65	100	19.63	6.29	2.49	0.11	5.9	136	
	1100	19.38	.78	100	19.68	6.29	2.48	0.10	5.4	137	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		6	40ml glass	HCl	N		VOC
						2	60ml plastic	HNO3	N		ARSENIC

Conversions	Stabilization Criteria									
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%						
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%						
	Cond	+/- 10%	ORP	+/- 10	Sample ID: LHSmw06-12/3/18				Sample Time: 1100	

00943710

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: LHSMW07	Date: 12/10/18
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 19.21
	Total Well Depth (ft) (C): 30.52	Water Column Thickness (ft) (C-B): 11.31	Well Volume (gal) (A*(C-B)): 7.37
	Screened Interval: 19.73 - 29.73	Weather: CLEAR/COOL	Ambient PID (ppm): NA
	Pump placement: 24.73	Well Condition: GOOD	Well Mouth PID (ppm): NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
12/10/18	1305	19.28	.13	100	18.97	6.62	10.7	0.59	18.1	-304	
	1310	19.35	.26	100	19.66	6.68	10.8	0.19	12.2	-316	
	1315	19.40	.39	100	19.87	6.70	10.8	0.03	11.9	-320	
	1320	19.43	.52	100	19.96	6.70	10.8	0.02	11.4	-322	
	1325	19.45	.65	100	20.06	6.70	10.8	0.02	10.9	-323	
↓	1330	19.46	.78	100	20.12	6.70	10.8	0.02	10.7	-324	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40 ml glass	HCl	N		VOC
							MNA				

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: LHSMW07_12/018 Sample Time: 1330

00943711

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35A MW06	Date: 3/19/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 19.50
	Total Well Depth (ft) (C): 30.38	Water Column Thickness (ft) (C-B): 10.88	2nd Depth to Water(pre-purge): 19.50
	Screened Interval: 20.50-30.50	Weather: clear/sunny	Well Volume (gal) (A*(C-B)): 7.09
	Pump placement: 25.50	Well Condition: Good	Ferrous Iron: 0.44 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
3/19/19	1135	19.58	.13	100	18.53	6.52	5.23	1.01	34.9	-220	
	1140	19.65	.26	100	18.59	6.48	5.13	0.63	33.1	-221	
	1145	19.69	.39	100	18.59	6.45	5.10	0.33	32.7	-227	
	1150	19.72	.52	100	18.64	6.40	5.09	0.17	32.4	-231	
	1155	19.74	.65	100	18.69	6.40	5.09	0.16	32.1	-232	
	1200	19.75	.78	100	18.73	6.39	5.09	0.16	31.9	-233	
	1205	19.75	.91	100	18.78	6.39	5.09	0.16	31.8	-234	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		6	40mL GLASS	HCl	N		VOC
						4	40 mL GLASS	HCl	N		MEE
						4	40mL AMBER	H2SO4	N		TOC
						4	40mL GLASS	NA	N		CO2
Conversions	**Stabilization Criteria**					2	250 mL PLASTIC	NA	N		ANIONS
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%		2	250 mL AMBER	Phosphoric	N		VFA
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%		1	1 Liter PLASTIC	NA	N		DHC/DNB
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AMW06-031919				Sample Time: 1205		

00943712

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

Page 1 of 1

LOCATION	Site: LHAAP - 58	Location ID: 35AWW11	Date: 3/19/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.16	Initial Depth to Water (ft) (B): 30.00
	Total Well Depth (ft) (C): 38.04	Water Column Thickness (ft) (C-B): 8.04	2nd Depth to Water(pre-purge): 30.00
	Screened Interval: 23.50 - 38.10	Weather: CLEAR / COLD	Well Volume (gal) (A*(C-B)): 1.29
	Pump placement: 32.00	Well Condition: GOOD	Ferrous Iron: 0.43 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
3/19/19	0750	30.09	.13	100	15.26	5.87	8.50	0.90	42.5	-117	
	0755	30.15	.26	100	16.84	5.87	8.86	0.39	39.4	-131	
	0800	30.20	.39	100	16.87	5.90	8.98	0.12	37.9	-140	
	0805	30.23	.52	100	16.89	5.92	8.99	0.12	37.3	-141	
	0810	30.25	.65	100	16.92	5.92	9.00	0.11	36.6	-142	
	0815	30.26	.78	100	16.95	5.92	9.00	0.11	36.2	-142	

Colorimeter Results				
Time	Analyte	Dilution	Result	Units

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40ml Glass	HCL	N		VOC
	2	40ml GLASS	HCL	N		MEE
	2	40ml Glass	H_2SO_4	N		TOC
	2	40ml GLASS	NA	N		CO_2
	1	200ml plastic	NA	N		ANIONS
	1	250ml Amber	PHOSPHORIC	N		VFA
	1	1 Liter Plastic	NA	N		DHC/DHB

Sample ID: 35AWW11-031919 Sample Time: 0815

00943713

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW19	Date: 3/19/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 27.00
	Total Well Depth (ft) (C): 32.47	Water Column Thickness (ft) (C-B): 5.47	2nd Depth to Water(pre-purge): 27.00
	Screened Interval: 17.96 - 32.46	Weather: CLEAR / COOL	Well Volume (gal) (A*(C-B)): 0.88
	Pump placement: 29.00	Well Condition: Needs Hinge	Ferrous Iron: 0.38 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
3/19/19	0945	27.09	.13	100	16.94	5.55	5.60	0.79	103	59	
	0950	27.15	.26	100	17.93	5.36	5.68	0.32	90.2	72	
	0955	27.20	.39	100	17.97	5.36	5.67	0.15	81.9	71	
	1000	27.23	.52	100	18.02	5.37	5.67	0.15	81.3	71	
	1005	27.25	.65	100	18.06	5.37	5.67	0.14	80.7	70	
	1010	27.27	.78	100	18.10	5.37	5.67	0.14	80.1	70	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40mL GLASS	HCL	N		VOC
						2	40 mL GLASS	HCL	N		MEE
						2	40 mL AMBER	H_2SO_4	N		TOC
						2	40 mL GLASS	NA	N		CO_2
Conversions	**Stabilization Criteria**					1	200 mL plastic	NA	N		ANIONS
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%		1	250 mL AMBER	PHOSPHORIC	N		VFA
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%		1	1 LITER PLASTIC	NA	N		DHC/DHB
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW19-031919				Sample Time: 1010		

00943714

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35A WW20	Date: 3/19/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 18.76
	Total Well Depth (ft) (C): 36.08	Water Column Thickness (ft) (C-B): 17.32	2nd Depth to Water(pre-purge): 18.76
	Screened Interval: 21.42 - 36.12	Weather: CLEAR/ SUNNY	Well Volume (gal) (A*(C-B)): 2.77
	Pump placement: 28.77	Well Condition: GOOD	Ferrous Iron: 0.17 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
3/19/19	1245	18.84	.13	100	21.96	6.38	7.01	0.88	28.7	-238	
	1250	18.89	.26	100	22.08	6.28	6.97	0.35	28.5	-239	
	1255	18.93	.39	100	22.05	6.26	6.94	0.21	28.0	-243	
	1300	18.96	.52	100	22.01	6.26	6.94	0.12	28.3	-245	
	1305	18.97	.65	100	21.98	6.26	6.94	0.12	28.5	-246	
	1310	18.98	.78	100	21.94	6.26	6.94	0.11	28.4	-246	
	1315	18.98	.91	100	21.90	6.26	6.94	0.11	28.1	-247	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type		**Preserv.**	**Filter (Y/N)**	**Method**	**Parameter(s)**
9	40 mL GLASS	HCl	N		VOC
6	40mL GLASS	HCl	N		MEE
6	40 mL AMBER	H_2SO_4	N		TOC
6	40 mL GLASS	NA	N		CO2
3	250 mL PLASTIC	NA	N		ANIONS
1	250 mL AMBER	Phosphoric	N		VFA
1	1 LITER PLASTIC	NA	N		DHC/DHB

Sample ID: 35A-WW20-031919 Sample Time: 1315

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58		Location ID: 35AWW24		Date: 3/19/19
	Project Name: LHAAP		Project No./Phase: NWO1312.0150		Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro		Water Quality Meter/ID#: U-52 Horiba		PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101		Other Equipment/ID#: NA		Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"		Other Equipment/ID#: NA		PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"		Unit Casing Volume (gal/lin ft) (A): 0.160		Initial Depth to Water (ft) (B): 26.06
	Total Well Depth (ft) (C): 35.05		Water Column Thickness (ft) (C-B): 8.99		2nd Depth to Water(pre-purge): 26.06
	Screened Interval: 24.68 - 34.68		Weather: CLEAR / COOL		Well Volume (gal) (A*(C-B)): 1.44
	Pump placement: 29.68		Well Condition: GOOD		Ferrous Iron: 1.17 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
3/19/19	0850	26.13	.13	100	16.11	5.17	0.595	0.87	301	127	
	0855	26.19	.26	100	17.25	4.84	0.491	0.33	244	162	
	0900	26.23	.34	100	17.38	4.80	0.486	0.09	215	157	
	0905	26.25	.52	100	17.44	4.79	0.485	0.08	214	156	
	0910	26.27	.65	100	17.50	4.79	0.485	0.09	214	155	
	0915	26.28	.78	100	17.57	4.79	0.485	0.08	213	154	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40mL GLASS	HCL	N		VOC
	2	40mL GLASS	HCL	N		MEE
	2	40mL Amber	H2SO4	N		TOC
	2	40mL GLASS	NA	N		CO2
	1	200mL plastic	NA	N		Anions
	1	250mL Amber	Phosphoric	N		VFA
	1	1 Liter PLASTIC	NA	N		DHC/DHB

Sample ID: 35AWW24-031919 Sample Time: 0915

00943716

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

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LOCATION	Site: LHAAP - 58	Location ID: LHSMW07	Date: 3/19/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 18.32
	Total Well Depth (ft) (C): 30.49	Water Column Thickness (ft) (C-B): 12.17	2nd Depth to Water(pre-purge): 18.32
	Screened Interval: 19.73-29.73	Weather: CLEAR/COOL	Well Volume (gal) (A*(C-B)): 7.93
	Pump placement: 24.73	Well Condition: Good	Ferrous Iron: 0.67 mg/L

CASING INFO										
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
3/19/19	1040	18.40	.13	100	17.02	6.78	10.9	0.91	26.2	-266	
	1045	18.45	.26	100	17.92	6.68	11.0	0.39	27.3	-295	
	1050	18.48	.39	100	18.20	6.60	11.0	0.18	27.1	-308	
	1055	18.50	.52	100	18.28	6.59	11.0	0.17	27.3	-309	
	1100	18.51	.65	100	18.35	6.58	11.0	0.17	27.7	-310	
↓	1105	18.52	.78	100	18.41	6.57	11.0	0.17	27.5	-311	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40 mL Glass	HCl	N		VOC
	2	40 mL Glass	HCl	N		MEE
	2	40 mL Amber	H_2SO_4	N		TOC
	2	40 mL Glass	NA	N		CO2
	1	250 mL Plastic	NA	N		Anions
	1	250 mL Amber	Phosphoric	N		VFA
	1	1 Liter Plastic	NA	N		DHC/DHB

Sample ID: LHSMW07-031919 Sample Time: 1105

00943717

bhate ENVIRONMENTAL INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 03WW01	Date: 6/3/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 29.45
	Total Well Depth (ft) (C): 33.43	Water Column Thickness (ft) (C-B): 3.98	2nd Depth to Water(pre-purge): 29.45
	Screened Interval: 23.43 - 33.43	Weather: CLEAR/SUNNY	Well Volume (gal) (A*(C-B)): 0.64
	Pump placement: NA	Well Condition: OK	Ferrous Iron: 0.84 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/3/19	1328	~~29.45~~		NA							BAILING WELL
6/3/19	1334	33.35	.75	NA							BAILED .75 gallons TOTAL
6/4/19	0745	29.45	NA	NA	21.53	8.10	4.95	16.68	14.8	-40	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions: 1 L = 0.26 gals; 1 gal = 3.79 L

Stabilization Criteria

Temp	+/- 10%	DO	+/- 10%
pH	+/- 0.1	Turb	+/- 10%
Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type		Preserv.	Filter (Y/N)	Method	Parameter(s)
3	40 mL GLASS	HCL	N		VOC
2	40 mL GLASS	HCL	N		~~MEE~~ MEE
2	40 mL GLASS	NA	N		CO2
2	40 mL AMBER	H2SO4	N		TOC
1	250 mL AMBER	H3PO4	N		VFA
1	1 Liter PLASTIC	NA	N		DHC/DHB
1	125 mL PLASTIC	HNO3	N		ARSENIC

Sample ID: 03WW01-060419 Sample Time: 0745

1 250 mL PLASTIC NA N ANIONS

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW01	Date: 6/10/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 44.52
	Total Well Depth (ft) (C): 72.53	Water Column Thickness (ft) (C-B): 28.01	2nd Depth to Water(pre-purge): 44.52
	Screened Interval: 62.50 - 72.50	Weather: CLEAR/SUNNY	Well Volume (gal) (A*(C-B)): 18.26
	Pump placement: 67.50	Well Condition: OK	Ferrous Iron: NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/10/19	0955	44.57	.13	100	24.06	8.32	0.626	1.11	60.3	32	
	1000	44.61	.26	100	23.07	7.70	0.597	0.22	56.3	47	
	1005	44.65	.39	100	23.05	7.26	0.593	0.03	52.0	68	
	1010	44.67	.52	100	23.03	7.25	0.592	0.02	51.3	69	
	1015	44.69	.65	100	23.01	7.24	0.592	0.02	50.8	70	
↓	1020	44.70	.78	100	23.00	7.24	0.592	0.02	50.4	71	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		9	40 ml glass	HCl	N		VOC

Conversions	Stabilization Criteria				
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%	
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%	
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW01_061019 Sample Time: 1020

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GROUNDWATER SAMPLE COLLECTION FORM

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LOCATION	Site: LHAAP - 58	Location ID: 35AWW05	Date: 6/10/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 46.20
	Total Well Depth (ft) (C): 72.15	Water Column Thickness (ft) (C-B): 25.95	2nd Depth to Water(pre-purge): 46.20
	Screened Interval: 62.15 - 72.15	Weather: CLEAR/SUNNY	Well Volume (gal) (A*(C-B)): 16.92
	Pump placement: 67.15	Well Condition: OK	Ferrous Iron: NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/10/19	1045	46.28	.13	100	24.96	5.74	2.53	1.09	36.7	30	
	1050	46.33	.26	100	24.18	5.60	2.56	0.27	36.8	50	
	1055	46.36	.39	100	24.07	5.53	2.57	0.06	36.9	64	
	1100	46.38	.52	100	23.98	5.52	2.57	0.06	37.2	65	
	1105	46.39	.65	100	23.94	5.51	2.57	0.05	37.5	66	
↓	1110	46.39	.78	100	23.89	5.50	2.57	0.05	37.8	66	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40 ml glass	HCL	N		VOC

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: 35AWW05_061019 Sample Time: 1110

00943720

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GROUNDWATER SAMPLE COLLECTION FORM

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LOCATION	Site: LHAAP - 58	Location ID: 35H MW06	Date: 6/4/19
	Project Name: LHAAP	Project No./Phase: NW01312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 18.95
	Total Well Depth (ft) (C): 30.50	Water Column Thickness (ft) (C-B): 11.55	2nd Depth to Water(pre-purge): 18.95
	Screened Interval: 20.50 - 30.50	Weather: CLEAR/ SUNNY	Well Volume (gal) (A*(C-B)): 7.53
	Pump placement: 25.50	Well Condition: OK	Ferrous Iron: 0.65 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/4/19	1110	19.02	.13	100	23.04	6.97	5.05	0.77	49.3	-118	
	1115	19.09	.26	100	22.07	6.84	5.17	0.25	48.6	-107	
	1120	19.13	.39	100	21.49	6.63	5.16	0.07	47.4	-101	
	1125	19.16	.52	100	21.37	6.62	5.15	0.07	47.1	-100	
	1130	19.18	.65	100	21.29	6.62	5.15	0.06	46.6	-99	
	1135	19.19	.78	100	21.23	6.61	5.15	0.06	46.1	-99	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40ml glass	HCl	N		VOC
	2	40ml glass	HCl	N		MEE
	2	40ml glass	NA	N		CO2
	2	40ml Amber	H2SO4	N		TOC
	1	250 ml Amber	H3PO4	N		VFA
	1	250 ml plastic	NA	N		Anions
	1	1 Liter Plastic	NA	N		DHC/DNB

Sample ID: 35A MW06-060419 Sample Time: 1135

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GROUNDWATER SAMPLE COLLECTION FORM

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LOCATION	Site: LHAAP - 58	Location ID: 35AWW08	Date: 6/3/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 28.95
	Total Well Depth (ft) (C): 33.35	Water Column Thickness (ft) (C-B): 4.40	2nd Depth to Water(pre-purge): 28.95
	Screened Interval: 23.35-33.35	Weather: CLEAR / SUNNY	Well Volume (gal) (A*(C-B)): 0.70
	Pump placement: NA	Well Condition: OK	Ferrous Iron: 2.03 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/3/19	1338	28.95	~~NA~~	NA							BAILING WELL
6/3/19	1343	33.28	~~1.0~~	NA							BAILED 1 GALLON RANDY
6/4/19	0820	28.95	NA	NA	22.63	8.67	9.93	10.47	86.9	-181	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type		Preserv.	Filter (Y/N)	Method	Parameter(s)
3	40 ml GLASS	HCl	N		VOC
~~3~~ 2	40 ml GLASS	HCl	N		MEK
2	40 ml GLASS	NA	N		CO2
2	40 ml AMBER	H2SO4	N		TOC
1	250 ml AMBER	H3PO4	N		VFA
1	1 Liter Plastic	NA	N		DHC/DHB
1	250 ml Plastic	NA	N		ANIONS
Sample ID: 35AWW08-060419			Sample Time: 0820		
1	125 ml plastic	HNO3	N		ARSENIC

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GROUNDWATER SAMPLE COLLECTION FORM

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LOCATION	Site: LHAAP - 58	Location ID: 35AWW09	Date: 6/3/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): RVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 31.60
	Total Well Depth (ft) (C): 42.18	Water Column Thickness (ft) (C-B): 10.58	2nd Depth to Water(pre-purge): 31.60
	Screened Interval: 27.58 - 42.18	Weather: CLEAR / SUNNY	Well Volume (gal) (A*(C-B)): 1.69
	Pump placement: 34.88	Well Condition: OK	Ferrous Iron: 1.41 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/3/19	1225	31.68	.13	100	23.88	5.55	5.93	1.63	289	184	
	1230	31.74	.26	100	23.24	5.10	6.27	1.10	229	262	
	1235	31.78	.39	100	23.18	5.02	6.22	0.97	223	269	
	1240	31.81	.52	100	23.12	5.01	6.22	0.96	222	270	
	1245	31.83	.65	100	23.07	5.01	6.21	0.95	221	271	
↓	1250	31.84	.78	100	23.02	5.01	6.21	0.94	221	272	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40 mL GLASS	HCL	N		VOC
	2	40 mL GLASS	HCL	N		MEE
	2	40 mL GLASS	NA	N		CO2
	2	40 mL AMBER	H2SO4	N		TOC
	1	250 mL AMBER	H3PO4	N		VFA
	1	1 LITER PLASTIC	NA	N		DHL/DHB
	1	125 mL PLASTIC	HNO3	N		ARSENIC
Sample ID: 35AWW09-060319				Sample Time: 1250		
	1	250 mL PLASTIC	NA	N		ANIONS

00943723

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW10	Date: 6/4/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 16.05
	Total Well Depth (ft) (C): 33.70	Water Column Thickness (ft) (C-B): 17.65	2nd Depth to Water(pre-purge): 16.05
	Screened Interval: 19.13 - 33.73	Weather: CLEAR / SUNNY	Well Volume (gal) (A*(C-B)): 2.82
	Pump placement: 26.43	Well Condition: OK	Ferrous Iron: 0.10 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/4/19	1000	16.12	.13	100	24.35	5.75	0.292	1.57	24.2	206	
	1005	16.18	.26	100	24.24	5.43	0.284	1.04	28.0	223	
	1010	16.21	.39	100	24.41	5.43	0.282	0.37	21.3	230	
	1015	16.23	.52	100	24.39	5.47	0.287	0.26	16.9	237	
	1020	16.24	.65	100	24.37	5.48	0.288	0.25	16.2	238	
	1025	16.25	.78	100	24.35	5.48	0.288	0.24	15.6	239	
	1030	16.25	.91	100	24.34	5.49	0.288	0.24	15.3	240	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		6	40 ml glass	HCl	N		VOC
						4	40 ml glass	HCl	N		Mag
						4	40 ml glass	NA	N		CO2
						4	40 ml AMBER	H2SO4	N		TOC
Conversions	**Stabilization Criteria**					2	250 ml AMBER	H2PO4	N		VFA
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%		2	250 ml plastic	NA	N		Anions
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%		1	1 Liter Plastic	NA	N		DHC/DMB
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW10-060419				Sample Time: 1030		

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GROUNDWATER SAMPLE COLLECTION FORM

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LOCATION	Site: LHAAP - 58	Location ID: 35AMW11	Date: 6/3/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 29.27
	Total Well Depth (ft) (C): 37.90	Water Column Thickness (ft) (C-B): 8.63	2nd Depth to Water(pre-purge): 29.27
	Screened Interval: 23.50 - 38.10	Weather: CLEAR / SUNNY	Well Volume (gal) (A*(C-B)): 1.38
	Pump placement: 30.80	Well Condition: OK	Ferrous Iron: 1.33 mg/L

CASING INFO	Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
	Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/3/19	1125	29.35	.13	100	24.29	5.70	7.50	0.75	76.3	-138	
	1130	29.41	.26	100	23.51	5.72	7.68	0.22	58.7	-142	
	1135	29.45	.39	100	23.29	5.71	7.80	0.09	56.2	-139	
	1140	29.48	.52	100	23.20	5.70	7.80	0.10	55.7	-138	
	1145	29.50	.65	100	23.12	5.70	7.81	0.09	55.1	-137	
	1150	29.51	.78	100	23.03	5.70	7.81	0.09	54.6	-136	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers	Volume/Type	Preserv.	Filter (Y/N)	Method	Parameter(s)
3	40 mL GLASS	HCl	N		VOC
2	40 mL GLASS	HCl	N		MEE
2	40 mL GLASS	NA	N		CO2
2	40 mL AMBER	H2SO4	N		TOC
1	250 mL AMBER	H3PO4	N		VFA,
1	1 Liter PLASTIC	NA	N		DHC/DHB
1	250 mL PLASTIC	NA	N		Anions

Sample ID: 35AMW11-060319 Sample Time: 1150

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35A WW12	Date: 6/10/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 28.59
	Total Well Depth (ft) (C): 37.61	Water Column Thickness (ft) (C-B): 9.02	2nd Depth to Water(pre-purge): 28.59
	Screened Interval: 23.01 - 37.61	Weather: CLEAR / SUNNY	Well Volume (gal) (A*(C-B)): 1.44
	Pump placement: 30.31	Well Condition: OK	Ferrous Iron: NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/10/19	0815	28.65	.13	100	20.19	6.47	2.12	0.89	28.9	327	
	0820	28.70	.26	100	19.59	6.21	1.89	0.23	19.5	404	
	0825	28.74	.39	100	19.58	6.27	1.89	0.05	11.7	429	
	0830	28.77	.52	100	19.56	6.28	1.90	0.05	11.4	430	
	0835	28.79	.65	100	19.54	6.29	1.90	0.04	10.9	431	
	0840	28.81	.78	100	19.52	6.29	1.90	0.04	10.5	432	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		6	40 mL Glass	HCL	N		VOC

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: 35AWW12-061019 Sample Time: 0840

00943726

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW13	Date: 6/7/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 23.08
	Total Well Depth (ft) (C): 40.28	Water Column Thickness (ft) (C-B): 17.20	2nd Depth to Water(pre-purge): 23.08
	Screened Interval: 25.68 - 40.28	Weather: CLEAR / SUNNY	Well Volume (gal) (A*(C-B)): 2.75
	Pump placement: 32.98	Well Condition: OK	Ferrous Iron: NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/7/19	0925	23.15	.13	100	22.20	6.23	0.956	0.89	55.5	482	
	0930	23.21	.26	100	22.48	5.84	0.989	0.24	43.2	[redacted]376	
	0935	23.25	.39	100	22.71	5.67	0.999	0.04	37.9	325	
	0940	23.27	.52	100	22.79	5.66	0.999	0.04	37.3	323	
	0945	23.29	.65	100	22.85	5.65	1.00	0.04	36.7	322	
↓	0950	23.30	.78	100	22.91	5.65	1.00	0.03	36.1	321	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

No. Containers/Volume/Type		Preserv.	Filter (Y/N)	Method	Parameter(s)
9	40 ml glass	HCL	N		VOC

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: 35AWW13.060719 Sample Time: 0950

00943727

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58		Location ID: 35AWW14		Date: 6/7/19
	Project Name: LHAAP		Project No./Phase: NWO1312.0150		Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro		Water Quality Meter/ID#: U-52 Horiba		PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101		Other Equipment/ID#: NA		Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"		Other Equipment/ID#: NA		PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"		Unit Casing Volume (gal/lin ft) (A): 0.160		Initial Depth to Water (ft) (B): 28.65
	Total Well Depth (ft) (C): 32.56		Water Column Thickness (ft) (C-B): 3.91		2nd Depth to Water(pre-purge): 28.65
	Screened Interval: 17.76 - 32.46		Weather: CLEAR/SUNNY		Well Volume (gal) (A*(C-B)): 0.63
	Pump placement: NA		Well Condition: OK		Ferrous Iron: NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/7/19	0730	28.65		NA							Bailing well
6/7/19	0734	32.48	.75	NA							Bailed .75 gallons then DRY
6/7/19	1010	28.70	NA	NA	21.57	5.62	6.33	9.62	31.7	148	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40ml glass	HCl	N		VOC

Conversions	Stabilization Criteria									
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%						
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%						
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW14				Sample Time: 1010	

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW15	Date: 6/7/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 17.77
	Total Well Depth (ft) (C): 41.48	Water Column Thickness (ft) (C-B): 23.71	2nd Depth to Water(pre-purge): 17.77
	Screened Interval: 26.78 - 41.48	Weather: CLEAR/SUNNY	Well Volume (gal) (A*(C-B)): 3.79
	Pump placement: 34.10	Well Condition: OK	Ferrous Iron: NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/7/19	0750	17.85	.13	100	22.18	6.35	13.0	1.01	653	362	
	0755	17.90	.26	100	22.13	5.65	12.9	0.38	608	353	
	0800	17.94	.39	100	22.19	5.45	12.9	0.10	596	352	
	0805	17.97	.52	100	22.23	5.45	12.8	0.10	595	351	
	0810	17.99	.65	100	22.28	5.44	12.8	0.09	595	350	
	0815	18.00	.78	100	22.32	5.44	12.8	0.09	594	350	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40ml glass	HCl	N		VOC

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

Sample ID: 35AWW15_060719 Sample Time: 0815

00943729

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW16	Date: 6/10/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 17.30
	Total Well Depth (ft) (C): 37.52	Water Column Thickness (ft) (C-B): 20.22	2nd Depth to Water(pre-purge): 17.30
	Screened Interval: 22.81-37.51	Weather: CLEAR/SUNNY	Well Volume (gal) (A*(C-B)): 3.24
	Pump placement: 30.16	Well Condition: OK	Ferrous Iron: NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/10/19	1130	17.37	.13	100	25.11	6.13	8.81	1.09	231	48	
	1135	17.43	.26	100	24.23	5.61	9.76	0.61	197	81	
	1140	17.46	.39	100	23.49	5.45	9.80	0.24	188	88	
	1145	17.48	.52	100	23.32	5.45	9.81	0.23	187	88	
	1150	17.50	.65	100	23.21	5.44	9.81	0.23	186	89	
	1155	17.51	.78	100	23.13	5.44	9.81	0.22	185	89	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40ml glass	HCl	N		VOC

Conversions	Stabilization Criteria									
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%						
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%						
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW16-061019				Sample Time: 1155	

00943730

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW17	Date: 6/10/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 24.28
	Total Well Depth (ft) (C): 42.48	Water Column Thickness (ft) (C-B):	2nd Depth to Water(pre-purge): 24.28
	Screened Interval: 22.78 - 42.48	Weather: CLEAR/SUNNY	Well Volume (gal) (A*(C-B)):
	Pump placement: 32.63	Well Condition: OK	Ferrous Iron: NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/10/19	1225	24.35	.13	100	24.73	6.01	9.59	1.07	25.8	10	
	1230	24.41	.26	100	21.75	5.41	8.71	0.23	17.3	45	
	1235	24.45	.39	100	21.42	5.30	8.41	0.07	15.9	53	
	1240	24.48	.52	100	21.31	5.29	8.40	0.07	15.3	54	
	1245	24.50	.65	100	21.17	5.29	8.39	0.06	14.8	55	
↓	1250	24.51	.78	100	21.02	5.29	8.39	0.06	14.5	55	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40 ml glass	HCL	N		VOC

Sample ID: 35AWW17-06/019 Sample Time: 1250

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GROUNDWATER SAMPLE COLLECTION FORM

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LOCATION	Site: LHAAP - 58	Location ID: 35A WW18	Date: 6/4/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 24.85
	Total Well Depth (ft) (C): 42.18	Water Column Thickness (ft) (C-B):	2nd Depth to Water(pre-purge): 24.85
	Screened Interval: 27.48 - 42.18	Weather: CLEAR / SUNNY	Well Volume (gal) (A*(C-B)):
	Pump placement: 34.83	Well Condition: OK	Ferrous Iron: NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/4/19	1155	24.93	.13	100	24.74	6.09	9.48	1.01	112	54	
	1200	24.99	.26	100	22.70	5.87	9.69	0.31	87.3	78	
	1205	25.03	.39	100	22.24	5.80	9.77	0.06	79.4	93	
	1210	25.06	.52	100	22.12	5.79	9.78	0.05	78.5	94	
	1215	25.07	.65	100	22.02	5.79	9.79	0.06	77.7	94	
	1220	25.08	.78	100	21.90	5.79	9.79	0.05	77.0	95	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40 ml GLASS	HCL	N		VOC

Sample ID: 35AWW18_060419 Sample Time: 1220

00943732

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GROUNDWATER SAMPLE COLLECTION FORM

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LOCATION	Site: LHAAP - 58	Location ID: 35A WW19	Date: 6/3/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 26.45
	Total Well Depth (ft) (C): 32.48	Water Column Thickness (ft) (C-B): 6.03	2nd Depth to Water(pre-purge): 26.45
	Screened Interval: 17.96 - 32.46	Weather: CLEAR/SUNNY	Well Volume (gal) (A*(C-B)): 0.96
	Pump placement: 27.50	Well Condition: OK	Ferrous Iron: 0.00 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/3/19	0740	26.53	.13	100	20.29	5.67	5.57	0.95	33.1	178	
	0745	26.59	.26	100	19.99	5.69	5.52	0.32	22.9	118	
	0750	26.63	.39	100	20.00	5.69	5.48	0.06	17.8	96	
	0755	26.66	.52	100	20.01	5.69	5.47	0.06	17.4	95	
	0800	26.68	.65	100	20.02	5.69	5.46	0.05	16.9	94	
	0805	26.70	.78	100	20.03	5.69	5.46	0.05	16.6	93	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40mL glass	HCL	N		VOC
						2	40 mL glass	HCL	N		MEE
						2	40 mL glass	NA	N		CO2
						2	40 mL Amber	H2SO4	N		TOC
Conversions	**Stabilization Criteria**					1	250mL Amber	H3PO4	N		VFA
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%		1	1 Liter Plastic	NA	N		DHC/DHB
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%		1	250 mL Plastic	NA	N		ANIONS
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW19_060319				Sample Time: 0805		

00943733

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GROUNDWATER SAMPLE COLLECTION FORM

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LOCATION	Site: LHAAP - 58	Location ID: 35A MW20	Date: 6/4/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 17.95
	Total Well Depth (ft) (C): 36.10	Water Column Thickness (ft) (C-B): 18.15	2nd Depth to Water(pre-purge): 17.95
	Screened Interval: 21.42 - 36.12	Weather: CLEAR/ SUNNY	Well Volume (gal) (A*(C-B)): 2.90
	Pump placement: 28.77	Well Condition: OK	Ferrous Iron: 0.09 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/4/19	0900	18.03	.13	100	23.48	7.05	6.75	1.03	55.6	-42	
	0905	18.10	.26	100	23.18	6.69	6.75	0.31	52.1	-48	
	0910	18.14	.39	100	23.17	6.65	6.78	0.21	48.9	-54	
	0915	18.17	.52	100	23.15	6.65	6.79	0.10	48.3	-55	
	0920	18.19	.65	100	23.14	6.65	6.79	0.10	47.7	-56	
	0925	18.20	.78	100	23.13	6.65	6.79	0.10	47.1	-56	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40ml glass	HCl	N		VOC
						2	40ml glass	HCl	N		MEE
						2	40ml glass	NA	N		CO2
						2	40ml Amber	H2SO4	N		TOC
Conversions	**Stabilization Criteria**					1	250ml Amber	H3PO4	N		VFA
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%		1	250 ml plastic	NA	N		Anions
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%		1	1 Liter Plastic	NA	N		DRO/DRO
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AMW20-060419				Sample Time: 0925		
						1	125ml Plastic	HNO3	N		ARSENIC

00943734

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW21	Date: 6/10/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 31.38
	Total Well Depth (ft) (C): 42.84	Water Column Thickness (ft) (C-B): 11.46	2nd Depth to Water(pre-purge): 31.38
	Screened Interval: 28.14-42.84	Weather: CLEAR/SUNNY	Well Volume (gal) (A*(C-B)): 1.83
	Pump placement: 35.49	Well Condition: OK	Ferrous Iron: NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/10/19	0905	31.45	.13	100	21.78	5.99	2.33	1.16	71.3	361	
	0910	31.51	.26	100	21.46	5.87	2.33	0.26	62.5	384	
	0915	31.55	.39	100	21.45	5.47	2.32	0.07	50.9	375	
	0920	31.58	.52	100	21.44	5.46	2.32	0.06	50.4	374	
	0925	31.60	.65	100	21.43	5.46	2.32	0.07	49.8	374	
	0930	31.61	.78	100	21.42	5.46	2.32	0.06	49.2	373	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		6	40 ml glass	HCL	N		VOC

Conversions	Stabilization Criteria									
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%						
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%						
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW21_061019				Sample Time: 0930		

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bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AMW22	Date: 6/10/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 32.40
	Total Well Depth (ft) (C): 37.78	Water Column Thickness (ft) (C-B): 5.38	2nd Depth to Water(pre-purge): 32.40
	Screened Interval: 23.28 - 37.78	Weather: CLEAR / Sunny	Well Volume (gal) (A*(C-B)): 0.86
	Pump placement: ~~30-33~~ 34.50	Well Condition: OK	Ferrous Iron: NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/10/19	0725	32.48	.13	100	21.37	6.51	8.28	0.81	25.6	312	
	0730	32.55	.26	100	20.41	6.35	8.43	0.41	19.9	364	
	0735	32.61	.39	100	20.17	6.36	8.45	0.24	14.5	386	
	0740	32.65	.52	100	20.08	6.37	8.46	0.23	14.1	388	
	0745	32.68	.65	100	19.96	6.37	8.46	0.23	13.7	389	
	0750	32.70	.78	100	19.86	6.37	8.46	0.22	13.0	390	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	**Stabilization Criteria**			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
	3	40ml glass	HCl	N		VOC

Sample ID: 35AMW22-06/10/19 Sample Time: 0750

00943736

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35A WW23	Date: 6/3/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 23.97
	Total Well Depth (ft) (C): 43.75	Water Column Thickness (ft) (C-B): 19.78	2nd Depth to Water(pre-purge): 23.97
	Screened Interval: 28.50 - 43.50	Weather: Clear / Sunny	Well Volume (gal) (A*(C-B)): 3.16
	Pump placement: 36.00	Well Condition: OK	Ferrous Iron: 0.52 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/3/19	0935	24.04	.13	100	21.28	5.97	4.75	0.83	61.3	-62	
	0940	24.10	.26	100	20.95	5.80	4.73	0.25	52.1	-54	
	0945	24.14	.39	100	20.87	5.76	4.84	0.03	49.2	-51	
	0950	24.16	.52	100	20.79	5.75	4.85	0.03	48.6	-50	
	0955	24.18	.65	100	20.70	5.75	4.86	0.03	48.1	-50	
	1000	24.19	.78	100	20.63	5.74	4.86	0.02	47.7	-50	

Colorimeter Results

Time	Analyte	Dilution	Result	Units

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type		Preserv.	Filter (Y/N)	Method	Parameter(s)
3	40 ml glass	HCl	N		VOC
2	40 ml glass	HCl	N		MEE
2	40 ml glass	NA	N		CO2
2	40 mL Amber	H2SO4	N		TOC
1	250 ml Amber	H3PO4	N		VFA
1	1 Liter Plastic	NA	N		DHC/DHB
1	250 mL plastic	NA	N		ANIONS

Sample ID: 35A WW23 - 060319 Sample Time: 1000

00943737

bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: 35AWW24	Date: 6/3/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 2"	Unit Casing Volume (gal/lin ft) (A): 0.160	Initial Depth to Water (ft) (B): 25.47
	Total Well Depth (ft) (C): 35.05	Water Column Thickness (ft) (C-B): 9.58	2nd Depth to Water(pre-purge): 25.47
	Screened Interval: 24.68 - 34.68	Weather: CLEAR/ SUNNY	Well Volume (gal) (A*(C-B)): 1.53
	Pump placement: 29.68	Well Condition: OK	Ferrous Iron: 1.17 mg/L

CASING INFO	Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
	Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/3/19	1030	25.55	.13	100	21.71	5.41	0.579	1.06	119	276	
	1035	25.61	.26	100	21.14	4.77	0.577	0.37	83.5	334	
	1040	25.65	.39	100	20.92	4.55	0.575	0.07	75.9	345	
	1045	25.68	.52	100	20.86	4.54	0.574	0.06	75.3	346	
	1050	25.70	.65	100	20.80	4.53	0.574	0.06	74.7	346	
	1055	25.72	.78	100	20.75	4.53	0.574	0.06	74.0	347	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40 ml glass	HCl	N		VOC
						2	40 ml glass	HCl	N		MEE
						2	40 ml glass	NA	N		CO2
						2	40 ml Amber	H2SO4	N		TOC
Conversions	**Stabilization Criteria**					1	@250 ml Amber	H3PO4	N		VFA
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%		1	1 Liter Plastic	NA	N		DHC/DHB
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%		1	250 ml Plastic	NA	N		ANIONS
	Cond	+/- 10%	ORP	+/- 10	Sample ID: 35AWW24-060319				Sample Time: 1055		

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bhate ENVIRONMENT INFRASTRUCTURE

GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: LHSmw04	Date: 6/4/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): DRY
	Total Well Depth (ft) (C): 31.14	Water Column Thickness (ft) (C-B): NA	2nd Depth to Water(pre-purge): DRY
	Screened Interval: 21.14-31.14	Weather: CLEAR/SUNNY	Well Volume (gal) (A*(C-B)): NA
	Pump placement: NA	Well Condition: OK	Ferrous Iron: NA

CASING INFO										
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)

DRY WELL

Colorimeter Results				
Time	Analyte	Dilution	Result	Units

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type	Preserv.	Filter (Y/N)	Method	Parameter(s)
Sample ID:		Sample Time:		

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GROUNDWATER SAMPLE COLLECTION FORM

LOCATION	Site: LHAAP - 58	Location ID: LHSmw06	Date: 6/7/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 16.93
	Total Well Depth (ft) (C): 23.53	Water Column Thickness (ft) (C-B): 6.60	2nd Depth to Water(pre-purge): 16.93
	Screened Interval: 13.53 - 23.53	Weather: CLEAR / SUNNY	Well Volume (gal) (A*(C-B)): 4.30
	Pump placement: 18.53	Well Condition: OK	Ferrous Iron: NA

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/7/19	0835	17.00	.13	100	19.50	6.01	1.90	0.75	133	440	
	0840	17.06	.26	100	19.12	5.63	1.80	0.31	120	542	
	0845	17.10	.39	100	19.10	5.42	1.80	0.09	113	565	
	0850	17.13	.52	100	19.07	5.41	1.80	0.08	112	566	
	0855	17.15	.65	100	19.05	5.40	1.80	0.09	111	567	
↓	0900	17.17	.78	100	19.03	5.40	1.80	0.08	111	568	

Colorimeter Results					No. Containers/Volume/Type			Preserv.	Filter (Y/N)	Method	Parameter(s)
Time	Analyte	Dilution	Result	Units		3	40ml glass	HCL	N		VOC
						1	125ml plastic	HNO3	N		ARSENIC

Conversions	Stabilization Criteria					
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%		
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%		
	Cond	+/- 10%	ORP	+/- 10	Sample ID: LHSmw06-060719	Sample Time: 0900

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GROUNDWATER SAMPLE COLLECTION FORM

Page 1 of 1

LOCATION	Site: LHAAP - 58	Location ID: LHSmw07	Date: 6/3/19
	Project Name: LHAAP	Project No./Phase: NWO1312.0150	Recorded By: Scott Beesinger
EQUIPMENT	Pump Type/ID#: Bladder Pump / SamplePro	Water Quality Meter/ID#: U-52 Horiba	PID Type/ID#: NA
	Water Level Indicator Type/ID#: Solinist 101	Other Equipment/ID#: NA	Decon Method: Liquinox & DI water
	Tubing Type/Diameter (in): 1/4"	Other Equipment/ID#: NA	PPE: Level D
WELL INFO	Casing Type / ID (in): PVC 4"	Unit Casing Volume (gal/lin ft) (A): 0.652	Initial Depth to Water (ft) (B): 17.68
	Total Well Depth (ft) (C): 30.49	Water Column Thickness (ft) (C-B): 12.81	2nd Depth to Water(pre-purge): 17.68
	Screened Interval: 19.73 - 29.73	Weather: CLEAR / SUNNY	Well Volume (gal) (A*(C-B)): 8.35
	Pump placement: 24.73	Well Condition: OK	Ferrous Iron: 0.25 mg/L

CASING INFO											
Casing ID (in)	0.5	0.75	1.0	1.5	2.0	3.0	4.0	5.0	6.0	8.0
Unit Casing Volume (gal/lin ft)	0.016	0.020	0.043	0.103	0.160	0.378	0.652	1.03	1.48	2.57

DATE	TIME (24 Hr)	Water Level (BTOC)	Volume Removed (Gals)	Pumping Rate (ml/min)	Temp (C)	pH	Cond (mS/cm)	DO (mg/l)	Turb (NTU)	ORP (mV)	Remarks (odor, clarity, etc.)
6/3/19	0835	17.75	.13	100	21.60	6.69	10.4	0.91	26.3	-97	
	0840	17.80	.26	100	21.40	6.42	10.4	0.22	23.0	-88	
	0845	17.84	.39	100	21.45	6.28	10.4	0.08	19.0	-94	
	0850	17.87	.52	100	21.48	6.27	10.4	0.08	18.6	-95	
	0855	17.89	.65	100	21.51	6.27	10.4	0.07	18.0	-96	
	0900	17.90	.78	100	21.54	6.27	10.4	0.07	17.5	-96	

Colorimeter Results				
Time	Analyte	Dilution	Result	Units

Conversions	Stabilization Criteria			
1 L = 0.26 gals	Temp	+/- 10%	DO	+/- 10%
1 gal = 3.79 L	pH	+/- 0.1	Turb	+/- 10%
	Cond	+/- 10%	ORP	+/- 10

No. Containers/Volume/Type		Preserv.	Filter (Y/N)	Method	Parameter(s)
3	40 mL GLASS	HCL	N		VOC
2	40 mL GLASS	HCL	N		MEE
2	40 mL GLASS	NA	N		CO2
2	40 mL AMBER	H2SO4	N		TOC
1	250 ml AMBER	H3PO4	N		VFA
1	1 LITER PLASTIC	NA	N		DHC/DHB
1	250 ml plastic	NA	N		Anions

Sample ID: LHSmw07-060319 Sample Time: 0900

APPENDIX D
TECHNICAL MEMORANDUM - MONITORED NATURAL ATTENUATION MONITORING PARAMETERS

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

February 26, 2019

DAIM-ODB-LO

Mr. Rich Mayer
U.S. Environmental Protection Agency
Federal Facilities Section R6
1445 Ross Avenue
Dallas, TX 75202-2733

Re: Final Technical Memorandum – Monitored Natural Attenuation Monitoring Parameters, Longhorn Army Ammunition Plant, Karnack, Texas, February 2019

Dear Mr. Mayer,

One hard copy and one compact disc (CD) of the above-referenced document is being transmitted to you for your records. Comments, not requiring revisions, were received on the Draft version of the document from Environmental Protection Agency (EPA) and from Texas Commission on Environmental Quality (TCEQ) on February 15, 2019.

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 (1 HC and 1 CD)
P. Bruckwicki, Caddo Lake NWR, TX (1 HC and 1 CD)
A. Williams, USACE, Fort Worth District, TX (1 CD)
A. Maly, USAEC, San Antonio, TX (1 CD)
K. Nemmers, Bhate, Lakewood, CO (1 HC and 1 CD)
P. Srivastav, APTIM, Houston, TX (letter)

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

February 26, 2019

DAIM-ODB-LO

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

Re: Final Technical Memorandum – Monitored Natural Attenuation Monitoring Parameters, Longhorn Army Ammunition Plant, Karnack, Texas, February 2019

Dear Ms. Palmie,

One hard copy and one compact disc (CD) of the above-referenced document is being transmitted to you for your records. Comments, not requiring revisions, were received on the Draft version of the document from Environmental Protection Agency (EPA) and from Texas Commission on Environmental Quality (TCEQ) on February 15, 2019.

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:
R. Mayer, USEPA Region 6, Dallas, TX (1 HC and 1 CD)
P. Bruckwicki, Caddo Lake NWR, TX (1 HC and 1 CD)
A. Williams, USACE, Fort Worth District, TX (1 CD)
A. Maly, USAEC, San Antonio, TX (1 CD)
K. Nemmers, Bhate, Lakewood, CO (1 HC and 1 CD)
P. Srivastav, APTIM, Houston, TX (letter)

Final

Technical Memorandum – Monitored Natural Attenuation Monitoring Parameters

Longhorn Army Ammunition Plant
Karnack, Texas

Prepared for U.S. Army Corps of Engineers, Tulsa District
Contracting Division
2488 East 81st Street
Tulsa, Oklahoma 74137-4290

Prepared by

bhate ENVIRONMENT & INFRASTRUCTURE

1608 13th Avenue south, Suite 300
Birmingham, Alabama 35205
1-800-806-4001 • www.bhate.com

Prepared by

APTIM

Aptim Federal Services, LLC
2500 CityWest, Suite 1700
Houston, Texas 77042

Contract No. W9128F-13-D-0012
Task Order No. W9128BV17F0150
Project No. 501032
Rev 0
February 2019

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Acronyms and Abbreviations

APTIM	Aptim Federal Services, LLC
LHAAP	Longhorn Army Ammunition Plant
LUC	land use controls
MNA	monitored natural attenuation
RACR	Remedial Action Completion Report
RA-O	Remedial Action Operation
RAWP	Remedial Action Work Plan
TCE	trichloroethene

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Contract No. W9128F-13-D-0012, Task Order No. W9128BV17F0150 • Final • Rev 0 • February 2019

1.0 INTRODUCTION

The purpose of this Technical Memorandum is to create a standard list of monitored natural attenuation (MNA) parameters across Longhorn Army Ammunition Plant (LHAAP) sites and eliminate analysis that are either redundant or not useful for the evaluation of MNA effectiveness. MNA with land use controls (LUCs) is the selected remedy to remediate trichloroethene (TCE) plumes in the groundwater at sites LHAAP-37, LHAAP-67, LHAAP-50, LHAAP-46, and LHAAP-58. On **Table 1**, each site and the three documents, Remedial Action Work Plan (RAWP), Remedial Action Completion Report (RACR), and Remedial Action Operation (RA-O), are listed and cross-referenced with the MNA parameters cited in each document.

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2.0 CURRENT REMEDIAL ACTION OPERATION (RA-O) MONITORING

Currently the list of MNA analytical parameters inclusive of all the sites includes anions (sulfate, sulfide, nitrate, nitrite, and chloride), methane, ethane, ethene, carbon dioxide, total iron, dissolved iron (ferrous) conducted in the lab and in the field, dissolved manganese, total phosphorus, alkalinity, total organic and inorganic carbon as shown on **Table 1**. Some of these analyses are redundant or are not required for the evaluation of MNA at LHAAP sites.

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3.0 PROPOSED PATH FORWARD

The proposed path is to optimize the MNA analytical list so that it is consistent across all sites. The optimization of analytical list will make the sampling and evaluation more accurate and efficient. The optimization includes eliminating MNA parameters that are redundant or nonessential, including alkalinity, nitrite, sulfide, total inorganic carbon, total iron, the lab analysis for dissolved iron and dissolved manganese, and total phosphorous.

Rationale for eliminating these parameters is as follows:

- Alkalinity is used as an indicator of microbial growth, because it is affected by microbial respiration off gases like carbon dioxide. Since alkalinity is affected by carbon dioxide, which is currently being analyzed, it is recommended that alkalinity be removed from the analytical list.
- Nitrate and sulfate concentrations at LHAAP sites are below levels that may inhibit reductive dechlorination, and therefore the reduced states of these chemicals, nitrite and sulfide, are not expected to be observed, and are recommended to be removed from the analytical list. Nitrate and sulfate will remain on analytical list to evaluate increased levels that may inhibit biological reactions in the future.
- Total organic carbon is essential for the MNA analysis; however, total inorganic carbon does not provide useful data and is recommended to be removed from the analytical list.
- The analysis for ferrous iron is being conducted in the field during sample collection and provides the most representative data to determine if iron reducing conditions are present in the groundwater. Total iron analysis for groundwater includes both solid (ferric) and dissolved (ferrous) forms of iron and does not provide useful data in the evaluation of MNA. Therefore, it is recommended that the lab analysis for total iron, and dissolved iron be removed from the analytical list. The field analysis for ferrous iron will remain on the on the analytical list.
- Dissolved manganese is also used to evaluate the reduced state in groundwater, like dissolved iron. The dissolved manganese analysis is redundant, because field analysis for dissolved iron is being retained, and recommended be removed from the analytical list.
- Total phosphorus does not provide essential data the analysis of MNA and is recommended for removal from the analytical list.

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The proposed list of analysis which are consistent across each site include nitrate, sulfate, chloride, methane, ethane, ethene, carbon dioxide, total organic carbon, and field analyzed ferrous iron and is provided on **Table 2**.

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4.0 CONCLUSION

Currently, each of the sites where MNA and LUC are the selected remedy, there is a different list and some of the analyses are redundant or not useful. It is recommended that the following analyses are removed from the MNA parameter list for all sites: alkalinity, nitrite, sulfide, total inorganic carbon, total iron, lab analyzed ferrous iron, dissolved manganese, and total phosphorus. The updated list includes nitrate, sulfate, chloride, methane, ethane, ethene, carbon dioxide, total organic carbon, and field analyzed ferrous iron. The recommended list of parameters will remove redundancy and create more consistent evaluations of the MNA processes in the future.

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Tables

Table 1
MNA Parameter and LHAAP Site Comparison

	LHAAP-37			LHAAP-67			LHAAP-50			LHAAP-46			LHAAP-58		
MNA Parameter	RAWP	RACR	RA-O	RAWP	RACR	RA-O	RAWP	RACR	RA-O	RAWP	RACR	RA-O	RAWP	RACR	RA-O
Alkalinity							x	x	x	x	x	x	x	x	x
Nitrate	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Nitrite		x		x	x	x	x	x	x	x	x	x	x	x	x
Sulfate	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Sulfide		x				x	x	x	x	x	x	x	x	x	x
Chloride	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Methane	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Ethane	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Ethene	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Carbon Dioxide						x	x	x	x	x	x	x	x	x	x
Total Organic Carbon	x	x		x	x	x	x	x	x	x	x	x	x	x	x
Total Inorganic Carbon	x	x		x	x	x									
Iron (dissolved) -field	x	x		x	x	x									x
Iron (dissolved) -lab							x	x	x	x	x	x	x	x	x
Total Iron							x	x	x	x	x	x	x	x	x
Manganese (dissolved)							x	x	x	x	x	x	x	x	x
Total Iron							x	x	x	x	x	x	x	x	x
Total Phosphorous							x	x	x	x	x	x	x	x	x

Notes:

LHAAP-37 RA-O does not list MNA parameters because the Y1Q1 report has not been finalized.

LHAAP - Longhorn Army Ammunition Plant

MNA - monitored natural attenuation

RAWP - Remedial Action Work Plan

RACR - Remedial Action Completion Report

RA-O - Remedial Action Operation

Table 2
Proposed LHAAP MNA Parameters

MNA Parameter	LHAAP-37	LHAAP-67	LHAAP-50	LHAAP-46	LHAAP-58
Nitrate	X	X	X	X	X
Sulfate	X	X	X	X	X
Chloride	X	X	X	X	X
Methane	X	X	X	X	X
Ethane	X	X	X	X	X
Ethene	X	X	X	X	X
Carbon Dioxide	X	X	X	X	X
Total Organic Carbon	X	X	X	X	X
Iron (dissolved) -field	X	X	X	X	X

Notes:

MNA - monitored natural attenuation

LHAAP - Longhorn Army Ammunition Plant

APPENDIX E
LABORATORY ANALYTICAL RESULTS
(PROVIDED ON CD)

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QUARTERLY CONTROL SUMMARY REPORT
LHAAP-58 SEPTEMBER 2018
WEST PLUME QUARTERLY SAMPLING EVENT
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

October 2018

Prepared For:

Longhorn Army Ammunition Plant
Karnack, Texas

Under Contract To:

U.S. Army Corps of Engineers
Tulsa District
Tulsa, Oklahoma

Contract Number: W9128F-13-D-0012
Task Order Number: W912BV17F0150

Prepared By:

1608 13th Avenue South, Suite 300
Birmingham, Alabama 35205
1-800-806-4001 • www.bhate.com

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1 INTRODUCTION

Bhate reviewed two data packages from ALS Environmental, Houston, Texas with the analyses for ferrous iron and volatile fatty acids subcontracted to ALS Rochester, NY; the analyses of dissolved gases to ALS Simi Valley, CA; and the analyses of total organic carbon to ALS Kelso, WA. The dechlorinating bacteria analysis was subcontracted to Microbial Insights in Knoxville, TN. Groundwater samples were collected on September 26-27, 2018, from Site LHAAP-58 at the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. Data were reviewed for conformance to the requirements of the following guidance documents: [United States Environmental Protection Agency] *USEPA Contract Laboratory Program* [CLP] *National Functional Guidelines for Superfund Organic Methods Data Review* (USEPA, January 2017); *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (USEPA, January 2017); and the *Final Basewide Uniform Federal Policy (UFP) – Quality Assurance Project Plan (QAPP) Longhorn Army Ammunition Plant* (Bhate, May 2018).

1.1 Intended Use of Data

The objective of sampling at LHAAP-58 in September 2018 was to complete a western plume quarterly event.

Analyses performed include:

- SM2320B – Alkalinity
- E365.3 – Phosphorus
- RSK-175 – Dissolved Gases
- E415.1/SM5310C – Total Organic Carbon
- SW8260C - Volatile Organic Compounds (VOCs)
- SM3500Fe - Ferrous Iron
- SW6020A – Total and Dissolved Metals (Iron and Manganese)
- SW9056A – Anions (chloride, nitrate, nitrite, and sulfate)
- E376.1 – Sulfide
- High Performance Liquid Chromatography (HPLC)-METACIDS – Volatile Fatty Acids (VFAs)
- CENSUS – Dechlorinating Bacteria (dehalococcoides [DHC]/dehalobacter [DHB])

Table 1 lists the sample identification (ID) numbers and their associated laboratory package.

Table 2 lists qualified results with the qualification flag and reason code.

The following narrative is a brief synopsis of data that required qualification due to quality control discrepancies.

1.2 Preservation and Holding Times

Sample ID data were evaluated for agreement with the chain-of-custody (COC). All samples were received in appropriate containers, within the proper temperature range, in good condition, and within the required hold time with the following exception.

- The analysis for ferrous iron was outside the requisite 24-hour hold time and all results were qualified as estimated, "J".

1.3 Calibrations

All analytes reported must be present in the initial and continuing calibration. The calibrations must meet the acceptance criteria specified in Worksheet 24 (Analytical Instrument Calibration) of the QAPP. All results reported must be within the calibration range. Samples were diluted, if necessary, to bring analyte responses within the calibration range.

1.3.1 Continuing Calibration Verifications

The calibrations must meet the following criteria otherwise the compound is qualified as J or UJ: the continuing calibration verification (CCV) criteria are 20 percent difference (%D) for VOCs and 50% for closing CCVs. Metals and general chemistry - 10%D; VFAs, dissolved gases, and TOC - 15%D.

The CCV for all compounds were within control limits.

1.4 Blanks

If the analyte result for an associated sample was less than 5X (10X for common laboratory contaminants) the analyte concentration in the blank, that result was qualified "UB" and considered an artifact of blank contamination. Where the sample result for the affected analyte was non-detect or greater than 5X the amount in the blank, no qualifier was applied.

No compounds were qualified due to blank contamination.

1.5 Surrogates

Surrogates were evaluated using limits defined by each method in the project-specific QAPP Worksheet 28.

No surrogates were reported outside control limits.

1.6 Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD)

LCS/LCSD recoveries were evaluated using limits defined in the project-specific QAPP Worksheet 15.

1.6.1 VFAs

The LCS and LCSD recoveries of pyruvic acid (147%/148%) were above control limits. Only associated sample 35AWW06_092618 reported a detection and was qualified as estimated, "J".

1.7 Matrix Spike (MS)/Matrix Spike Duplicate Sample (MSD)

MS/MSD recoveries were evaluated using limits defined in Worksheet 15 of the project-specific QAPP. When sample results were greater than 4X the spike amount, control limits were not applicable and require no qualification. Furthermore, if a MS/MSD analyses was performed on a batched (unrelated) sample no qualification was made to the sample data.

1.7.1 SW8260

The MS and MSD recoveries for bromomethane were below control limits in the spike samples 35AWW24_092718 (30.4%/37.3%) and 35WW06_092618 (21.2%/28.8%). Bromomethane was qualified as estimated non-detected, "UJ". Chloroethane reported MS and MSD recoveries above control limits but required no qualification as the compound was not detected in the spike sample (35AWW06_092618).

1.7.2 SW6020

The MS and MSD recoveries for dissolved iron (42%/24.8%) and dissolved manganese (60.6%/57.3%) were below control limits in the spiked sample 35AWW24_092718. The MS and MSD recoveries for total iron (156%/161%) were above control limits in the above mentioned parent sample. These compounds were qualified as estimated, "J".

1.7.3 SW376.1

The MS recovery of sulfide (78.4%) was slightly below control limits in spike sample 35AWW06_092618. This compound was qualified as estimated, "J".

1.7.4 RSK-175

Methane (63%/28%), ethane (63%/66%), and ethane (60%/59%) all reported MS and MSD recoveries below control limits in spike sample 35AWW06_092618. These compounds were qualified estimated "J/UJ".

1.7.5 VFAs

The MS and MSD recoveries for pyruvic acid (139%/139%) were above control limits in spike sample 35AWW06_092618 and was qualified estimated "J".

1.8 Internal Standards

If the percent recovery (%R) for an internal standard in a sample is not within the limit, the associated sample is qualified for those analytes associated with the errant internal standard(s).

Internal standards were within acceptance criteria for the associated compounds.

1.9 Field Precision

Precision is the measure of variability of individual sample measurements. Evaluation of field duplicates for precision was done using the relative percent difference (RPD). The RPD is defined as the difference between two duplicate samples divided by the mean and expressed as a percent. Field duplicate RPD limits were set at <30% for groundwater matrices.

All detected compounds were within RPD control limits.

2 DATA USABILITY SUMMARY

The data are usable for the intended purposes of the project (see Table 3). The data quality objectives have been met for the project.

Table 1: Field Sample Identification and Laboratory Packages

Client Sample ID	Lab Package/ID	SM2320B	E365.3	E415.1/SM5310C	SW6020A	SW8260C	HPLC-METACIDS	SW9056A	RSK-175	SM3500Fe	E376.1	CENSUS
35AWW06_092618	HS18091438	X	X	X	X	X	X	X	X	X	X	X
35AWW11_092718	HS18091510	X	X	X	X	X	X	X	X	X	X	X
35AWW19_092718	HS18091510	X	X	X	X	X	X	X	X	X	X	X
35AWW20_092618	HS18091438	X	X	X	X	X	X	X	X	X	X	X
35AWW20_092618-a	HS18091438	X	X	X	X	X	X	X	X	X	X	X
35AWW24_092718	HS18091510	X	X	X	X	X	X	X	X	X	X	X
LHSMW07_092618	HS18091438	X	X	X	X	X	X	X	X	X	X	X

Notes:
MW – Monitoring Well
SM – Standard Method
SW-846 - Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.
E – USEPA Method
HS - Houston

Table 2: Qualified Analytical Data

Client Sample ID Laboratory	Laboratory Package	Analyte Name	Result and Qualifier	Reason for Qualification
35AWW06_092618	HS18091438	Ferrous Iron (mg/L) Bromomethane (µg/L) Sulfide (mg/L) Methane (µg/L) Ethane (µg/L) Ethene (µg/L) Pyruvic acid (mg/L)	27.8 J < 0.5 UJ 1.96 J 3.0 J < 0.47 UJ < 0.55 UJ 0.20 J	HT MS/MSD < MS < MS/MSD < MS/MSD < MS/MSD < MS/MSD >/LCS/LCSD >
35AWW11_092718	HS18091510	Ferrous Iron (mg/L)	36.5 J	HT
35AWW19_092718	HS18091510	Ferrous Iron (mg/L)	3.99 J	HT
35AWW20_092618	HS18091438	Ferrous Iron (mg/L)	1.38 J	HT
35AWW20_092618-a	HS18091438	Ferrous Iron (mg/L)	1.41 J	HT
35AWW24_092718	HS18091510	Ferrous Iron (mg/L) Bromomethane (µg/L) Dissolved Iron (mg/L) Dissolved Manganese (mg/L) Total Iron (mg/L)	0.31 J < 0.5 UJ 6.55 J 0.127 J 1.06 J	HT MS/MSD < MS/MSD < MS/MSD < MS/MSD >

Client Sample ID Laboratory	Laboratory Package	Analyte Name	Result and Qualifier	Reason for Qualification
LHSMW07_092618	HS18091438	Ferrous Iron (mg/L)	0.93 J	HT

Notes:
mg/L – milligrams per liter
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.
UJ – The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
MS/MSD >/<– Matrix spike/duplicate recoveries above/below control limits
LCS/LCSD > – Laboratory control sample/duplicate recoveries above control limits
HT – exceeded recommended hold time

Table 3: Completeness by Method

Method	No. of Rejected Results	% Completeness
SM2320B	0	100
E365.3	0	100
E415.1/SM5310C	0	100
SW6020A	0	100
SW8260C	0	100
HPLC-METACIDS	0	100
SW9056A	0	100
RSK-175	0	100
SM3500Fe	0	100
E376.1	0	100
CENSUS	0	100

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

October 12, 2018

Marcia Olive
Bhate Environmental Associates, Inc.
445 Union Blvd Ste 129
Lakewood, CO 80228

Work Order: **HS18091438**

Laboratory Results for: **LHAAP-58**

Dear Marcia,

ALS Environmental received 5 sample(s) on Sep 27, 2018 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: JUMOKE.LAWAL
RJ Modashia
Project Manager



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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Work Order: HS18091438

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18091438-01	35AWW06_092618	Groundwater		26-Sep-2018 09:20	27-Sep-2018 08:50	☐
HS18091438-02	35AWW20_092618	Groundwater		26-Sep-2018 11:15	27-Sep-2018 08:50	☐
HS18091438-03	35AWW20_092618_a	Groundwater		26-Sep-2018 11:15	27-Sep-2018 08:50	☐
HS18091438-04	LHSMW07_092618	Groundwater		26-Sep-2018 12:30	27-Sep-2018 08:50	☐
HS18091438-05	Trip Blank	Water	ALS 071918-82	26-Sep-2018 12:30	27-Sep-2018 08:50	☐

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc. **CASE NARRATIVE**
Project: LHAAP-58
Work Order: HS18091438

Work Order Comments

- The analyses for RSK-175 Dissolved Gases and CO2 were subcontracted to ALS Environmental in Simi Valley, CA. Final Report attached.

  The analyses for Ferrous Iron and Volatile Fatty Acids were subcontracted to ALS Environmental in Rochester, NY. Final Report attached.

  The analysis for TOC was subcontracted to ALS Environmental in Kelso, WA. Final Report attached.

  The analyses for DHC/DHB were subcontracted to Microbial Insights in Knoxville, TN. Final Report attached.

GCMS Volatiles by Method SW8260

Batch ID: R324990

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

Batch ID: R324965

Sample ID: 35AWW06_092618 (HS18091438-01MS)

- MS/MSD failed QC limits for Bromomethane , Chloroethane due to suspect matrix. effect

Sample ID: 35AWW06_092618 (HS18091438-01MSD)

- The RPD between the MS and MSD was outside of the control limit for Chloroethane

Metals by Method SW6020

Batch ID: 132985

Sample ID: 35AWW06_092618 (HS18091438-01MS)

- The MS and/or MSD recovery was outside of the control; however, the result in the parent sample is greater than 4x the spike amount. Manganese.

Sample ID: 35AWW06_092618 (HS18091438-01MSD)

- The MS and/or MSD recovery was outside of the control; however, the result in the parent sample is greater than 4x the spike amount. Iron.

Sample ID: 35AWW06_092618 (HS18091438-01PDS)

- The PDS recovery was outside method control limits, however the result in the parent sample is greater than 4x the spike amount. Manganese.

Batch ID: 132987

Sample ID: 35AWW06_092618 (HS18091438-01MS)

- The MS and/or MSD recovery was outside of the control; however, the result in the parent sample is greater than 4x the spike amount. Manganese.

Sample ID: 35AWW06_092618 (HS18091438-01PDS)

- The PDS recovery was outside method control limits, however the result in the parent sample is greater than 4x the spike amount. Manganese.

WetChemistry by Method E376.1

Batch ID: R324851

Sample ID: 35AWW06_092618 (HS18091438-01MS)

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Work Order: HS18091438

CASE NARRATIVE

WetChemistry by Method E376.1

Batch ID: R324851

- 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.

WetChemistry by Method SW9056

Batch ID: R324594

Sample ID: 35AWW06_092618 (HS18091438-01MS)

- 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)

Sample ID: HS18091510-01MS

- MS and MSD are for an unrelated sample (Chloride)

Batch ID: R324811

Sample ID: HS18100126-01MS

- MS and MSD are for an unrelated sample (Sulfate)

WetChemistry by Method SM2320B

Batch ID: R324424

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

WetChemistry by Method E365.3

Batch ID: 133178

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW06_092618
Collection Date: 26-Sep-2018 09:20

ANALYTICAL REPORT
WorkOrder:HS18091438
Lab ID:HS18091438-01
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:44
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
2-Butanone	**210**		**0.50**	**1.0**	**2.0**	**ug/L**	1	08-Oct-2018 14:44
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
2-Hexanone	**1.7**	J	**1.0**	**1.0**	**2.0**	**ug/L**	1	08-Oct-2018 14:44
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:44
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	08-Oct-2018 14:44
Acetone	**6,600**		**20**	**100**	**100**	**ug/L**	50	09-Oct-2018 02:35
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Carbon disulfide	**2.6**		**0.60**	**1.0**	**2.0**	**ug/L**	1	08-Oct-2018 14:44
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44

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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW06_092618
Collection Date: 26-Sep-2018 09:20

ANALYTICAL REPORT
WorkOrder:HS18091438
Lab ID:HS18091438-01
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	08-Oct-2018 14:44
Methylene chloride	0.50	U	0.40	0.50	2.0	ug/L	1	08-Oct-2018 14:44
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:44
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:44
Surr: 1,2-Dichloroethane-d4	*96.0*			**0**	*81-118*	*%REC*	*1*	*08-Oct-2018 14:44*
Surr: 1,2-Dichloroethane-d4	*93.8*			**0**	*81-118*	*%REC*	*50*	*09-Oct-2018 02:35*
Surr: 4-Bromofluorobenzene	*94.0*			**0**	*85-114*	*%REC*	*1*	*08-Oct-2018 14:44*
Surr: 4-Bromofluorobenzene	*99.5*			**0**	*85-114*	*%REC*	*50*	*09-Oct-2018 02:35*
Surr: Dibromofluoromethane	*92.3*			**0**	*80-119*	*%REC*	*1*	*08-Oct-2018 14:44*
Surr: Dibromofluoromethane	*94.8*			**0**	*80-119*	*%REC*	*50*	*09-Oct-2018 02:35*
Surr: Toluene-d8	*97.7*			**0**	*89-112*	*%REC*	*1*	*08-Oct-2018 14:44*
Surr: Toluene-d8	*92.6*			**0**	*89-112*	*%REC*	*50*	*09-Oct-2018 02:35*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 28-Sep-2018		Analyst: JDE
Iron	**27.9**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	04-Oct-2018 12:53
Manganese	**9.44**		**0.00700**	**0.0100**	**0.0500**	**mg/L**	10	04-Oct-2018 14:29
DISSOLVED METALS BY SW6020A		**Method:SW6020 (dissolved)**				Prep:SW3010A / 28-Sep-2018		Analyst: JDE
Iron	**26.5**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	04-Oct-2018 12:29
Manganese	**9.26**		**0.00700**	**0.0100**	**0.0500**	**mg/L**	10	04-Oct-2018 14:17

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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW06_092618
Collection Date: 26-Sep-2018 09:20

ANALYTICAL REPORT
WorkOrder:HS18091438
Lab ID:HS18091438-01
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
PHOSPHORUS BY E365.3		**Method:E365.3**				Prep:E365.3 / 04-Oct-2018		Analyst: MZD
Phosphorus, Total (As P)	**2.67**		**0.200**	**0.250**	**0.500**	**mg/L**	10	04-Oct-2018 14:35
SULFIDE BY E376.1		**Method:E376.1**						Analyst: KVL
Sulfide	**1.96**		**1.00**	**1.00**	**1.00**	**mg/L**	1	03-Oct-2018 11:45
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**775**		**5.00**	**5.00**	**5.00**	**mg/L**	1	29-Sep-2018 10:39
ANIONS BY SW9056A		**Method:SW9056**						Analyst: AJH
Chloride	**910**		**2.00**	**5.00**	**5.00**	**mg/L**	10	28-Sep-2018 04:24
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	28-Sep-2018 04:09
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	28-Sep-2018 04:09
Sulfate	**508**		**2.00**	**5.00**	**5.00**	**mg/L**	10	28-Sep-2018 04:24
SUBCONTRACT ANALYSIS - DHC/DHB		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	03-Oct-2018 15:10
SUBCONTRACT ANALYSIS - FERROUS IRON		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	04-Oct-2018 09:37
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	12-Oct-2018 09:58
SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51

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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc. **ANALYTICAL REPORT**
Project: LHAAP-58 WorkOrder:HS18091438
Sample ID: 35AWW20_092618 Lab ID:HS18091438-02
Collection Date: 26-Sep-2018 11:15 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,1,2-Trichloroethane	**48**		**0.30**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:10
1,1-Dichloroethane	**200**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:10
1,1-Dichloroethene	**1,100**		**2.0**	**5.0**	**10**	**ug/L**	10	08-Oct-2018 19:46
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,2-Dichlorobenzene	**10**		**0.50**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:10
1,2-Dichloroethane	**14**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:10
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:10
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:10
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	08-Oct-2018 15:10
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	08-Oct-2018 15:10
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:10
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	08-Oct-2018 15:10
Acetone	2.0	U	0.40	2.0	2.0	ug/L	1	09-Oct-2018 03:49
Benzene	**3.3**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:10
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	08-Oct-2018 15:10
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:10

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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW20_092618
Collection Date: 26-Sep-2018 11:15

ANALYTICAL REPORT
WorkOrder:HS18091438
Lab ID:HS18091438-02
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:10
cis-1,2-Dichloroethene	**45**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:10
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	08-Oct-2018 15:10
Methylene chloride	0.50	U	0.40	0.50	2.0	ug/L	1	08-Oct-2018 15:10
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:10
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Tetrachloroethene	**0.81**	J	**0.30**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:10
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:10
trans-1,2-Dichloroethene	**1.8**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:10
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Trichloroethene	**170**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:10
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:10
Surr: 1,2-Dichloroethane-d4	*93.2*			**0**	*81-118*	*%REC*	*1*	*08-Oct-2018 15:10*
Surr: 1,2-Dichloroethane-d4	*89.7*			**0**	*81-118*	*%REC*	*10*	*08-Oct-2018 19:46*
Surr: 1,2-Dichloroethane-d4	*96.1*			**0**	*81-118*	*%REC*	*1*	*09-Oct-2018 03:49*
Surr: 4-Bromofluorobenzene	*93.3*			**0**	*85-114*	*%REC*	*10*	*08-Oct-2018 19:46*
Surr: 4-Bromofluorobenzene	*94.8*			**0**	*85-114*	*%REC*	*1*	*08-Oct-2018 15:10*
Surr: 4-Bromofluorobenzene	*97.6*			**0**	*85-114*	*%REC*	*1*	*09-Oct-2018 03:49*
Surr: Dibromofluoromethane	*91.8*			**0**	*80-119*	*%REC*	*1*	*08-Oct-2018 15:10*
Surr: Dibromofluoromethane	*86.8*			**0**	*80-119*	*%REC*	*10*	*08-Oct-2018 19:46*
Surr: Dibromofluoromethane	*96.5*			**0**	*80-119*	*%REC*	*1*	*09-Oct-2018 03:49*
Surr: Toluene-d8	*107*			**0**	*89-112*	*%REC*	*10*	*08-Oct-2018 19:46*
Surr: Toluene-d8	*107*			**0**	*89-112*	*%REC*	*1*	*08-Oct-2018 15:10*
Surr: Toluene-d8	*92.5*			**0**	*89-112*	*%REC*	*1*	*09-Oct-2018 03:49*

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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW20_092618
Collection Date: 26-Sep-2018 11:15

ANALYTICAL REPORT
WorkOrder:HS18091438
Lab ID:HS18091438-02
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 28-Sep-2018		Analyst: JDE
Iron	**1.40**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	04-Oct-2018 13:03
Manganese	**6.23**		**0.00700**	**0.0100**	**0.0500**	**mg/L**	10	04-Oct-2018 14:39
DISSOLVED METALS BY SW6020A		**Method:SW6020 (dissolved)**				Prep:SW3010A / 28-Sep-2018		Analyst: JDE
Iron	**1.33**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	04-Oct-2018 12:39
Manganese	**6.00**		**0.00700**	**0.0100**	**0.0500**	**mg/L**	10	04-Oct-2018 14:23
PHOSPHORUS BY E365.3		**Method:E365.3**				Prep:E365.3 / 04-Oct-2018		Analyst: MZD
Phosphorus, Total (As P)	**0.144**		**0.0200**	**0.0250**	**0.0500**	**mg/L**	1	04-Oct-2018 14:35
SULFIDE BY E376.1		**Method:E376.1**						Analyst: KVL
Sulfide	**17.0**		**1.00**	**1.00**	**1.00**	**mg/L**	1	03-Oct-2018 11:45
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**1,450**		**5.00**	**5.00**	**5.00**	**mg/L**	1	29-Sep-2018 10:58
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Chloride	**1,220**		**4.00**	**10.0**	**10.0**	**mg/L**	20	04-Oct-2018 20:43
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	28-Sep-2018 06:20
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	28-Sep-2018 06:20
Sulfate	**922**		**2.00**	**5.00**	**5.00**	**mg/L**	10	28-Sep-2018 05:08
SUBCONTRACT ANALYSIS - DHC/DHB		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	03-Oct-2018 15:10
SUBCONTRACT ANALYSIS - FERROUS IRON		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	04-Oct-2018 09:37
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	12-Oct-2018 09:58
SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51

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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW20_092618_a
Collection Date: 26-Sep-2018 11:15

ANALYTICAL REPORT
WorkOrder:HS18091438
Lab ID:HS18091438-03
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,1,2-Trichloroethane	**44**		**0.30**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:35
1,1-Dichloroethane	**170**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:35
1,1-Dichloroethene	**970**		**2.0**	**5.0**	**10**	**ug/L**	10	08-Oct-2018 20:11
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,2-Dichlorobenzene	**9.3**		**0.50**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:35
1,2-Dichloroethane	**13**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:35
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:35
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:35
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	08-Oct-2018 15:35
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	08-Oct-2018 15:35
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:35
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	08-Oct-2018 15:35
Acetone	2.0	U	0.40	2.0	2.0	ug/L	1	09-Oct-2018 04:14
Benzene	**2.9**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:35
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	08-Oct-2018 15:35
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:35

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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW20_092618_a
Collection Date: 26-Sep-2018 11:15

ANALYTICAL REPORT
WorkOrder:HS18091438
Lab ID:HS18091438-03
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:35
cis-1,2-Dichloroethene	**40**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:35
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	08-Oct-2018 15:35
Methylene chloride	0.50	U	0.40	0.50	2.0	ug/L	1	08-Oct-2018 15:35
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 15:35
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Tetrachloroethene	**0.71**	J	**0.30**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:35
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:35
trans-1,2-Dichloroethene	**1.7**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:35
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Trichloroethene	**150**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 15:35
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 15:35
Surr: 1,2-Dichloroethane-d4	*93.6*			**0**	*81-118*	*%REC*	*1*	*08-Oct-2018 15:35*
Surr: 1,2-Dichloroethane-d4	*90.1*			**0**	*81-118*	*%REC*	*10*	*08-Oct-2018 20:11*
Surr: 1,2-Dichloroethane-d4	*97.8*			**0**	*81-118*	*%REC*	*1*	*09-Oct-2018 04:14*
Surr: 4-Bromofluorobenzene	*92.3*			**0**	*85-114*	*%REC*	*10*	*08-Oct-2018 20:11*
Surr: 4-Bromofluorobenzene	*93.2*			**0**	*85-114*	*%REC*	*1*	*08-Oct-2018 15:35*
Surr: 4-Bromofluorobenzene	*101*			**0**	*85-114*	*%REC*	*1*	*09-Oct-2018 04:14*
Surr: Dibromofluoromethane	*92.8*			**0**	*80-119*	*%REC*	*1*	*08-Oct-2018 15:35*
Surr: Dibromofluoromethane	*87.5*			**0**	*80-119*	*%REC*	*10*	*08-Oct-2018 20:11*
Surr: Dibromofluoromethane	*98.5*			**0**	*80-119*	*%REC*	*1*	*09-Oct-2018 04:14*
Surr: Toluene-d8	*107*			**0**	*89-112*	*%REC*	*1*	*08-Oct-2018 15:35*
Surr: Toluene-d8	*106*			**0**	*89-112*	*%REC*	*10*	*08-Oct-2018 20:11*
Surr: Toluene-d8	*92.9*			**0**	*89-112*	*%REC*	*1*	*09-Oct-2018 04:14*

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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW20_092618_a
Collection Date: 26-Sep-2018 11:15

ANALYTICAL REPORT
WorkOrder:HS18091438
Lab ID:HS18091438-03
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 28-Sep-2018		Analyst: JDE
Iron	**1.49**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	04-Oct-2018 13:05
Manganese	**6.15**		**0.00700**	**0.0100**	**0.0500**	**mg/L**	10	04-Oct-2018 14:41
DISSOLVED METALS BY SW6020A		**Method:SW6020 (dissolved)**				Prep:SW3010A / 28-Sep-2018		Analyst: JDE
Iron	**1.41**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	04-Oct-2018 12:41
Manganese	**6.26**		**0.00700**	**0.0100**	**0.0500**	**mg/L**	10	04-Oct-2018 14:25
PHOSPHORUS BY E365.3		**Method:E365.3**				Prep:E365.3 / 04-Oct-2018		Analyst: MZD
Phosphorus, Total (As P)	**0.192**		**0.0200**	**0.0250**	**0.0500**	**mg/L**	1	04-Oct-2018 14:35
SULFIDE BY E376.1		**Method:E376.1**						Analyst: KVL
Sulfide	**13.0**		**1.00**	**1.00**	**1.00**	**mg/L**	1	03-Oct-2018 11:45
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**1,470**		**5.00**	**5.00**	**5.00**	**mg/L**	1	29-Sep-2018 11:08
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Chloride	**1,220**		**4.00**	**10.0**	**10.0**	**mg/L**	20	04-Oct-2018 20:57
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	28-Sep-2018 06:35
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	28-Sep-2018 06:35
Sulfate	**894**		**2.00**	**5.00**	**5.00**	**mg/L**	10	28-Sep-2018 05:22
SUBCONTRACT ANALYSIS - DHC/DHB		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	03-Oct-2018 15:10
SUBCONTRACT ANALYSIS - FERROUS IRON		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	04-Oct-2018 09:37
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	12-Oct-2018 09:58
SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51

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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: LHSMW07_092618
Collection Date: 26-Sep-2018 12:30

ANALYTICAL REPORT
WorkOrder:HS18091438
Lab ID:HS18091438-04
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,1,2-Trichloroethane	**0.73**	J	**0.30**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 18:06
1,1-Dichloroethane	**11**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 18:06
1,1-Dichloroethene	**3.1**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 18:06
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,2-Dichloroethane	**0.92**	J	**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 18:06
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 18:06
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06
2-Butanone	**5.3**		**0.50**	**1.0**	**2.0**	**ug/L**	1	08-Oct-2018 18:06
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	08-Oct-2018 18:06
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 18:06
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	08-Oct-2018 18:06
Acetone	**12**		**0.40**	**2.0**	**2.0**	**ug/L**	1	09-Oct-2018 04:38
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	08-Oct-2018 18:06
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06

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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: LHSMW07_092618
Collection Date: 26-Sep-2018 12:30

ANALYTICAL REPORT
WorkOrder:HS18091438
Lab ID:HS18091438-04
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06
cis-1,2-Dichloroethene	**1.1**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 18:06
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	08-Oct-2018 18:06
Methylene chloride	0.50	U	0.40	0.50	2.0	ug/L	1	08-Oct-2018 18:06
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 18:06
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Trichloroethene	**2.4**		**0.20**	**0.50**	**1.0**	**ug/L**	1	08-Oct-2018 18:06
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 18:06
Surr: 1,2-Dichloroethane-d4	*88.7*			**0**	*81-118*	*%REC*	*1*	*08-Oct-2018 18:06*
Surr: 1,2-Dichloroethane-d4	*98.1*			**0**	*81-118*	*%REC*	*1*	*09-Oct-2018 04:38*
Surr: 4-Bromofluorobenzene	*92.8*			**0**	*85-114*	*%REC*	*1*	*08-Oct-2018 18:06*
Surr: 4-Bromofluorobenzene	*99.8*			**0**	*85-114*	*%REC*	*1*	*09-Oct-2018 04:38*
Surr: Dibromofluoromethane	*89.7*			**0**	*80-119*	*%REC*	*1*	*08-Oct-2018 18:06*
Surr: Dibromofluoromethane	*99.6*			**0**	*80-119*	*%REC*	*1*	*09-Oct-2018 04:38*
Surr: Toluene-d8	*107*			**0**	*89-112*	*%REC*	*1*	*08-Oct-2018 18:06*
Surr: Toluene-d8	*93.1*			**0**	*89-112*	*%REC*	*1*	*09-Oct-2018 04:38*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 28-Sep-2018		Analyst: JDE
Iron	**1.78**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	04-Oct-2018 13:07
Manganese	**9.50**		**0.00700**	**0.0100**	**0.0500**	**mg/L**	10	04-Oct-2018 14:43
DISSOLVED METALS BY SW6020A		**Method:SW6020 (dissolved)**				Prep:SW3010A / 28-Sep-2018		Analyst: JDE
Iron	**1.85**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	04-Oct-2018 12:43
Manganese	**9.56**		**0.00700**	**0.0100**	**0.0500**	**mg/L**	10	04-Oct-2018 14:27

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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: LHSMW07_092618
Collection Date: 26-Sep-2018 12:30

ANALYTICAL REPORT
WorkOrder:HS18091438
Lab ID:HS18091438-04
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
PHOSPHORUS BY E365.3		**Method:E365.3**				Prep:E365.3 / 04-Oct-2018		Analyst: MZD
Phosphorus, Total (As P)	**0.331**		**0.0200**	**0.0250**	**0.0500**	**mg/L**	1	04-Oct-2018 14:35
SULFIDE BY E376.1		**Method:E376.1**						Analyst: KVL
Sulfide	**26.0**		**1.00**	**1.00**	**1.00**	**mg/L**	1	03-Oct-2018 11:45
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**2,060**		**5.00**	**5.00**	**5.00**	**mg/L**	1	29-Sep-2018 11:21
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Chloride	**2,180**		**10.0**	**25.0**	**25.0**	**mg/L**	50	04-Oct-2018 21:12
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	28-Sep-2018 07:04
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	28-Sep-2018 07:04
Sulfate	**1,120**		**10.0**	**25.0**	**25.0**	**mg/L**	50	04-Oct-2018 21:12
SUBCONTRACT ANALYSIS - DHC/DHB		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	03-Oct-2018 15:10
SUBCONTRACT ANALYSIS - FERROUS IRON		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	04-Oct-2018 09:37
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	12-Oct-2018 09:58
SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51

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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: Trip Blank
Collection Date: 26-Sep-2018 12:30

ANALYTICAL REPORT
WorkOrder:HS18091438
Lab ID:HS18091438-05
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:19
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	08-Oct-2018 14:19
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	08-Oct-2018 14:19
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:19
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	08-Oct-2018 14:19
Acetone	2.0	U	0.40	2.0	2.0	ug/L	1	09-Oct-2018 02:08
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	08-Oct-2018 14:19
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19

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

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: Trip Blank
Collection Date: 26-Sep-2018 12:30

ANALYTICAL REPORT
WorkOrder:HS18091438
Lab ID:HS18091438-05
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	08-Oct-2018 14:19
Methylene chloride	0.50	U	0.40	0.50	2.0	ug/L	1	08-Oct-2018 14:19
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	08-Oct-2018 14:19
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	08-Oct-2018 14:19
Surr: 1,2-Dichloroethane-d4	*95.7*			**0**	*81-118*	*%REC*	*1*	*08-Oct-2018 14:19*
Surr: 1,2-Dichloroethane-d4	*96.3*			**0**	*81-118*	*%REC*	*1*	*09-Oct-2018 02:08*
Surr: 4-Bromofluorobenzene	*93.9*			**0**	*85-114*	*%REC*	*1*	*08-Oct-2018 14:19*
Surr: 4-Bromofluorobenzene	*99.6*			**0**	*85-114*	*%REC*	*1*	*09-Oct-2018 02:08*
Surr: Dibromofluoromethane	*89.0*			**0**	*80-119*	*%REC*	*1*	*08-Oct-2018 14:19*
Surr: Dibromofluoromethane	*98.5*			**0**	*80-119*	*%REC*	*1*	*09-Oct-2018 02:08*
Surr: Toluene-d8	*108*			**0**	*89-112*	*%REC*	*1*	*08-Oct-2018 14:19*
Surr: Toluene-d8	*92.7*			**0**	*89-112*	*%REC*	*1*	*09-Oct-2018 02:08*

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

WEIGHT LOG

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

Batch ID: 132985 **Method:** ICP-MS METALS BY SW6020A **Prep:** 3010A

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18091438-01	1	10	10 (mL)	1
HS18091438-02	1	10	10 (mL)	1
HS18091438-03	1	10	10 (mL)	1
HS18091438-04	1	10	10 (mL)	1

Batch ID: 132987 **Method:** DISSOLVED METALS BY SW6020A **Prep:** 3010A DISS

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18091438-01	1	10	10 (mL)	1
HS18091438-02	1	10	10 (mL)	1
HS18091438-03	1	10	10 (mL)	1
HS18091438-04	1	10	10 (mL)	1

Batch ID: 133178 **Method:** PHOSPHORUS BY E365.3 **Prep:** P_TW_PR

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18091438-01	1	50	50 (mL)	1
HS18091438-02	1	50	50 (mL)	1
HS18091438-03	1	50	50 (mL)	1
HS18091438-04	1	50	50 (mL)	1

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID 132985	**Test Name :** ICP-MS METALS BY SW6020A			**Matrix:** Groundwater		
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20		28 Sep 2018 14:00	04 Oct 2018 14:29	10
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20		28 Sep 2018 14:00	04 Oct 2018 12:53	1
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15		28 Sep 2018 14:00	04 Oct 2018 14:39	10
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15		28 Sep 2018 14:00	04 Oct 2018 13:03	1
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15		28 Sep 2018 14:00	04 Oct 2018 14:41	10
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15		28 Sep 2018 14:00	04 Oct 2018 13:05	1
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30		28 Sep 2018 14:00	04 Oct 2018 14:43	10
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30		28 Sep 2018 14:00	04 Oct 2018 13:07	1
Batch ID 132987	**Test Name :** DISSOLVED METALS BY SW6020A			**Matrix:** Groundwater		
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20		28 Sep 2018 13:00	04 Oct 2018 14:17	10
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20		28 Sep 2018 13:00	04 Oct 2018 12:29	1
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15		28 Sep 2018 13:00	04 Oct 2018 14:23	10
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15		28 Sep 2018 13:00	04 Oct 2018 12:39	1
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15		28 Sep 2018 13:00	04 Oct 2018 14:25	10
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15		28 Sep 2018 13:00	04 Oct 2018 12:41	1
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30		28 Sep 2018 13:00	04 Oct 2018 14:27	10
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30		28 Sep 2018 13:00	04 Oct 2018 12:43	1
Batch ID 133178	**Test Name :** PHOSPHORUS BY E365.3			**Matrix:** Groundwater		
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20		04 Oct 2018 09:30	04 Oct 2018 14:35	10
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15		04 Oct 2018 09:30	04 Oct 2018 14:35	1
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15		04 Oct 2018 09:30	04 Oct 2018 14:35	1
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30		04 Oct 2018 09:30	04 Oct 2018 14:35	1
Batch ID R324424	**Test Name :** ALKALINITY BY SM2320B			**Matrix:** Groundwater		
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20			29 Sep 2018 10:39	1
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15			29 Sep 2018 10:58	1
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15			29 Sep 2018 11:08	1
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30			29 Sep 2018 11:21	1
Batch ID R324594	**Test Name :** ANIONS BY SW9056A			**Matrix:** Groundwater		
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20			28 Sep 2018 04:24	10
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20			28 Sep 2018 04:09	2
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15			28 Sep 2018 06:20	2
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15			28 Sep 2018 05:08	10
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15			28 Sep 2018 06:35	2
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15			28 Sep 2018 05:22	10
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30			28 Sep 2018 07:04	2

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58 **DATES REPORT**
WorkOrder: HS18091438

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID R324652	**Test Name :** SUBCONTRACT ANALYSIS - DHC/DHB				**Matrix:** Groundwater	
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20			03 Oct 2018 15:10	1
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15			03 Oct 2018 15:10	1
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15			03 Oct 2018 15:10	1
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30			03 Oct 2018 15:10	1
Batch ID R324680	**Test Name :** SUBCONTRACT ANALYSIS - RSK				**Matrix:** Groundwater	
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20			04 Oct 2018 09:37	1
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15			04 Oct 2018 09:37	1
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15			04 Oct 2018 09:37	1
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30			04 Oct 2018 09:37	1
Batch ID R324811	**Test Name :** ANIONS BY SW9056A				**Matrix:** Groundwater	
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15			04 Oct 2018 20:43	20
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15			04 Oct 2018 20:57	20
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30			04 Oct 2018 21:12	50
Batch ID R324851	**Test Name :** SULFIDE BY E376.1				**Matrix:** Groundwater	
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20			03 Oct 2018 11:45	1
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15			03 Oct 2018 11:45	1
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15			03 Oct 2018 11:45	1
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30			03 Oct 2018 11:45	1
Batch ID R324965	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C				**Matrix:** Water	
HS18091438-05	Trip Blank	26 Sep 2018 12:30			08 Oct 2018 14:19	1
Batch ID R324965	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C				**Matrix:** Groundwater	
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20			08 Oct 2018 14:44	1
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15			08 Oct 2018 19:46	10
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15			08 Oct 2018 15:10	1
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15			08 Oct 2018 20:11	10
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15			08 Oct 2018 15:35	1
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30			08 Oct 2018 18:06	1
Batch ID R324990	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C				**Matrix:** Water	
HS18091438-05	Trip Blank	26 Sep 2018 12:30			09 Oct 2018 02:08	1
Batch ID R324990	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C				**Matrix:** Groundwater	
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20			09 Oct 2018 02:35	50
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15			09 Oct 2018 03:49	1
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15			09 Oct 2018 04:14	1
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30			09 Oct 2018 04:38	1

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID R325206	**Test Name :** SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS				**Matrix:** Groundwater	
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20			11 Oct 2018 12:51	1
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20			11 Oct 2018 12:51	1
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15			11 Oct 2018 12:51	1
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15			11 Oct 2018 12:51	1
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15			11 Oct 2018 12:51	1
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15			11 Oct 2018 12:51	1
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30			11 Oct 2018 12:51	1
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30			11 Oct 2018 12:51	1
Batch ID R325282	**Test Name :** SUBCONTRACT ANALYSIS - TOC ANALYSIS				**Matrix:** Groundwater	
HS18091438-01	35AWW06_092618	26 Sep 2018 09:20			12 Oct 2018 09:58	1
HS18091438-02	35AWW20_092618	26 Sep 2018 11:15			12 Oct 2018 09:58	1
HS18091438-03	35AWW20_092618_a	26 Sep 2018 11:15			12 Oct 2018 09:58	1
HS18091438-04	LHSMW07_092618	26 Sep 2018 12:30			12 Oct 2018 09:58	1

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: 132985 **Instrument: ICPMS05** **Method: SW6020**

MBLK Sample ID: **MBLK-132985** Units: **mg/L** Analysis Date: **04-Oct-2018 12:50**
Client ID: Run ID: **ICPMS05_324696** SeqNo: **4754447** PrepDate: **28-Sep-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	0.100	0.200								U
Manganese	0.002139	0.00500								J

LCS Sample ID: **LCS-132985** Units: **mg/L** Analysis Date: **04-Oct-2018 12:52**
Client ID: Run ID: **ICPMS05_324696** SeqNo: **4754448** PrepDate: **28-Sep-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	5.021	0.200	5	0	100	80 - 120				
Manganese	0.049	0.00500	0.05	0	98.0	80 - 120				

MS Sample ID: **HS18091438-01MS** Units: **mg/L** Analysis Date: **04-Oct-2018 12:57**
Client ID: **35AWW06_092618** Run ID: **ICPMS05_324696** SeqNo: **4754451** PrepDate: **28-Sep-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	32.15	0.200	5	27.87	85.7	80 - 120				O
Manganese	9.47	0.00500	0.05	9.533	-127	80 - 120				SEO

MSD Sample ID: **HS18091438-01MSD** Units: **mg/L** Analysis Date: **04-Oct-2018 12:59**
Client ID: **35AWW06_092618** Run ID: **ICPMS05_324696** SeqNo: **4754452** PrepDate: **28-Sep-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	31.84	0.200	5	27.87	79.4	80 - 120	32.15	0.976	20	SO
Manganese	9.401	0.00500	0.05	9.533	-265	80 - 120	9.47	0.735	20	SEO

PDS Sample ID: **HS18091438-01PDS** Units: **mg/L** Analysis Date: **04-Oct-2018 13:01**
Client ID: **35AWW06_092618** Run ID: **ICPMS05_324696** SeqNo: **4754453** PrepDate: **28-Sep-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	37.57	0.200	10	27.87	97.1	75 - 125				

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: 132985 **Instrument: ICPMS05** **Method: SW6020**

PDS Sample ID: **HS18091438-01PDS** Units: **mg/L** Analysis Date: **04-Oct-2018 14:33**
Client ID: **35AWW06_092618** Run ID: **ICPMS05_324696** SeqNo: **4754492** PrepDate: **28-Sep-2018** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Manganese	9.523	0.0500	1	9.436	8.72	75 - 125				SO

SD Sample ID: **HS18091438-01SD** Units: **mg/L** Analysis Date: **04-Oct-2018 12:55**
Client ID: **35AWW06_092618** Run ID: **ICPMS05_324696** SeqNo: **4754450** PrepDate: **28-Sep-2018** DF: **5**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Iron	28.2	1.00					27.87	1.2	10	

SD Sample ID: **HS18091438-01SD** Units: **mg/L** Analysis Date: **04-Oct-2018 14:31**
Client ID: **35AWW06_092618** Run ID: **ICPMS05_324696** SeqNo: **4754491** PrepDate: **28-Sep-2018** DF: **50**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Manganese	8.687	0.250					9.436	7.94	10	

The following samples were analyzed in this batch: HS18091438-01 HS18091438-02 HS18091438-03 HS18091438-04

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: 132987 **Instrument: ICPMS05** **Method: SW6020 (dissolved) (DISSOLVED)**

MBLK Sample ID: **MBLK-132987** Units: **mg/L** Analysis Date: **04-Oct-2018 12:25**
Client ID: Run ID: **ICPMS05_324696** SeqNo: **4754435** PrepDate: **28-Sep-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	0.100	0.200								U
Manganese	0.002007	0.00500								J

LCS Sample ID: **LCS-132987** Units: **mg/L** Analysis Date: **04-Oct-2018 12:27**
Client ID: Run ID: **ICPMS05_324696** SeqNo: **4754436** PrepDate: **28-Sep-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	5.12	0.200	5	0	102	80 - 120				
Manganese	0.0504	0.00500	0.05	0	101	80 - 120				

MS Sample ID: **HS18091438-01MS** Units: **mg/L** Analysis Date: **04-Oct-2018 12:33**
Client ID: **35AWW06_092618** Run ID: **ICPMS05_324696** SeqNo: **4754439** PrepDate: **28-Sep-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	32.5	0.200	5	26.51	120	75 - 125				O
Manganese	9.976	0.00500	0.05	9.696	561	75 - 125				SEO

MSD Sample ID: **HS18091438-01MSD** Units: **mg/L** Analysis Date: **04-Oct-2018 12:35**
Client ID: **35AWW06_092618** Run ID: **ICPMS05_324696** SeqNo: **4754440** PrepDate: **28-Sep-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	32.38	0.200	5	26.51	117	75 - 125	32.5	0.363	20	O
Manganese	9.971	0.00500	0.05	9.696	550	75 - 125	9.976	0.0521	20	SEO

PDS Sample ID: **HS18091438-01PDS** Units: **mg/L** Analysis Date: **04-Oct-2018 12:37**
Client ID: **35AWW06_092618** Run ID: **ICPMS05_324696** SeqNo: **4754441** PrepDate: **28-Sep-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	37.18	0.200	10	26.51	107	75 - 125				

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: 132987 **Instrument: ICPMS05** **Method: SW6020 (dissolved) (DISSOLVED)**

PDS Sample ID: **HS18091438-01PDS** Units: **mg/L** Analysis Date: **04-Oct-2018 14:21**
Client ID: **35AWW06_092618** Run ID: **ICPMS05_324696** SeqNo: **4754486** PrepDate: **28-Sep-2018** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Manganese	9.865	0.0500	1	9.257	60.8	75 - 125				SO

SD Sample ID: **HS18091438-01SD** Units: **mg/L** Analysis Date: **04-Oct-2018 12:31**
Client ID: **35AWW06_092618** Run ID: **ICPMS05_324696** SeqNo: **4754438** PrepDate: **28-Sep-2018** DF: **5**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Iron	27.36	1.00					26.51	3.22	10	

SD Sample ID: **HS18091438-01SD** Units: **mg/L** Analysis Date: **04-Oct-2018 14:19**
Client ID: **35AWW06_092618** Run ID: **ICPMS05_324696** SeqNo: **4754485** PrepDate: **28-Sep-2018** DF: **50**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Manganese	8.988	0.250					9.257	2.9	10	

The following samples were analyzed in this batch: HS18091438-01 HS18091438-02 HS18091438-03 HS18091438-04

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324965 **Instrument: VOA9** **Method: SW8260**

MBLK Sample ID: **VBLKW-181008** Units: **ug/L** Analysis Date: **08-Oct-2018 13:54**
Client ID: Run ID: **VOA9_324965** SeqNo: **4762554** 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-Trichloroethane	0.50	1.0								U
1,1-Dichloroethane	0.50	1.0								U
1,1-Dichloroethene	0.50	1.0								U
1,1-Dichloropropene	0.50	1.0								U
1,2,3-Trichlorobenzene	0.50	1.0								U
1,2,3-Trichloropropane	0.50	1.0								U
1,2,4-Trichlorobenzene	0.50	1.0								U
1,2,4-Trimethylbenzene	0.50	1.0								U
1,2-Dibromo-3-chloropropane	0.50	1.0								U
1,2-Dibromoethane	0.50	1.0								U
1,2-Dichlorobenzene	0.50	1.0								U
1,2-Dichloroethane	0.50	1.0								U
1,2-Dichloropropane	0.50	1.0								U
1,3,5-Trimethylbenzene	0.50	1.0								U
1,3-Dichlorobenzene	0.50	1.0								U
1,3-Dichloropropane	0.50	1.0								U
1,4-Dichlorobenzene	0.50	1.0								U
2,2-Dichloropropane	0.50	1.0								U
2-Butanone	1.0	2.0								U
2-Chlorotoluene	0.50	1.0								U
2-Hexanone	1.0	2.0								U
4-Chlorotoluene	0.50	1.0								U
4-Isopropyltoluene	0.50	1.0								U
4-Methyl-2-pentanone	1.0	2.0								U
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
Bromomethane	0.50	1.0								U
Carbon disulfide	1.0	2.0								U

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324965 **Instrument: VOA9** **Method: SW8260**

MBLK Sample ID: **VBLKW-181008** Units: **ug/L** Analysis Date: **08-Oct-2018 13:54**
Client ID: Run ID: **VOA9_324965** SeqNo: **4762554** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
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	0.50	1.0								U
Isopropylbenzene	0.50	1.0								U
m,p-Xylene	1.0	2.0								U
Methylene chloride	0.50	2.0								U
Naphthalene	0.50	1.0								U
n-Butylbenzene	0.50	1.0								U
n-Propylbenzene	0.50	1.0								U
o-Xylene	0.50	1.0								U
sec-Butylbenzene	0.50	1.0								U
Styrene	0.50	1.0								U
tert-Butylbenzene	0.50	1.0								U
Tetrachloroethene	0.50	1.0								U
Toluene	0.50	1.0								U
trans-1,2-Dichloroethene	0.50	1.0								U
trans-1,3-Dichloropropene	0.50	1.0								U
Trichloroethene	0.50	1.0								U
Trichlorofluoromethane	0.50	1.0								U
Vinyl chloride	0.50	1.0								U
Surr: 1,2-Dichloroethane-d4	*47.98*	*1.0*	*50*	*0*	*96.0*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*46.78*	*1.0*	*50*	*0*	*93.6*	*85 - 114*				
Surr: Dibromofluoromethane	*44.64*	*1.0*	*50*	*0*	*89.3*	*80 - 119*				
Surr: Toluene-d8	*54.2*	*1.0*	*50*	*0*	*108*	*89 - 112*				

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324965 **Instrument: VOA9** **Method: SW8260**

LCS Sample ID: **VLCSW-181008** Units: **ug/L** Analysis Date: **08-Oct-2018 13:04**
Client ID: Run ID: **VOA9_324965** SeqNo: **4762553** 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	19.03	1.0	20	0	95.1	78 - 124				
1,1,1-Trichloroethane	17.09	1.0	20	0	85.4	74 - 131				
1,1,2,2-Tetrachloroethane	21.06	1.0	20	0	105	71 - 121				
1,1,2-Trichloroethane	20.65	1.0	20	0	103	80 - 119				
1,1-Dichloroethane	19.24	1.0	20	0	96.2	77 - 125				
1,1-Dichloroethene	18.85	1.0	20	0	94.3	71 - 131				
1,1-Dichloropropene	19.88	1.0	20	0	99.4	78 - 125				
1,2,3-Trichlorobenzene	20.49	1.0	20	0	102	69 - 129				
1,2,3-Trichloropropane	19.62	1.0	20	0	98.1	73 - 122				
1,2,4-Trichlorobenzene	20.21	1.0	20	0	101	69 - 130				
1,2,4-Trimethylbenzene	19.96	1.0	20	0	99.8	76 - 124				
1,2-Dibromo-3-chloropropane	16.99	1.0	20	0	85.0	62 - 128				
1,2-Dibromoethane	19.9	1.0	20	0	99.5	77 - 121				
1,2-Dichlorobenzene	20.65	1.0	20	0	103	80 - 119				
1,2-Dichloroethane	20.12	1.0	20	0	101	73 - 128				
1,2-Dichloropropane	20.64	1.0	20	0	103	78 - 122				
1,3,5-Trimethylbenzene	19.81	1.0	20	0	99.0	75 - 124				
1,3-Dichlorobenzene	20.74	1.0	20	0	104	80 - 119				
1,3-Dichloropropane	20.6	1.0	20	0	103	80 - 119				
1,4-Dichlorobenzene	20.83	1.0	20	0	104	79 - 118				
2,2-Dichloropropane	18.03	1.0	20	0	90.1	60 - 139				
2-Butanone	40.96	2.0	40	0	102	56 - 143				
2-Chlorotoluene	20.25	1.0	20	0	101	79 - 122				
2-Hexanone	40.72	2.0	40	0	102	57 - 139				
4-Chlorotoluene	20.45	1.0	20	0	102	78 - 122				
4-Isopropyltoluene	20.03	1.0	20	0	100	77 - 127				
4-Methyl-2-pentanone	39.98	2.0	40	0	100.0	67 - 130				
Benzene	20.76	1.0	20	0	104	79 - 120				
Bromobenzene	19.19	1.0	20	0	95.9	80 - 120				
Bromochloromethane	19.95	1.0	20	0	99.8	78 - 123				
Bromodichloromethane	18.4	1.0	20	0	92.0	79 - 125				
Bromoform	15.98	1.0	20	0	79.9	66 - 130				
Bromomethane	18.48	1.0	20	0	92.4	53 - 141				
Carbon disulfide	48.72	2.0	40	0	122	64 - 133				

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324965 **Instrument: VOA9** **Method: SW8260**

LCS Sample ID: **VLCSW-181008** Units: **ug/L** Analysis Date: **08-Oct-2018 13:04**
Client ID: Run ID: **VOA9_324965** SeqNo: **4762553** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
Carbon tetrachloride	18.12	1.0	20	0	90.6	72 - 136				
Chlorobenzene	19.97	1.0	20	0	99.8	82 - 118				
Chloroethane	21.15	1.0	20	0	106	60 - 138				
Chloroform	18.85	1.0	20	0	94.3	79 - 124				
Chloromethane	19.67	1.0	20	0	98.3	50 - 139				
cis-1,2-Dichloroethene	18.54	1.0	20	0	92.7	78 - 123				
cis-1,3-Dichloropropene	18.57	1.0	20	0	92.8	75 - 124				
Dibromochloromethane	18.45	1.0	20	0	92.3	74 - 126				
Dibromomethane	19.43	1.0	20	0	97.1	79 - 123				
Dichlorodifluoromethane	22.85	1.0	20	0	114	32 - 152				
Ethylbenzene	19.12	1.0	20	0	95.6	79 - 121				
Hexachlorobutadiene	22.21	1.0	20	0	111	66 - 134				
Isopropylbenzene	19.46	1.0	20	0	97.3	72 - 131				
m,p-Xylene	39	2.0	40	0	97.5	80 - 121				
Methylene chloride	20.81	2.0	20	0	104	74 - 124				
Naphthalene	19.45	1.0	20	0	97.2	61 - 128				
n-Butylbenzene	20.58	1.0	20	0	103	75 - 128				
n-Propylbenzene	20.26	1.0	20	0	101	76 - 126				
o-Xylene	19.35	1.0	20	0	96.7	78 - 122				
sec-Butylbenzene	20	1.0	20	0	100	77 - 126				
Styrene	19.93	1.0	20	0	99.6	78 - 123				
tert-Butylbenzene	20.77	1.0	20	0	104	78 - 124				
Tetrachloroethene	19.2	1.0	20	0	96.0	74 - 129				
Toluene	20.68	1.0	20	0	103	80 - 121				
trans-1,2-Dichloroethene	19.24	1.0	20	0	96.2	75 - 124				
trans-1,3-Dichloropropene	18.29	1.0	20	0	91.4	73 - 127				
Trichloroethene	18.92	1.0	20	0	94.6	79 - 123				
Trichlorofluoromethane	18.51	1.0	20	0	92.6	65 - 141				
Vinyl chloride	20.07	1.0	20	0	100	58 - 137				
Surr: 1,2-Dichloroethane-d4	*46.23*	*1.0*	*50*	*0*	*92.5*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*49.65*	*1.0*	*50*	*0*	*99.3*	*85 - 114*				
Surr: Dibromofluoromethane	*46.69*	*1.0*	*50*	*0*	*93.4*	*80 - 119*				
Surr: Toluene-d8	*53.96*	*1.0*	*50*	*0*	*108*	*89 - 112*				

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324965 **Instrument: VOA9** **Method: SW8260**

MS Sample ID: **HS18091438-01MS** Units: **ug/L** Analysis Date: **08-Oct-2018 16:25**
Client ID: **35AWW06_092618** Run ID: **VOA9_324965** SeqNo: **4762559** 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	20.21	1.0	20	0	101	78 - 124				
1,1,1-Trichloroethane	17.01	1.0	20	0	85.1	74 - 131				
1,1,2,2-Tetrachloroethane	21.49	1.0	20	0	107	71 - 121				
1,1,2-Trichloroethane	19.4	1.0	20	0	97.0	80 - 119				
1,1-Dichloroethane	19.1	1.0	20	0	95.5	77 - 125				
1,1-Dichloroethene	20.51	1.0	20	0	103	71 - 131				
1,1-Dichloropropene	19.67	1.0	20	0	98.3	78 - 125				
1,2,3-Trichlorobenzene	17.67	1.0	20	0	88.3	69 - 129				
1,2,3-Trichloropropane	20.24	1.0	20	0	101	73 - 122				
1,2,4-Trichlorobenzene	17.35	1.0	20	0	86.7	69 - 130				
1,2,4-Trimethylbenzene	19.39	1.0	20	0	97.0	76 - 124				
1,2-Dibromo-3-chloropropane	19.61	1.0	20	0	98.0	62 - 128				
1,2-Dibromoethane	19.77	1.0	20	0	98.8	77 - 121				
1,2-Dichlorobenzene	20.1	1.0	20	0	100	80 - 119				
1,2-Dichloroethane	20.85	1.0	20	0	104	73 - 128				
1,2-Dichloropropane	21.59	1.0	20	0	108	78 - 122				
1,3,5-Trimethylbenzene	18.31	1.0	20	0	91.5	75 - 124				
1,3-Dichlorobenzene	20.06	1.0	20	0	100	80 - 119				
1,3-Dichloropropane	19.59	1.0	20	0	97.9	80 - 119				
1,4-Dichlorobenzene	20.17	1.0	20	0	101	79 - 118				
2,2-Dichloropropane	16.82	1.0	20	0	84.1	60 - 139				
2-Butanone	241.1	2.0	40	210.6	76.1	56 - 143				O
2-Chlorotoluene	19.58	1.0	20	0	97.9	79 - 122				
2-Hexanone	41.1	2.0	40	1.745	98.4	57 - 139				
4-Chlorotoluene	19.72	1.0	20	0	98.6	78 - 122				
4-Isopropyltoluene	17.51	1.0	20	0	87.5	77 - 127				
4-Methyl-2-pentanone	37.97	2.0	40	0	94.9	67 - 130				
Benzene	21.27	1.0	20	0	106	79 - 120				
Bromobenzene	19.27	1.0	20	0	96.3	80 - 120				
Bromochloromethane	17.71	1.0	20	0	88.5	78 - 123				
Bromodichloromethane	19.07	1.0	20	0	95.3	79 - 125				
Bromoform	16.6	1.0	20	0	83.0	66 - 130				
Bromomethane	4.24	1.0	20	0	21.2	53 - 141				S
Carbon disulfide	42.59	2.0	40	2.559	100	64 - 133				

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324965 **Instrument: VOA9** **Method: SW8260**

MS Sample ID: **HS18091438-01MS** Units: **ug/L** Analysis Date: **08-Oct-2018 16:25**
Client ID: **35AWW06_092618** Run ID: **VOA9_324965** SeqNo: **4762559** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Carbon tetrachloride	18.37	1.0	20	0	91.8	72 - 136				
Chlorobenzene	20.46	1.0	20	0	102	82 - 118				
Chloroethane	99.92	1.0	20	0	500	60 - 138				S
Chloroform	18.91	1.0	20	0	94.5	79 - 124				
Chloromethane	14.71	1.0	20	0	73.6	50 - 139				
cis-1,2-Dichloroethene	18.83	1.0	20	0	94.1	78 - 123				
cis-1,3-Dichloropropene	18.95	1.0	20	0	94.8	75 - 124				
Dibromochloromethane	18.59	1.0	20	0	92.9	74 - 126				
Dibromomethane	20.42	1.0	20	0	102	79 - 123				
Dichlorodifluoromethane	18.8	1.0	20	0	94.0	32 - 152				
Ethylbenzene	19.54	1.0	20	0	97.7	79 - 121				
Hexachlorobutadiene	14.32	1.0	20	0	71.6	66 - 134				
Isopropylbenzene	18.41	1.0	20	0	92.1	72 - 131				
m,p-Xylene	38.55	2.0	40	0	96.4	80 - 121				
Methylene chloride	20.49	2.0	20	0	102	74 - 124				
Naphthalene	20.67	1.0	20	0	103	61 - 128				
n-Butylbenzene	16.59	1.0	20	0	82.9	75 - 128				
n-Propylbenzene	19.17	1.0	20	0	95.8	76 - 126				
o-Xylene	19.1	1.0	20	0	95.5	78 - 122				
sec-Butylbenzene	17.05	1.0	20	0	85.3	77 - 126				
Styrene	19.51	1.0	20	0	97.5	78 - 123				
tert-Butylbenzene	18.78	1.0	20	0	93.9	78 - 124				
Tetrachloroethene	18.2	1.0	20	0	91.0	74 - 129				
Toluene	19.57	1.0	20	0	97.8	80 - 121				
trans-1,2-Dichloroethene	19.07	1.0	20	0	95.3	75 - 124				
trans-1,3-Dichloropropene	20.14	1.0	20	0	101	73 - 127				
Trichloroethene	20.51	1.0	20	0	103	79 - 123				
Trichlorofluoromethane	17.57	1.0	20	0	87.9	65 - 141				
Vinyl chloride	18.17	1.0	20	0	90.8	58 - 137				
Surr: 1,2-Dichloroethane-d4	*45.58*	*1.0*	*50*	*0*	*91.2*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*48.36*	*1.0*	*50*	*0*	*96.7*	*85 - 114*				
Surr: Dibromofluoromethane	*45.94*	*1.0*	*50*	*0*	*91.9*	*80 - 119*				
Surr: Toluene-d8	*48.88*	*1.0*	*50*	*0*	*97.8*	*89 - 112*				

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324965 **Instrument: VOA9** **Method: SW8260**

MSD Sample ID: **HS18091438-01MSD** Units: **ug/L** Analysis Date: **08-Oct-2018 16:50**
Client ID: **35AWW06_092618** Run ID: **VOA9_324965** SeqNo: **4762560** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
1,1,1,2-Tetrachloroethane	20.57	1.0	20	0	103	78 - 124	20.21	1.76	20	
1,1,1-Trichloroethane	17.43	1.0	20	0	87.2	74 - 131	17.01	2.43	20	
1,1,2,2-Tetrachloroethane	21.84	1.0	20	0	109	71 - 121	21.49	1.64	20	
1,1,2-Trichloroethane	19.7	1.0	20	0	98.5	80 - 119	19.4	1.53	20	
1,1-Dichloroethane	19.37	1.0	20	0	96.9	77 - 125	19.1	1.39	20	
1,1-Dichloroethene	19.4	1.0	20	0	97.0	71 - 131	20.51	5.55	20	
1,1-Dichloropropene	19.74	1.0	20	0	98.7	78 - 125	19.67	0.338	20	
1,2,3-Trichlorobenzene	18.47	1.0	20	0	92.3	69 - 129	17.67	4.41	20	
1,2,3-Trichloropropane	20.21	1.0	20	0	101	73 - 122	20.24	0.11	20	
1,2,4-Trichlorobenzene	18.38	1.0	20	0	91.9	69 - 130	17.35	5.79	20	
1,2,4-Trimethylbenzene	19.7	1.0	20	0	98.5	76 - 124	19.39	1.59	20	
1,2-Dibromo-3-chloropropane	19.75	1.0	20	0	98.7	62 - 128	19.61	0.722	20	
1,2-Dibromoethane	20.39	1.0	20	0	102	77 - 121	19.77	3.1	20	
1,2-Dichlorobenzene	20.63	1.0	20	0	103	80 - 119	20.1	2.61	20	
1,2-Dichloroethane	20.49	1.0	20	0	102	73 - 128	20.85	1.72	20	
1,2-Dichloropropane	21.52	1.0	20	0	108	78 - 122	21.59	0.319	20	
1,3,5-Trimethylbenzene	18.58	1.0	20	0	92.9	75 - 124	18.31	1.47	20	
1,3-Dichlorobenzene	20.51	1.0	20	0	103	80 - 119	20.06	2.22	20	
1,3-Dichloropropane	19.97	1.0	20	0	99.9	80 - 119	19.59	1.95	20	
1,4-Dichlorobenzene	20.42	1.0	20	0	102	79 - 118	20.17	1.24	20	
2,2-Dichloropropane	17.29	1.0	20	0	86.4	60 - 139	16.82	2.75	20	
2-Butanone	241.6	2.0	40	210.6	77.4	56 - 143	241.1	0.209	20	O
2-Chlorotoluene	19.73	1.0	20	0	98.7	79 - 122	19.58	0.774	20	
2-Hexanone	40.99	2.0	40	1.745	98.1	57 - 139	41.1	0.272	20	
4-Chlorotoluene	19.89	1.0	20	0	99.4	78 - 122	19.72	0.858	20	
4-Isopropyltoluene	17.78	1.0	20	0	88.9	77 - 127	17.51	1.55	20	
4-Methyl-2-pentanone	38.76	2.0	40	0	96.9	67 - 130	37.97	2.07	20	
Benzene	21.28	1.0	20	0	106	79 - 120	21.27	0.0405	20	
Bromobenzene	19.64	1.0	20	0	98.2	80 - 120	19.27	1.9	20	
Bromochloromethane	18.42	1.0	20	0	92.1	78 - 123	17.71	3.97	20	
Bromodichloromethane	18.8	1.0	20	0	94.0	79 - 125	19.07	1.4	20	
Bromoform	16.92	1.0	20	0	84.6	66 - 130	16.6	1.91	20	
Bromomethane	5.765	1.0	20	0	28.8	53 - 141	4.24	30.5	20	SR
Carbon disulfide	51.73	2.0	40	2.559	123	64 - 133	42.59	19.4	20	

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324965 **Instrument: VOA9** **Method: SW8260**

MSD Sample ID: **HS18091438-01MSD** Units: **ug/L** Analysis Date: **08-Oct-2018 16:50**
Client ID: **35AWW06_092618** Run ID: **VOA9_324965** SeqNo: **4762560** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
Carbon tetrachloride	18.42	1.0	20	0	92.1	72 - 136	18.37	0.285	20	
Chlorobenzene	20.62	1.0	20	0	103	82 - 118	20.46	0.771	20	
Chloroethane	75.02	1.0	20	0	375	60 - 138	99.92	28.5	20	SR
Chloroform	19.15	1.0	20	0	95.8	79 - 124	18.91	1.3	20	
Chloromethane	13.95	1.0	20	0	69.8	50 - 139	14.71	5.3	20	
cis-1,2-Dichloroethene	19.29	1.0	20	0	96.4	78 - 123	18.83	2.41	20	
cis-1,3-Dichloropropene	19.48	1.0	20	0	97.4	75 - 124	18.95	2.74	20	
Dibromochloromethane	18.75	1.0	20	0	93.7	74 - 126	18.59	0.871	20	
Dibromomethane	20.71	1.0	20	0	104	79 - 123	20.42	1.39	20	
Dichlorodifluoromethane	18.22	1.0	20	0	91.1	32 - 152	18.8	3.14	20	
Ethylbenzene	19.73	1.0	20	0	98.6	79 - 121	19.54	0.965	20	
Hexachlorobutadiene	14.68	1.0	20	0	73.4	66 - 134	14.32	2.53	20	
Isopropylbenzene	18.4	1.0	20	0	92.0	72 - 131	18.41	0.0918	20	
m,p-Xylene	39.14	2.0	40	0	97.9	80 - 121	38.55	1.54	20	
Methylene chloride	20.37	2.0	20	0	102	74 - 124	20.49	0.602	20	
Naphthalene	21.58	1.0	20	0	108	61 - 128	20.67	4.32	20	
n-Butylbenzene	16.87	1.0	20	0	84.4	75 - 128	16.59	1.71	20	
n-Propylbenzene	19.43	1.0	20	0	97.2	76 - 126	19.17	1.38	20	
o-Xylene	19.49	1.0	20	0	97.4	78 - 122	19.1	2.01	20	
sec-Butylbenzene	17.3	1.0	20	0	86.5	77 - 126	17.05	1.42	20	
Styrene	19.88	1.0	20	0	99.4	78 - 123	19.51	1.91	20	
tert-Butylbenzene	18.95	1.0	20	0	94.8	78 - 124	18.78	0.915	20	
Tetrachloroethene	18.61	1.0	20	0	93.0	74 - 129	18.2	2.23	20	
Toluene	19.57	1.0	20	0	97.8	80 - 121	19.57	0.00995	20	
trans-1,2-Dichloroethene	19.04	1.0	20	0	95.2	75 - 124	19.07	0.127	20	
trans-1,3-Dichloropropene	20.66	1.0	20	0	103	73 - 127	20.14	2.57	20	
Trichloroethene	20.01	1.0	20	0	100	79 - 123	20.51	2.46	20	
Trichlorofluoromethane	16.67	1.0	20	0	83.3	65 - 141	17.57	5.27	20	
Vinyl chloride	17.51	1.0	20	0	87.5	58 - 137	18.17	3.7	20	
Surr: 1,2-Dichloroethane-d4	*44.68*	*1.0*	*50*	*0*	*89.4*	*81 - 118*	*45.58*	*2*	*20*	
Surr: 4-Bromofluorobenzene	*48.27*	*1.0*	*50*	*0*	*96.5*	*85 - 114*	*48.36*	*0.184*	*20*	
Surr: Dibromofluoromethane	*46.24*	*1.0*	*50*	*0*	*92.5*	*80 - 119*	*45.94*	*0.658*	*20*	
Surr: Toluene-d8	*49.15*	*1.0*	*50*	*0*	*98.3*	*89 - 112*	*48.88*	*0.553*	*20*	

The following samples were analyzed in this batch: HS18091438-01 HS18091438-02 HS18091438-03 HS18091438-04 HS18091438-05

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324990 **Instrument: VOA2** **Method: SW8260**

MBLK Sample ID: **VBLKW-181008** Units: **ug/L** Analysis Date: **09-Oct-2018 00:55**
Client ID: Run ID: **VOA2_324990** SeqNo: **4763226** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Acetone	2.0	2.0								U
Surr: 1,2-Dichloroethane-d4	*45.85*	*1.0*	*50*	*0*	*91.7*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*48.72*	*1.0*	*50*	*0*	*97.4*	*85 - 114*				
Surr: Dibromofluoromethane	*48.68*	*1.0*	*50*	*0*	*97.4*	*80 - 119*				
Surr: Toluene-d8	*47.19*	*1.0*	*50*	*0*	*94.4*	*89 - 112*				

LCS Sample ID: **VLCSW-181008** Units: **ug/L** Analysis Date: **09-Oct-2018 00:30**
Client ID: Run ID: **VOA2_324990** SeqNo: **4763225** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Acetone	44.42	2.0	40	0	111	39 - 160				
Surr: 1,2-Dichloroethane-d4	*47.84*	*1.0*	*50*	*0*	*95.7*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*50.99*	*1.0*	*50*	*0*	*102*	*85 - 114*				
Surr: Dibromofluoromethane	*46.88*	*1.0*	*50*	*0*	*93.8*	*80 - 119*				
Surr: Toluene-d8	*45.36*	*1.0*	*50*	*0*	*90.7*	*89 - 112*				

MS Sample ID: **HS18091438-01MS** Units: **ug/L** Analysis Date: **09-Oct-2018 03:00**
Client ID: **35AWW06_092618** Run ID: **VOA2_324990** SeqNo: **4763229** PrepDate: DF: **50**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Acetone	8489	100	2000	6605	94.2	39 - 160				
Surr: 1,2-Dichloroethane-d4	*2434*	*50*	*2500*	*0*	*97.3*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*2576*	*50*	*2500*	*0*	*103*	*85 - 114*				
Surr: Dibromofluoromethane	*2398*	*50*	*2500*	*0*	*95.9*	*80 - 119*				
Surr: Toluene-d8	*2283*	*50*	*2500*	*0*	*91.3*	*89 - 112*				

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324990 **Instrument: VOA2** **Method: SW8260**

MSD Sample ID: **HS18091438-01MSD** Units: **ug/L** Analysis Date: **09-Oct-2018 03:24**
Client ID: **35AWW06_092618** Run ID: **VOA2_324990** SeqNo: **4763230** PrepDate: DF: **50**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Acetone	8547	100	2000	6605	97.1	39 - 160	8489	0.68	20	
Surr: 1,2-Dichloroethane-d4	*2424*	*50*	*2500*	*0*	*97.0*	*81 - 118*	*2434*	*0.394*	*20*	
Surr: 4-Bromofluorobenzene	*2596*	*50*	*2500*	*0*	*104*	*85 - 114*	*2576*	*0.784*	*20*	
Surr: Dibromofluoromethane	*2406*	*50*	*2500*	*0*	*96.3*	*80 - 119*	*2398*	*0.328*	*20*	
Surr: Toluene-d8	*2277*	*50*	*2500*	*0*	*91.1*	*89 - 112*	*2283*	*0.285*	*20*	

The following samples were analyzed in this batch: HS18091438-01 HS18091438-02 HS18091438-03 HS18091438-04 HS18091438-05

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: 133178 **Instrument: UV-2450** **Method: E365.3**

MBLK Sample ID: **MBLK-133178** Units: **mg/L** Analysis Date: **04-Oct-2018 14:35**
Client ID: Run ID: **UV-2450_324727** SeqNo: **4754626** PrepDate: **04-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.0250	0.0500								U

LCS Sample ID: **LCS-133178** Units: **mg/L** Analysis Date: **04-Oct-2018 14:35**
Client ID: Run ID: **UV-2450_324727** SeqNo: **4754625** PrepDate: **04-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.252	0.0500	0.25	0	101	80 - 120				

MS Sample ID: **HS18091510-01MS** Units: **mg/L** Analysis Date: **04-Oct-2018 14:35**
Client ID: Run ID: **UV-2450_324727** SeqNo: **4754623** PrepDate: **04-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.302	0.0500	0.25	0.062	96.0	80 - 120				

MS Sample ID: **HS18091438-01MS** Units: **mg/L** Analysis Date: **04-Oct-2018 14:35**
Client ID: **35AWW06_092618** Run ID: **UV-2450_324727** SeqNo: **4754621** PrepDate: **04-Oct-2018** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	5.18	0.500	2.5	2.67	100	80 - 120				

MSD Sample ID: **HS18091510-01MSD** Units: **mg/L** Analysis Date: **04-Oct-2018 14:35**
Client ID: Run ID: **UV-2450_324727** SeqNo: **4754624** PrepDate: **04-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.299	0.0500	0.25	0.062	94.8	80 - 120	0.302	0.998	20	

MSD Sample ID: **HS18091438-01MSD** Units: **mg/L** Analysis Date: **04-Oct-2018 14:35**
Client ID: **35AWW06_092618** Run ID: **UV-2450_324727** SeqNo: **4754622** PrepDate: **04-Oct-2018** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	5.17	0.500	2.5	2.67	100	80 - 120	5.18	0.193	20	

The following samples were analyzed in this batch: HS18091438-01 HS18091438-02 HS18091438-03 HS18091438-04

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324424 **Instrument: ManTech01** **Method: SM2320B**

MBLK Sample ID: **WBLKW1-180929** Units: **mg/L** Analysis Date: **29-Sep-2018 08:52**
Client ID: Run ID: **ManTech01_324424** SeqNo: **4748148** 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: **WLCS1-180929** Units: **mg/L** Analysis Date: **29-Sep-2018 09:01**
Client ID: Run ID: **ManTech01_324424** SeqNo: **4748149** 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)	1072	5.00	1000	0	107	85 - 115				

LCSD Sample ID: **WLCSD1-180929** Units: **mg/L** Analysis Date: **29-Sep-2018 09:09**
Client ID: Run ID: **ManTech01_324424** SeqNo: **4748150** 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)	1071	5.00	1000	0	107	85 - 115	1072	0.0541	20	

DUP Sample ID: **HS18091438-01DUP** Units: **mg/L** Analysis Date: **29-Sep-2018 10:47**
Client ID: **35AWW06_092618** Run ID: **ManTech01_324424** SeqNo: **4748164** 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)	764.5	5.00					775	1.36	20	

The following samples were analyzed in this batch: HS18091438-01 HS18091438-02 HS18091438-03 HS18091438-04

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324594 **Instrument: ICS2100** **Method: SW9056**

MBLK Sample ID: **WBLKW1-092718** Units: **mg/L** Analysis Date: **28-Sep-2018 03:26**
Client ID: Run ID: **ICS2100_324594** SeqNo: **4751753** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	0.500	0.500								U
Nitrogen, Nitrate (As N)	0.100	0.100								U
Nitrogen, Nitrite (As N)	0.100	0.100								U
Sulfate	0.500	0.500								U

LCS Sample ID: **WLCSW1-092718** Units: **mg/L** Analysis Date: **28-Sep-2018 03:40**
Client ID: Run ID: **ICS2100_324594** SeqNo: **4751754** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	20.28	0.500	20	0	101	80 - 120				
Nitrogen, Nitrate (As N)	3.935	0.100	4	0	98.4	80 - 120				
Nitrogen, Nitrite (As N)	4.217	0.100	4	0	105	80 - 120				
Sulfate	20.06	0.500	20	0	100	80 - 120				

LCSD Sample ID: **WLCSDW1-092718** Units: **mg/L** Analysis Date: **28-Sep-2018 03:55**
Client ID: Run ID: **ICS2100_324594** SeqNo: **4751755** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	20.46	0.500	20	0	102	80 - 120	20.28	0.889	20	
Nitrogen, Nitrate (As N)	3.977	0.100	4	0	99.4	80 - 120	3.935	1.06	20	
Nitrogen, Nitrite (As N)	4.261	0.100	4	0	107	80 - 120	4.217	1.04	20	
Sulfate	20.25	0.500	20	0	101	80 - 120	20.06	0.962	20	

MS Sample ID: **HS18091510-01MS** Units: **mg/L** Analysis Date: **28-Sep-2018 16:43**
Client ID: Run ID: **ICS2100_324594** SeqNo: **4765751** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	205.7	5.00	100	109.5	96.2	80 - 120				
Nitrogen, Nitrate (As N)	18.53	1.00	20	0	92.6	80 - 120				
Nitrogen, Nitrite (As N)	20.08	1.00	20	0	100	80 - 120				
Sulfate	161.2	5.00	100	65.28	95.9	80 - 120				

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324594 **Instrument: ICS2100** **Method: SW9056**

MS Sample ID: **HS18091510-01MS** Units: **mg/L** Analysis Date: **28-Sep-2018 15:59**
Client ID: Run ID: **ICS2100_324594** SeqNo: **4765748** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	121.6	0.500	10	113.6	79.8	80 - 120				SEO
Nitrogen, Nitrate (As N)	2.028	0.100	2	0	101	80 - 120				
Nitrogen, Nitrite (As N)	2.096	0.100	2	0	105	80 - 120				
Sulfate	78.31	0.500	10	69.87	84.4	80 - 120				O

MS Sample ID: **HS18091438-01MS** Units: **mg/L** Analysis Date: **28-Sep-2018 04:39**
Client ID: **35AWW06_092618** Run ID: **ICS2100_324594** SeqNo: **4751758** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	1025	5.00	100	909.6	115	80 - 120				EO
Nitrogen, Nitrate (As N)	19.46	1.00	20	0	97.3	80 - 120				
Nitrogen, Nitrite (As N)	22.99	1.00	20	0	115	80 - 120				
Sulfate	599.9	5.00	100	507.7	92.3	80 - 120				O

MSD Sample ID: **HS18091510-01MSD** Units: **mg/L** Analysis Date: **28-Sep-2018 16:58**
Client ID: Run ID: **ICS2100_324594** SeqNo: **4765752** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	205.3	5.00	100	109.5	95.8	80 - 120	205.7	0.187	20	
Nitrogen, Nitrate (As N)	18.36	1.00	20	0	91.8	80 - 120	18.53	0.905	20	
Nitrogen, Nitrite (As N)	20.1	1.00	20	0	101	80 - 120	20.08	0.11	20	
Sulfate	161.2	5.00	100	65.28	96.0	80 - 120	161.2	0.0192	20	

MSD Sample ID: **HS18091510-01MSD** Units: **mg/L** Analysis Date: **28-Sep-2018 16:14**
Client ID: Run ID: **ICS2100_324594** SeqNo: **4765749** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	124.1	0.500	10	113.6	104	80 - 120	121.6	2.01	20	EO
Nitrogen, Nitrate (As N)	2.057	0.100	2	0	103	80 - 120	2.028	1.42	20	
Nitrogen, Nitrite (As N)	2.131	0.100	2	0	107	80 - 120	2.096	1.66	20	
Sulfate	79.53	0.500	10	69.87	96.6	80 - 120	78.31	1.54	20	O

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324594 **Instrument: ICS2100** **Method: SW9056**

MSD Sample ID: **HS18091438-01MSD** Units: **mg/L** Analysis Date: **28-Sep-2018 04:53**
Client ID: **35AWW06_092618** Run ID: **ICS2100_324594** SeqNo: **4751759** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	1031	5.00	100	909.6	121	80 - 120	1025	0.584	20	SEO
Nitrogen, Nitrate (As N)	19.5	1.00	20	0	97.5	80 - 120	19.46	0.2	20	
Nitrogen, Nitrite (As N)	23.21	1.00	20	0	116	80 - 120	22.99	0.957	20	
Sulfate	607.2	5.00	100	507.7	99.5	80 - 120	599.9	1.2	20	O

The following samples were analyzed in this batch: HS18091438-01 HS18091438-02 HS18091438-03 HS18091438-04

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324811 **Instrument: ICS2100** **Method: SW9056**

MBLK Sample ID: **WBLKW-100418** Units: **mg/L** Analysis Date: **04-Oct-2018 14:40**
Client ID: Run ID: **ICS2100_324811** SeqNo: **4756226** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	0.500	0.500								U
Sulfate	0.500	0.500								U

LCS Sample ID: **WLCSW-100418** Units: **mg/L** Analysis Date: **04-Oct-2018 14:54**
Client ID: Run ID: **ICS2100_324811** SeqNo: **4756227** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	19.48	0.500	20	0	97.4	80 - 120				
Sulfate	18.6	0.500	20	0	93.0	80 - 120				

LCSD Sample ID: **WLCSDW-100418** Units: **mg/L** Analysis Date: **04-Oct-2018 15:09**
Client ID: Run ID: **ICS2100_324811** SeqNo: **4756228** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	19.28	0.500	20	0	96.4	80 - 120	19.48	1.04	20	
Sulfate	18.01	0.500	20	0	90.0	80 - 120	18.6	3.25	20	

MS Sample ID: **HS18100126-01MS** Units: **mg/L** Analysis Date: **04-Oct-2018 15:45**
Client ID: Run ID: **ICS2100_324811** SeqNo: **4756230** PrepDate: DF: **50**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	628.7	25.0	500	128.1	100	80 - 120				
Sulfate	2104	25.0	500	1492	122	80 - 120				S

MSD Sample ID: **HS18100126-01MSD** Units: **mg/L** Analysis Date: **04-Oct-2018 15:59**
Client ID: Run ID: **ICS2100_324811** SeqNo: **4756231** PrepDate: DF: **50**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	622.7	25.0	500	128.1	98.9	80 - 120	628.7	0.96	20	
Sulfate	1973	25.0	500	1492	96.3	80 - 120	2104	6.42	20	

The following samples were analyzed in this batch: HS18091438-02 HS18091438-03 HS18091438-04

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091438

QC BATCH REPORT

Batch ID: R324851 **Instrument: WetChem_HS** **Method: E376.1**

MBLK Sample ID: **MBLK-R324851** Units: **mg/L** Analysis Date: **03-Oct-2018 11:45**
Client ID: Run ID: **WetChem_HS_324851** SeqNo: **4760404** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	1.00	1.00								U

LCS Sample ID: **LCS-R324851** Units: **mg/L** Analysis Date: **03-Oct-2018 11:45**
Client ID: Run ID: **WetChem_HS_324851** SeqNo: **4760403** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	21.36	1.00	25	0	85.4	80 - 120				

LCSD Sample ID: **LCSD-R324851** Units: **mg/L** Analysis Date: **03-Oct-2018 11:45**
Client ID: Run ID: **WetChem_HS_324851** SeqNo: **4760402** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	21.16	1.00	25	0	84.6	80 - 120	21.36	0.941	20	

MS Sample ID: **HS18091510-01MS** Units: **mg/L** Analysis Date: **03-Oct-2018 11:45**
Client ID: Run ID: **WetChem_HS_324851** SeqNo: **4760401** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	21.36	1.00	25	0.36	84.0	80 - 120				

MS Sample ID: **HS18091438-01MS** Units: **mg/L** Analysis Date: **03-Oct-2018 11:45**
Client ID: **35AWW06_092618** Run ID: **WetChem_HS_324851** SeqNo: **4760399** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	21.56	1.00	25	1.96	78.4	80 - 120				S

The following samples were analyzed in this batch: HS18091438-01 HS18091438-02 HS18091438-03 HS18091438-04

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: **HS18091438**

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

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
North Carolina	624-2018	31-Dec-2018
Arkansas	88-0356	27-Mar-2019
Texas	T10470231-18-21	30-Apr-2019
North Dakota	R193 2018-2019	30-Apr-2019
Illinois	004438	29-Jun-2019
Louisiana	03087	30-Jun-2019
Dept of Defense	ANAB L2231	22-Dec-2018
Kentucky	123043 - 2018	30-Apr-2019
Kansas	E-10352 2018-2019	31-Jul-2019
Oklahoma	2018-156	31-Aug-2019

ALS Houston, US Date: 12-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Work Order: HS18091438

SAMPLE TRACKING

Lab Samp ID	Client Sample ID	Action	Date	Person	New Location
HS18091438-01	35AWW06_092618	Login	9/27/2018 3:40:40 PM	JML	WET367
HS18091438-01	35AWW06_092618	Login	9/27/2018 3:40:40 PM	JML	WET367
HS18091438-01	35AWW06_092618	Login	9/27/2018 3:40:40 PM	JML	WET367
HS18091438-01	35AWW06_092618	Login	9/27/2018 3:40:40 PM	JML	MET067
HS18091438-01	35AWW06_092618	Login	9/27/2018 3:40:40 PM	JML	MET067
HS18091438-01	35AWW06_092618	Login	9/27/2018 3:40:40 PM	JML	VOA197
HS18091438-01	35AWW06_092618	Login	9/27/2018 3:40:40 PM	JML	Sub
HS18091438-01	35AWW06_092618	Login	9/27/2018 3:40:40 PM	JML	Sub
HS18091438-02	35AWW20_092618	Login	9/27/2018 3:56:40 PM	JML	WET367
HS18091438-02	35AWW20_092618	Login	9/27/2018 3:56:40 PM	JML	WET367
HS18091438-02	35AWW20_092618	Login	9/27/2018 3:56:40 PM	JML	WET367
HS18091438-02	35AWW20_092618	Login	9/27/2018 3:56:40 PM	JML	MET067
HS18091438-02	35AWW20_092618	Login	9/27/2018 3:56:40 PM	JML	MET067
HS18091438-02	35AWW20_092618	Login	9/27/2018 3:56:40 PM	JML	VOA197
HS18091438-02	35AWW20_092618	Login	9/27/2018 3:56:40 PM	JML	Sub
HS18091438-02	35AWW20_092618	Login	9/27/2018 3:56:40 PM	JML	Sub
HS18091438-03	35AWW20_092618_a	Login	9/27/2018 3:56:40 PM	JML	WET367
HS18091438-03	35AWW20_092618_a	Login	9/27/2018 3:56:40 PM	JML	WET367
HS18091438-03	35AWW20_092618_a	Login	9/27/2018 3:56:40 PM	JML	WET367
HS18091438-03	35AWW20_092618_a	Login	9/27/2018 3:56:40 PM	JML	MET067
HS18091438-03	35AWW20_092618_a	Login	9/27/2018 3:56:40 PM	JML	MET067
HS18091438-03	35AWW20_092618_a	Login	9/27/2018 3:56:40 PM	JML	VOA197
HS18091438-03	35AWW20_092618_a	Login	9/27/2018 3:56:40 PM	JML	Sub
HS18091438-03	35AWW20_092618_a	Login	9/27/2018 3:56:40 PM	JML	Sub
HS18091438-04	LHSMW07_092618	Login	9/27/2018 3:56:40 PM	JML	WET367
HS18091438-04	LHSMW07_092618	Login	9/27/2018 3:56:40 PM	JML	WET367
HS18091438-04	LHSMW07_092618	Login	9/27/2018 3:56:40 PM	JML	WET367
HS18091438-04	LHSMW07_092618	Login	9/27/2018 3:56:40 PM	JML	MET067
HS18091438-04	LHSMW07_092618	Login	9/27/2018 3:56:40 PM	JML	MET067
HS18091438-04	LHSMW07_092618	Login	9/27/2018 3:56:40 PM	JML	VOA197
HS18091438-04	LHSMW07_092618	Login	9/27/2018 3:56:40 PM	JML	Sub
HS18091438-04	LHSMW07_092618	Login	9/27/2018 3:56:40 PM	JML	Sub
HS18091438-05	Trip Blank	Login	9/27/2018 3:57:59 PM	JML	VOA197

ALS Houston, US Date: 12-Oct-18

Sample Receipt Checklist

Client Name: Bhate Environmental
Work Order: HS18091438
Date/Time Received: **27-Sep-2018 08:50**
Received by: **NDR**

Checklist completed by: *Jared R. Makan* eSignature 27-Sep-2018 Date
Reviewed by: *RJ Modashia* eSignature 28-Sep-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 ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
TX1005 solids received in hermetically sealed vials?	Yes ☐	No ☐	N/A ☑
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):	2.2c/1.8c UC/C	IR11	
Cooler(s)/Kit(s):	44321		
Date/Time sample(s) sent to storage:	09/27/2018 18:10		
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:	Si Ma		

Login Notes: pH>2 (5) for LHSMW07-092618 metals, dissolved metals & Phosphorus. Metals & Dissolved metals preserved with 0.25ml HNO3, Phosphorus preserved with 0.5ml H2SO4. Preserved 09/27/18 at 11:25.

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

bhate ENVIRONMENTAL CONSTRUCTION ENERGY

1608 13th Avenue South, Suite 300
Birmingham Alabama 35205
Tel: 205-918-4000
Fax: 205-918-4050

Chain of Custody and Analytical Request

Page: _____ of _____

Project/Phase No: NWO1312.0150

COC Number(1): _____

LIMS Number: _____

Facility/Base I.D.: LHAAP

Project/Site Name: LHAAP / Site 58

Client Name:

Collected by: Scott Beesinger

Sample Analysis Requested (5) / Quality Assurance Samples (6)

Field Sample ID (30 Characters Max)	ERPIMS LOCID (15 Characters Max)	Date Collected (dd-mmm-yyyy)	Time Collected (Military) (hhmm)	Sample Depth (beginning - ending)	SA Code (1)	Sample Number (3)	Sample Matrix (4)	Number of containers	VOC	MEE	TOC	Carbon Dioxide	Anions/Alkalinity	Total Phosphorous	Total Manganese & Iron	Dissolved Manganese & Iron	Sulfide	Ambient Blank Lot Control Number	Equipment Blank Lot Control Number	Trip Blank Lot Control Number	Cooler ID
35AWW06_092618		26 Sep 2018	0920	-		N	WG	12	X	X	X	X	X	X	X	X	X				
35AWW06_092618_MS		26 Sep 2018	0920	-		MS	WG	12	X	X	X	X	X	X	X	X	X				
35AWW06_092618_MSD		26 Sep 2018	0920	-		SD	WG	12	X	X	X	X	X	X	X	X	X				
35AWW20_092618		26 Sep 2018	1115			N	WG	12	X	X	X	X	X	X	X	X	X				
35AWW20_092618_a		26 Sep 2018	1115			FD	WG	12	X	X	X	X	X	X	X	X	X				
LHSMW07_092618		26 Sep 2018	1230	-		N	WG	12	X	X	X	X	X	X	X	X	X				
TRIP BLANK		26 Sep 2018		-		TB	W	2	X												
				-																	
				-																	
				-																	
				-																	

COMMENTS: _____

Bhate Environmental Associates, Inc.
LHAAP-58

HS18091438

Custody Transfers Prior to Receipt by Laboratory

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1. Scott Beesinger	9/26/18	1400	1. NA	9/27/18	0350
2.			2.		
3.			3.		

Sample Delivery Details / Laboratory Receipt

Delivered Directly to Lab: _____ Shipped No.:

Method of Shipment: _____

Fed Ex Airbill Number:

Analytical Lab: ALS 10450 Stancliff Rd. Suite 210 Houston, TX 77099 (281) 530-5656

ATTN: SONJA WEST Lab Recipient: Delivery Date/Time:

1.) Chain of Custody Number = date collected + custody number (e.g. 09-02-1999-01)
2.) Sample Type (SA) Codes: N = Normal Sample, TB = Trip Blank (-c) Sample, FD = Field Duplicate (-a) Samples, FR = Field Replicate (-b) Samples, EB = Equipment Blank (-d) Samples, MS = Matrix Spike, SD = Matrix Spike Duplicate, AB = Ambient Blank (-e)
3.) Sample Number: Unique sample number collected from a particular location per day. (e.g. Groundwater sample collected from MW-1 on 10/10/99 = 01, if sampled again on 10/10/99 = 02, etc.)
4.) Matrix Codes: GS = Soil Gas, WG = Groundwater, WS = Surface Water, SO = Soil, SE = Sediment, SL = Sludge, SS = Surface Soil Samples, WQ = Aqueous Blank Samples (trip, equipment, ambient, etc), SQ = Soil Blanks
5.) Sample Analysis Requested: Analytical method requested and number of containers provided for each.
6.) Quality assurance samples are assigned by date (ddmmyy) and the sample number associated with the sample (01, 02, etc) (e.g. Equipment blank collected in association with MW-1 on 10/10/99 will be designated 10109901 in the Equipment Blank Lot Control

44321
Temp ulc 2.2
Id # 11
C(1-0-4

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

CUSTODY SEAL

Date: 9/27/18 Time: 1400
Name: Scott Beeson-Wolf
Company: BHATE

Seal Broken By:
Date: 9/27/18

SEP 2 7 2018

TO CLIENT SERVICES
ALS LABORATORY GROUP
10450 STANCLIFF ROAD
SUITE 210
HOUSTON TX 77099
(281) 530-5656
REF: LHAAP 58 – RJ
RMA:

FedEx Express

TRK# 0221 4380 9532 8289

RETURNS MON-SAT
PRIORITY OVERNIGHT
THU - 27 SEP 10:30A
PRIORITY OVERNIGHT

FedEx
TRK# 0221 4380 9532 8289

77099
TX-US
IAH

AB SGRA

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
T : +1 360 577 7222
F : +1 360 636 1068
www.alsglobal.com

October 11, 2018

Analytical Report for Service Request No: K1809385

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

RE: HS18091438

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory September 28, 2018
For your reference, these analyses have been assigned our service request number **K1809385.**

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

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
T : +1 360 577 7222
F : +1 360 636 1068
www.alsglobal.com

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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
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577- 7222 Fax (360)636-1 068
www.alsglobal.com

1317 South 13th Ave, Kelso, WA 98626 | 1-360-577-7222 | www.alsglobal.com

Client: ALS Environmental - US
Project: HS18091438
Sample Matrix: Ground Water

Service Request: K1809385
Date Received: 09/28/2018

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:

Four ground water samples were received for analysis at ALS Environmental on 09/28/2018. 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 Bowsjoy Date 10/11/2018

Chain of Custody

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577- 7222 Fax (360)636-1 068
www.alsglobal.com

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

K1809385

Subcontract Chain of Custody

COC ID: 9908

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:	HS18091438
TSR:	Danielle Winnings

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18091438-01**	**35AWW06_092618**	**Groundwater**	**26 Sep 2018 09:20**
	TOC Analysis for DOD Level IV			05 Oct 2018
2.	**HS18091438-02**	**35AWW20_092618**	**Groundwater**	**26 Sep 2018 11:15**
	TOC Analysis for DOD Level IV			05 Oct 2018
3.	**HS18091438-03**	**35AWW20_092618_a**	**Groundwater**	**26 Sep 2018 11:15**
	TOC Analysis for DOD Level IV			05 Oct 2018
4.	**HS18091438-04**	**LHSMW07_092618**	**Groundwater**	**26 Sep 2018 12:30**
	TOC Analysis for DOD Level IV			05 Oct 2018

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

MS/MSD - HS18091438-01

QC Level: DOD IV (DoD Data Package)

Relinquished By: J. WALKER Date/Time: 9/27/18 18:00

Received By: Date/Time: 9/28/18 1000

Cooler ID(s): Temperature(s):

00943829

PC Kelly

Cooler Receipt and Preservation Form

Client ALS-Houston Service Request K18 09385

Received: 9/28/18 Opened: 9/28/18 By: CG Unloaded: 9/28/18 By: CG

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
-0.5	-0.5	2.2	2.2	0.0	325	9908	4380 9533 0142	

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: 6 vials for sample 1, 2 vials for samples 2, 3, 4

RUSH

General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577- 7222 Fax (360)636-1 068
www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	K1809385
Project:	HS18091438	**Date Collected:**	09/26/18
Sample Matrix:	Ground Water	**Date Received:**	09/28/18
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
HS18091438-01 35AWW06_092618	K1809385-001	**2860**	130	50	20	250	10/10/18	
HS18091438-02 35AWW20_092618	K1809385-002	**53**	10	4	2	20	10/04/18	
HS18091438-03 35AWW20_092618_a	K1809385-003	**53**	10	4	2	20	10/10/18	
HS18091438-04 LHSMW07_092618	K1809385-004	**14.2**	0.50	0.20	0.07	1	10/05/18	
Method Blank	K1809385-MB1	ND U	0.50	0.20	0.07	1	10/04/18	
Method Blank	K1809385-MB2	ND U	0.50	0.20	0.07	1	10/05/18	
Method Blank	K1809385-MB4	ND U	0.50	0.20	0.07	1	10/10/18	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1809385
Project	HS18091438	**Date Collected:**	09/26/18
Sample Matrix:	Ground Water	**Date Received:**	09/28/18
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
HS18091438-01 35AWW06_092618	K1809385-001DUP3	130	50	20	2860	2790	2820	2	10	10/10/18
HS18091438-02 35AWW20_092618	K1809385-002DUP	10	4	2	53	51	51.9	3	10	10/04/18
HS18091438-03 35AWW20_092618_a	K1809385-003DUP2	10	4	2	53	52	52.5	3	10	10/10/18
HS18091438-04 LHSMW07_092618	K1809385-004DUP	0.50	0.20	0.07	14.2	14.0	14.1	1	10	10/05/18

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.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1809385
Project:	HS18091438	**Date Collected:**	09/26/18
Sample Matrix:	Ground Water	**Date Received:**	09/28/18
		Date Analyzed:	10/10/18
		Date Extracted:	NA

Matrix Spike Summary
Carbon, Total Organic

Sample Name:	HS18091438-01 35AWW06_092618	**Units:**	mg/L
Lab Code:	K1809385-001	**Basis:**	NA
Analysis Method:	SM 5310 C		
Prep Method:	None		

Matrix Spike
K1809385-001MS2

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Carbon, Total Organic	2860	9300	6250	103	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.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1809385
Project:	HS18091438	**Date Analyzed:**	10/04/18
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:	609436

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1809385-LCS1	20.8	21.9	95	83-117

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1809385
Project:	HS18091438	**Date Analyzed:**	10/05/18
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:	609741

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1809385-LCS2	20.7	21.9	95	83-117
Lab Control Sample	K1809385-LCS3	20.2	21.9	92	83-117

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1809385
Project:	HS18091438	**Date Analyzed:**	10/10/18
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:	610329

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1809385-LCS4	21.8	21.9	99	83-117

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:** K1809385
Project: HS18091438

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	609436	KQ1814370-23	10/04/18 10:29	25.0	24.3	97	90-110
CCV2	609436	KQ1814370-24	10/04/18 15:17	25.0	24.7	99	90-110
CCV3	609436	KQ1814370-25	10/04/18 20:22	25.0	24.4	98	90-110
CCV4	609436	KQ1814370-26	10/05/18 00:38	25.0	24.6	98	90-110
CCV5	609436	KQ1814370-27	10/05/18 05:10	25.0	24.0	96	90-110
CCV6	609741	KQ1814385-27	10/05/18 15:18	25.0	24.6	98	90-110
CCV7	609741	KQ1814385-28	10/05/18 19:21	25.0	24.8	99	90-110
CCV8	609741	KQ1814385-29	10/06/18 00:55	25.0	24.5	98	90-110
CCV9	609741	KQ1814385-30	10/06/18 05:59	25.0	25.2	101	90-110
CCV10	609741	KQ1814385-31	10/06/18 11:04	25.0	24.7	99	90-110
CCV11	610329	KQ1814465-14	10/09/18 22:57	25.0	24.5	98	90-110
CCV12	610329	KQ1814465-15	10/10/18 04:01	25.0	24.9	100	90-110
CCV13	610329	KQ1814465-16	10/10/18 08:19	25.0	24.4	97	90-110
CCV14	610329	KQ1814465-17	10/10/18 10:12	25.0	24.2	97	90-110

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:**K1809385
Project: HS18091438

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	609436	KQ1814370-28	10/04/18 10:45	0.50	0.20	0.07	ND	U
CCB2	609436	KQ1814370-29	10/04/18 15:34	0.50	0.20	0.07	ND	U
CCB3	609436	KQ1814370-30	10/04/18 20:38	0.50	0.20	0.07	ND	U
CCB4	609436	KQ1814370-31	10/05/18 00:55	0.50	0.20	0.07	ND	U
CCB5	609436	KQ1814370-32	10/05/18 05:26	0.50	0.20	0.07	ND	U
CCB6	609741	KQ1814385-32	10/05/18 15:35	0.50	0.20	0.07	ND	U
CCB7	609741	KQ1814385-33	10/05/18 19:37	0.50	0.20	0.07	ND	U
CCB8	609741	KQ1814385-34	10/06/18 01:12	0.50	0.20	0.07	ND	U
CCB9	609741	KQ1814385-35	10/06/18 06:16	0.50	0.20	0.07	ND	U
CCB10	609741	KQ1814385-36	10/06/18 11:20	0.50	0.20	0.07	ND	U
CCB11	610329	KQ1814465-18	10/09/18 23:13	0.50	0.20	0.07	ND	U
CCB12	610329	KQ1814465-19	10/10/18 04:17	0.50	0.20	0.07	ND	U
CCB13	610329	KQ1814465-20	10/10/18 08:36	0.50	0.20	0.07	ND	U
CCB14	610329	KQ1814465-21	10/10/18 10:29	0.50	0.20	0.07	ND	U

Raw Data

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577-7222 Fax (360)636-1068
www.alsglobal.com

General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577- 7222 Fax (360)636-1 068
www.alsglobal.com

Work Request # (Original) K1808614, 9036, 9040, 8827, 9156, 9024, 8614, 9491, 9489, 9385, 8765

Tier: IV III IV II III II IV IV IV IV IV

Date Analyzed: 10/3/18

Analyst: CES

Run # DOC: 609428, 609435
TOC: 609436

Analysis: DOC/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:

9036-2, 3, 5, 9156-2, 3, 6, 7, 9 RPD not within acceptance limits. The sample results are less than 5x the MRL.

RA 9491-2 over diluted; 3-9491 over cal range; 9385-1 over cal range; 9385-3 RPD not within acceptance limit.

Final Approved by: [signature] Date: 10/9/18

DQREPORT

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609428 **Method/Testcode:** SM 5310 C/TOC D

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1808614-002	Carbon, Dissolved Organic (DOC)	N/A		Water	5.14 mg/L	10 ml	5.14 mg/L	1	0.07	0.50			10/3/18 16:06	N	IV
1808614-004	Carbon, Dissolved Organic (DOC)	N/A		Water	2.53 mg/L	10 ml	2.53 mg/L	1	0.07	0.50			10/3/18 16:38	N	IV
1808614-008	Carbon, Dissolved Organic (DOC)	N/A		Water	1.02 mg/L	10 ml	1.02 mg/L	1	0.07	0.50			10/3/18 17:09	N	IV
1808827-001	Carbon, Dissolved Organic (DOC)	N/A		Water	2.29 mg/L	10 ml	2.29 mg/L	1	0.07	0.50			10/3/18 23:01	N	II
1808827-002	Carbon, Dissolved Organic (DOC)	N/A		Water	3.19 mg/L	10 ml	3.19 mg/L	1	0.07	0.50			10/4/18 00:55	N	II
1808827-003	Carbon, Dissolved Organic (DOC)	N/A		Water	3.03 mg/L	10 ml	3.03 mg/L	1	0.07	0.50			10/4/18 01:27	N	II
K1808827-004	Carbon, Dissolved Organic (DOC)	N/A		Water	2.17 mg/L	10 ml	2.17 mg/L	1	0.07	0.50			10/4/18 01:59	N	II
1808827-005	Carbon, Dissolved Organic (DOC)	N/A		Water	1.75 mg/L	10 ml	1.75 mg/L	1	0.07	0.50			10/4/18 02:30	N	II
K1808827-006	Carbon, Dissolved Organic (DOC)	N/A		Water	1.20 mg/L	10 ml	1.20 mg/L	1	0.07	0.50			10/4/18 03:02	N	II
K1808827-007	Carbon, Dissolved Organic (DOC)	N/A		Water	0.42 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 03:34	N	II
1808827-008	Carbon, Dissolved Organic (DOC)	N/A		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 04:05	N	II
K1808827-009	Carbon, Dissolved Organic (DOC)	N/A		Water	1.59 mg/L	10 ml	1.59 mg/L	1	0.07	0.50			10/4/18 04:37	N	II
K1808827-010	Carbon, Dissolved Organic (DOC)	N/A		Water	1.29 mg/L	10 ml	1.29 mg/L	1	0.07	0.50			10/4/18 05:42	N	II
K1809036-001	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.21 mg/L	10 ml	0.21 mg/L J	1	0.07	0.50			10/3/18 17:57	Y	III
K1809036-002	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.26 mg/L	10 ml	0.26 mg/L J	1	0.07	0.50			10/3/18 19:18	N	III
K1809036-003	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.90 mg/L	10 ml	0.90 mg/L	1	0.07	0.50			10/3/18 19:50	N	III
K1809036-004	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	2.15 mg/L	10 ml	2.15 mg/L	1	0.07	0.50			10/3/18 20:22	N	III
K1809036-005	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.26 mg/L	10 ml	0.26 mg/L J	1	0.07	0.50			10/3/18 20:54	N	III
K1809040-001	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.99 mg/L	10 ml	0.99 mg/L	1	0.07	0.50			10/3/18 21:25	N	IV
K1809040-002	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	2.52 mg/L	10 ml	2.52 mg/L	1	0.07	0.50			10/3/18 22:30	N	IV
KQ1814032-01	Carbon, Dissolved Organic (DOC)	DUP	K1808614-002	Water	5.01 mg/L	10 ml	5.01 mg/L	1	0.07	0.50		3	10/3/18 16:06	N	IV
KQ1814032-02	Carbon, Dissolved Organic (DOC)	DUP	K1808614-004	Water	2.31 mg/L	10 ml	2.31 mg/L	1	0.07	0.50		9	10/3/18 16:38	N	IV
KQ1814032-03	Carbon, Dissolved Organic (DOC)	DUP	K1808614-008	Water	0.99 mg/L	10 ml	0.99 mg/L	1	0.07	0.50		4	10/3/18 17:09	N	IV

CES 10/9/18

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

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609428 **Method/Testcode:** SM 5310 C/TOC D

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
Q1814032-04	Carbon, Dissolved Organic (DOC)	MS	K1809036-001	Ground Water	25.69 mg/L	10 ml	25.7 mg/L	1	0.07	0.50	102		10/3/18 18:29	N	III
Q1814032-05	Carbon, Dissolved Organic (DOC)	DUP	K1809036-001	Ground Water	0.22 mg/L	10 ml	0.22 mg/L J	1	0.07	0.50		6	10/3/18 17:57	N	III
Q1814032-06	Carbon, Dissolved Organic (DOC)	DUP	K1809036-002	Ground Water	0.22 mg/L	10 ml	0.22 mg/L J	1	0.07	0.50		19*	10/3/18 19:18	N	III
Q1814032-07	Carbon, Dissolved Organic (DOC)	DUP	K1809036-003	Ground Water	0.80 mg/L	10 ml	0.80 mg/L	1	0.07	0.50		12*	10/3/18 19:50	N	III
Q1814032-08	Carbon, Dissolved Organic (DOC)	DUP	K1809036-004	Ground Water	2.15 mg/L	10 ml	2.15 mg/L	1	0.07	0.50		<1	10/3/18 20:22	N	III
Q1814032-09	Carbon, Dissolved Organic (DOC)	DUP	K1809036-005	Ground Water	0.20 mg/L	10 ml	0.20 mg/L J	1	0.07	0.50		26*	10/3/18 20:54	N	III
Q1814032-10	Carbon, Dissolved Organic (DOC)	MS	K1809040-001	Ground Water	26.73 mg/L	10 ml	26.7 mg/L	1	0.07	0.50	103		10/3/18 21:57	N	IV
Q1814032-11	Carbon, Dissolved Organic (DOC)	DUP	K1809040-001	Ground Water	0.92 mg/L	10 ml	0.92 mg/L	1	0.07	0.50		7	10/3/18 21:25	N	IV
Q1814032-12	Carbon, Dissolved Organic (DOC)	DUP	K1809040-002	Ground Water	2.52 mg/L	10 ml	2.52 mg/L	1	0.07	0.50		<1	10/3/18 22:30	N	IV
Q1814032-13	Carbon, Dissolved Organic (DOC)	MS	K1808827-001	Water	28.18 mg/L	10 ml	28.2 mg/L	1	0.07	0.50	104		10/3/18 23:33	N	II
Q1814032-14	Carbon, Dissolved Organic (DOC)	DUP	K1808827-001	Water	2.22 mg/L	10 ml	2.22 mg/L	1	0.07	0.50		3	10/3/18 23:01	N	II
Q1814032-15	Carbon, Dissolved Organic (DOC)	DUP	K1808827-002	Water	2.96 mg/L	10 ml	2.96 mg/L	1	0.07	0.50		7	10/4/18 00:55	N	II
KQ1814032-16	Carbon, Dissolved Organic (DOC)	DUP	K1808827-003	Water	2.95 mg/L	10 ml	2.95 mg/L	1	0.07	0.50		3	10/4/18 01:27	N	II
KQ1814032-17	Carbon, Dissolved Organic (DOC)	DUP	K1808827-004	Water	2.04 mg/L	10 ml	2.04 mg/L	1	0.07	0.50		6	10/4/18 01:59	N	II
KQ1814032-18	Carbon, Dissolved Organic (DOC)	DUP	K1808827-005	Water	1.72 mg/L	10 ml	1.72 mg/L	1	0.07	0.50		2	10/4/18 02:30	N	II
KQ1814032-19	Carbon, Dissolved Organic (DOC)	DUP	K1808827-006	Water	1.12 mg/L	10 ml	1.12 mg/L	1	0.07	0.50		7	10/4/18 03:02	N	II
KQ1814032-20	Carbon, Dissolved Organic (DOC)	DUP	K1808827-007	Water	0.36 mg/L	10 ml	0.36 mg/L J	1	0.07	0.50		NC	10/4/18 03:34	N	II
KQ1814032-21	Carbon, Dissolved Organic (DOC)	DUP	K1808827-008	Water	0.03 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	10/4/18 04:05	N	II
KQ1814032-22	Carbon, Dissolved Organic (DOC)	DUP	K1808827-009	Water	1.52 mg/L	10 ml	1.52 mg/L	1	0.07	0.50		5	10/4/18 04:37	N	II
KQ1814032-23	Carbon, Dissolved Organic (DOC)	DUP	K1808827-010	Water	1.28 mg/L	10 ml	1.28 mg/L	1	0.07	0.50		<1	10/4/18 05:42	N	II
KQ1814032-24	Carbon, Dissolved Organic (DOC)	MB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/3/18 15:17	N	IV
KQ1814032-25	Carbon, Dissolved Organic (DOC)	MB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 00:23	N	IV
KQ1814032-26	Carbon, Dissolved Organic (DOC)	LCS		Water	21.11 mg/L	10 ml	21.1 mg/L	1	0.07	0.50	96		10/3/18 15:33	N	IV

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

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609428 **Method/Testcode:** SM 5310 C/TOC D

La	Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
	Q1814032-27	Carbon, Dissolved Organic (DOC)	LCS		Water	20.84 mg/L	10 ml	20.8 mg/L	1	0.07	0.50	95		10/4/18 00:39	N	IV
	Q1814032-28	Carbon, Dissolved Organic (DOC)	CCV		Water	24.31 mg/L	10 ml	24.3 mg/L	1			97		10/3/18 14:43	N	IV
	Q1814032-29	Carbon, Dissolved Organic (DOC)	CCV		Water	24.84 mg/L	10 ml	24.8 mg/L	1			99		10/3/18 18:45	N	IV
	KQ1814032-30	Carbon, Dissolved Organic (DOC)	CCV		Water	24.54 mg/L	10 ml	24.5 mg/L	1			98		10/3/18 23:49	N	IV
	KQ1814032-31	Carbon, Dissolved Organic (DOC)	CCV		Water	24.74 mg/L	10 ml	24.7 mg/L	1			99		10/4/18 05:09	N	IV
	KQ1814032-32	Carbon, Dissolved Organic (DOC)	CCV		Water	24.32 mg/L	10 ml	24.3 mg/L	1			97		10/4/18 10:29	N	IV
	KQ1814032-33	Carbon, Dissolved Organic (DOC)	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/3/18 15:00	N	IV
	KQ1814032-34	Carbon, Dissolved Organic (DOC)	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/3/18 19:02	N	IV
	KQ1814032-35	Carbon, Dissolved Organic (DOC)	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 00:06	N	IV
	KQ1814032-36	Carbon, Dissolved Organic (DOC)	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 05:26	N	IV
	KQ1814032-37	Carbon, Dissolved Organic (DOC)	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 10:45	N	IV

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609435 **Method/Testcode:** SM 5310 C/TOC D

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1809024-001	Carbon, Dissolved Organic (DOC)	N/A		Water	5.93 mg/L	10 ml	5.93 mg/L	1	0.07	0.50			10/4/18 13:10	N	II
1809024-002	Carbon, Dissolved Organic (DOC)	N/A		Water	2.77 mg/L	10 ml	2.77 mg/L	1	0.07	0.50			10/4/18 14:14	N	II
1809156-001	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	2.37 mg/L	10 ml	2.37 mg/L	1	0.07	0.50			10/4/18 06:14	N	III
1809156-002	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.39 mg/L	10 ml	0.39 mg/L J	1	0.07	0.50			10/4/18 07:19	N	III
1809156-003	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.40 mg/L	10 ml	0.40 mg/L J	1	0.07	0.50			10/4/18 07:50	N	III
1809156-004	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	1.02 mg/L	10 ml	1.02 mg/L	1	0.07	0.50			10/4/18 08:22	N	III
1809156-005	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.01 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 08:54	N	III
1809156-006	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.58 mg/L	10 ml	0.58 mg/L	1	0.07	0.50			10/4/18 09:25	N	III
1809156-007	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.35 mg/L	10 ml	0.35 mg/L J	1	0.07	0.50			10/4/18 09:57	N	III
1809156-008	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.15 mg/L	10 ml	0.15 mg/L J	1	0.07	0.50			10/4/18 11:34	N	III
1809156-009	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.30 mg/L	10 ml	0.30 mg/L J	1	0.07	0.50			10/4/18 12:06	N	III
1809156-010	Carbon, Dissolved Organic (DOC)	N/A		Ground Water	0.44 mg/L	10 ml	0.44 mg/L J	1	0.07	0.50			10/4/18 12:38	N	III
Q1814369-01	Carbon, Dissolved Organic (DOC)	MS	K1809156-001	Ground Water	28.40 mg/L	10 ml	28.4 mg/L	1	0.07	0.50	104		10/4/18 06:46	N	III
Q1814369-02	Carbon, Dissolved Organic (DOC)	DUP	K1809156-001	Ground Water	2.20 mg/L	10 ml	2.20 mg/L	1	0.07	0.50		7	10/4/18 06:14	N	III
Q1814369-03	Carbon, Dissolved Organic (DOC)	DUP	K1809156-002	Ground Water	0.45 mg/L	10 ml	0.45 mg/L J	1	0.07	0.50		15*	10/4/18 07:19	N	III
Q1814369-04	Carbon, Dissolved Organic (DOC)	DUP	K1809156-003	Ground Water	0.29 mg/L	10 ml	0.29 mg/L J	1	0.07	0.50		31*	10/4/18 07:50	N	III
KQ1814369-05	Carbon, Dissolved Organic (DOC)	DUP	K1809156-004	Ground Water	0.99 mg/L	10 ml	0.99 mg/L	1	0.07	0.50		4	10/4/18 08:22	N	III
KQ1814369-06	Carbon, Dissolved Organic (DOC)	DUP	K1809156-005	Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	10/4/18 08:54	N	III
KQ1814369-07	Carbon, Dissolved Organic (DOC)	DUP	K1809156-006	Ground Water	0.52 mg/L	10 ml	0.52 mg/L	1	0.07	0.50		11*	10/4/18 09:25	N	III
KQ1814369-08	Carbon, Dissolved Organic (DOC)	DUP	K1809156-007	Ground Water	0.27 mg/L	10 ml	0.27 mg/L J	1	0.07	0.50		27*	10/4/18 09:57	N	III
KQ1814369-09	Carbon, Dissolved Organic (DOC)	DUP	K1809156-008	Ground Water	0.03 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	10/4/18 11:34	N	III
KQ1814369-10	Carbon, Dissolved Organic (DOC)	DUP	K1809156-009	Ground Water	0.16 mg/L	10 ml	0.16 mg/L J	1	0.07	0.50		60*	10/4/18 12:06	N	III
KQ1814369-11	Carbon, Dissolved Organic (DOC)	DUP	K1809156-010	Ground Water	0.39 mg/L	10 ml	0.39 mg/L J	1	0.07	0.50		10	10/4/18 12:38	N	III

CES 10/9/18

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

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609435 **Method/Testcode:** SM 5310 C/TOC D

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
Q1814369-12	Carbon, Dissolved Organic (DOC)	MS	K1809024-001	Water	31.79 mg/L	10 ml	31.8 mg/L	1	0.07	0.50	103		10/4/18 13:41	N	II
Q1814369-13	Carbon, Dissolved Organic (DOC)	DUP	K1809024-001	Water	5.74 mg/L	10 ml	5.74 mg/L	1	0.07	0.50		3	10/4/18 13:10	N	II
Q1814369-14	Carbon, Dissolved Organic (DOC)	DUP	K1809024-002	Water	2.68 mg/L	10 ml	2.68 mg/L	1	0.07	0.50		3	10/4/18 14:14	N	II
KQ1814369-15	Carbon, Dissolved Organic (DOC)	MB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 11:02	N	III
KQ1814369-16	Carbon, Dissolved Organic (DOC)	LCS		Ground Water	20.92 mg/L	10 ml	20.9 mg/L	1	0.07	0.50	96		10/4/18 11:18	N	III
KQ1814369-17	Carbon, Dissolved Organic (DOC)	CCV		Ground Water	24.74 mg/L	10 ml	24.7 mg/L	1			99		10/4/18 05:09	N	III
KQ1814369-18	Carbon, Dissolved Organic (DOC)	CCV		Ground Water	24.32 mg/L	10 ml	24.3 mg/L	1			97		10/4/18 10:29	N	III
KQ1814369-19	Carbon, Dissolved Organic (DOC)	CCV		Ground Water	24.68 mg/L	10 ml	24.7 mg/L	1			99		10/4/18 15:17	N	III
KQ1814369-20	Carbon, Dissolved Organic (DOC)	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 05:26	N	III
KQ1814369-21	Carbon, Dissolved Organic (DOC)	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 10:45	N	III
KQ1814369-22	Carbon, Dissolved Organic (DOC)	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 15:34	N	III

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

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609436 **Method/Testcode:** SM 5310 C/TOC T

b Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1808614-002	Carbon, Total Organic	N/A		Water	5.41 mg/L	10 ml	5.41 mg/L	1	0.07	0.50			10/4/18 14:46	N	IV
1808614-004	Carbon, Total Organic	N/A		Water	2.38 mg/L	10 ml	2.38 mg/L	1	0.07	0.50			10/4/18 15:50	N	IV
1808614-008	Carbon, Total Organic	N/A		Water	0.88 mg/L	10 ml	0.88 mg/L	1	0.07	0.50			10/4/18 16:22	N	IV
1808765-001	Carbon, Total Organic	N/A		Water	0.66 mg/L	10 mL	13 mg/L	20	2	10			10/5/18 01:11:00	N	IV
1808765-002	Carbon, Total Organic	N/A		Water	1.24 mg/L	10 mL	25 mg/L	20	2	10			10/5/18 02:31:00	N	IV
1808765-003	Carbon, Total Organic	N/A		Water	0.69 mg/L	10 mL	14 mg/L	20	2	10			10/5/18 03:03:00	N	IV
1808765-004	Carbon, Total Organic	N/A		Water	3.28 mg/L	10 mL	13.1 mg/L	4	0.3	2.0			10/5/18 03:35:00	N	IV
1808765-005	Carbon, Total Organic	N/A		Water	1.09 mg/L	10 mL	22 mg/L	20	2	10			10/5/18 04:07:00	N	IV
1809385-001	Carbon, Total Organic	N/A		Ground Water	111.82 mg/L	10 mL	2240 mg/L	20	2	10	–		10/4/18 22:00:00	Y	IV
1809385-002	Carbon, Total Organic	N/A		Ground Water	2.64 mg/L	10 mL	53 mg/L	20	2	10			10/4/18 23:03:00	N	IV
1809385-003	Carbon, Total Organic	N/A		Ground Water	2.60 mg/L	10 mL	52 mg/L	20	2	10			10/4/18 23:35:00	N	IV
1809385-004	Carbon, Total Organic	N/A		Ground Water	14.19 mg/L	10 mL	14.2 mg/L	1	0.07	0.50			10/5/18 00:07:00	N	IV
1809489-001	Carbon, Total Organic	N/A		Water	11.93 mg/L	10 ml	11.9 mg/L	1	0.07	0.50			10/4/18 19:50	N	IV
1809491-001	Carbon, Total Organic	N/A		Ground Water	0.87 mg/L	10 ml	0.87 mg/L	1	0.07	0.50			10/4/18 17:10	N	IV
1809491-002	Carbon, Total Organic	N/A		Ground Water	0.05 mg/L	10 ml	2.0 mg/L U	4	0.3	2.0			10/4/18 18:14	N	IV
1809491-003	Carbon, Total Organic	N/A		Ground Water	116.17 mg/L	10 ml	465 mg/L	4	0.3	2.0			10/4/18 18:46	N	IV
Q1814370-01	Carbon, Total Organic	DUP	K1808614-002	Water	5.06 mg/L	10 ml	5.06 mg/L	1	0.07	0.50		7	10/4/18 14:46	N	IV
Q1814370-02	Carbon, Total Organic	DUP	K1808614-004	Water	2.33 mg/L	10 ml	2.33 mg/L	1	0.07	0.50		2	10/4/18 15:50	N	IV
Q1814370-03	Carbon, Total Organic	DUP	K1808614-008	Water	0.84 mg/L	10 ml	0.84 mg/L	1	0.07	0.50		4	10/4/18 16:22	N	IV
Q1814370-04	Carbon, Total Organic	MS	K1809491-001	Ground Water	26.41 mg/L	10 ml	26.4 mg/L	1	0.07	0.50	102		10/4/18 17:42	N	IV
Q1814370-05	Carbon, Total Organic	DUP	K1809491-001	Ground Water	0.85 mg/L	10 ml	0.85 mg/L	1	0.07	0.50		2	10/4/18 17:10	N	IV
Q1814370-06	Carbon, Total Organic	DUP	K1809491-002	Ground Water	0.08 mg/L	10 ml	0.3 mg/L J	4	0.3	2.0		NC	10/4/18 18:14	N	IV
Q1814370-07	Carbon, Total Organic	DUP	K1809491-003	Ground Water	115.70 mg/L	10 ml	463 mg/L	4	0.3	2.0		<1	10/4/18 18:46	N	IV
Q1814370-08	Carbon, Total Organic	MS	K1809489-001	Water	34.39 mg/L	10 ml	34.4 mg/L	1	0.07	0.50	90		10/4/18 21:27	N	IV
Q1814370-09	Carbon, Total Organic	DUP	K1809489-001	Water	11.56 mg/L	10 ml	11.6 mg/L	1	0.07	0.50		3	10/4/18 19:50	N	IV
Q1814370-10	Carbon, Total Organic	MS	K1809385-001	Ground Water		10 mL	U	1						N	IV
Q1814370-11	Carbon, Total Organic	DUP	K1809385-001	Ground Water	108.67 mg/L	10 mL	2170 mg/L	20	2	10		3	10/4/18 22:00:00	N	IV
Q1814370-12	Carbon, Total Organic	DUP	K1809385-002	Ground Water	2.56 mg/L	10 mL	51 mg/L	20	2	10		3	10/4/18 23:03:00	N	IV

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

CES 10/9/18

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609436 **Method/Testcode:** SM 5310 C/TOC T

ab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
′Q1814370-13	Carbon, Total Organic	DUP	K1809385-003	Ground Water	2.32 mg/L	10 mL	46 mg/L	20	2	10		11*	10/4/18 23:35:00	N	IV
Q1814370-14	Carbon, Total Organic	DUP	K1809385-004	Ground Water	14.03 mg/L	10 mL	14.0 mg/L	1	0.07	0.50		1	10/5/18 00:07:00	N	IV
Q1814370-15	Carbon, Total Organic	MS	K1808765-001	Water	26.33 mg/L	10 mL	527 mg/L	20	2	10	103		10/5/18 01:43:00	N	IV
′Q1814370-16	Carbon, Total Organic	DUP	K1808765-001	Water	0.67 mg/L	10 mL	13 mg/L	20	2	10		2	10/5/18 01:11:00	N	IV
′Q1814370-17	Carbon, Total Organic	DUP	K1808765-002	Water	1.13 mg/L	10 mL	23 mg/L	20	2	10		10	10/5/18 02:31:00	N	IV
Q1814370-18	Carbon, Total Organic	DUP	K1808765-003	Water	0.68 mg/L	10 mL	14 mg/L	20	2	10		2	10/5/18 03:03:00	N	IV
′Q1814370-19	Carbon, Total Organic	DUP	K1808765-004	Water	3.17 mg/L	10 mL	12.7 mg/L	4	0.3	2.0		3	10/5/18 03:35:00	N	IV
′Q1814370-20	Carbon, Total Organic	DUP	K1808765-005	Water	1.00 mg/L	10 mL	20 mg/L	20	2	10		8	10/5/18 04:07:00	N	IV
′Q1814370-21	Carbon, Total Organic	MB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 20:55	N	IV
′Q1814370-21	Carbon, Total Organic	MB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 20:55	N	IV
Q1814370-22	Carbon, Total Organic	LCS		Water	20.85 mg/L	10 ml	20.8 mg/L	1	0.07	0.50	95		10/4/18 21:11	N	IV
Q1814370-22	Carbon, Total Organic	LCS		Water	20.85 mg/L	10 ml	20.8 mg/L	1	0.07	0.50	95		10/4/18 21:11	N	IV
′Q1814370-23	Carbon, Total Organic	CCV		Water	24.32 mg/L	10 ml	24.3 mg/L	1			97		10/4/18 10:29	N	IV
Q1814370-23	Carbon, Total Organic	CCV		Water	24.32 mg/L	10 ml	24.3 mg/L	1			97		10/4/18 10:29	N	IV
KQ1814370-24	Carbon, Total Organic	CCV		Water	24.68 mg/L	10 ml	24.7 mg/L	1			99		10/4/18 15:17	N	IV
KQ1814370-24	Carbon, Total Organic	CCV		Water	24.68 mg/L	10 ml	24.7 mg/L	1			99		10/4/18 15:17	N	IV
KQ1814370-25	Carbon, Total Organic	CCV		Water	24.45 mg/L	10 ml	24.4 mg/L	1			98		10/4/18 20:22	N	IV
KQ1814370-25	Carbon, Total Organic	CCV		Water	24.45 mg/L	10 ml	24.4 mg/L	1			98		10/4/18 20:22	N	IV
KQ1814370-26	Carbon, Total Organic	CCV		Water	24.60 mg/L	10 mL	24.6 mg/L	1			98		10/5/18 00:38:00	N	IV
KQ1814370-26	Carbon, Total Organic	CCV		Water	24.60 mg/L	10 mL	24.6 mg/L	1			98		10/5/18 00:38:00	N	IV
KQ1814370-27	Carbon, Total Organic	CCV		Water	23.96 mg/L	10 mL	24.0 mg/L	1			96		10/5/18 05:10:00	N	IV
KQ1814370-27	Carbon, Total Organic	CCV		Water	23.96 mg/L	10 mL	24.0 mg/L	1			96		10/5/18 05:10:00	N	IV
KQ1814370-28	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 10:45	N	IV
KQ1814370-28	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 10:45	N	IV
KQ1814370-29	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 15:34	N	IV
KQ1814370-29	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 15:34	N	IV
KQ1814370-30	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 20:38	N	IV
KQ1814370-30	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/4/18 20:38	N	IV
KQ1814370-31	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			10/5/18 00:55:00	N	IV
KQ1814370-31	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			10/5/18 00:55:00	N	IV
KQ1814370-32	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			10/5/18 05:26:00	N	IV
KQ1814370-32	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 mL	0.50 mg/L U	1	0.07	0.50			10/5/18 05:26:00	N	IV

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

StarLIMS Run: K1808614, 9036, 9040, 8827, 9156, 9024, 8614, 9491, 9489, 9385, 8765

Analysis: TOC, DOC

Method: SM 5310 C, 415.1

CCV: 11-GEN-05-69K 50 ppm LCS: 11-GEN-05-68N 21.9 ppm

ICAL Date: 3/13/18

ICAL ID: 11-GEN-05-65A

ICS ID: 11-GEN-05-67D

ICS TV: 25.0 ppm ICS % R = 0

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-05-69I

21 % H3PO4: 11-GEN-05-69J

Equipment ID: K-TOC-03

PIPETTE ID: 124276B, 129001F

FILTER ID: 16808142

Analyzed By: CES	Date Analyzed: 10/3/18
Reviewed By: JC	Date Reviewed: 10/9/18

DOC: 609428, 609435
TOC: 609436

Schedule: 10032018

Version: 11
Instrument: Fusion1
Last Saved by: Fusion1 (Fusion1)
Last Saved on: 2018/10/04 22:29 - Thursday

Position	Sample Type	Sample ID	Method ID (Calibration ID)	Reps
(Clean)	Clean	Clean		1
(Clean)	Clean	Clean		1
(Clean)	Clean	Clean		1
(Blank)	Blank	Reagent/Acid Blank		1
D	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
1	Sample	MB1	Extended Reaction 021711 (Extended Reaction 021711)	1
2	Check Standard	[TOC] LCS ER [21.9 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
3	Sample	ICS	Extended Reaction 021711 (Extended Reaction 021711)	1
4	Sample	K1808614-002.08 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
5	Sample	K1808614-004.08 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
6	Sample	K1808614-008.08 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
7	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
8	Sample	K1809036-001.13 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
9	Sample	K1809036-001.13 ms doc	Extended Reaction 021711 (Extended Reaction 021711)	1
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
10	Sample	K1809036-002.03 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
11	Sample	K1809036-003.03 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
12	Sample	K1809036-004.03 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
13	Sample	K1809036-005.03 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
14	Sample	K1809040-001.03 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
15	Sample	K1809040-001.03 ms doc	Extended Reaction 021711 (Extended Reaction 021711)	1
16	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
17	Sample	K1809040-002.03 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
18	Sample	K1808827-001.01 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
19	Sample	K1808827-001.01 ms doc	Extended Reaction 021711 (Extended Reaction 021711)	1
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
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	K1808827-002.01 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
22	Sample	K1808827-003.01 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
23	Sample	K1808827-004.01 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
24	Sample	K1808827-005.02 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
25	Sample	K1808827-006.02 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
26	Sample	K1808827-007.02 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
27	Sample	K1808827-008.02 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
28	Sample	K1808827-009.02 doc	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	K1808827-010.01 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
30	Sample	K1809156-001.14 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
31	Sample	K1809156-001.14 ms doc	Extended Reaction 021711 (Extended Reaction 021711)	1
32	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
33	Sample	K1809156-002.14 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
34	Sample	K1809156-003.14 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
35	Sample	K1809156-004.14 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
36	Sample	K1809156-005.14 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
37	Sample	K1809156-006.14 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
38	Sample	K1809156-007.14 doc	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

Schedule: 10032018

Position	Sample Type	Sample ID	Method ID (Calibration ID)	Reps
39	Sample	MB3	Extended Reaction 021711 (Extended Reaction 021711)	1
2	Check Standard	[TOC] LCS ER [21.9 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	
40	Sample	K1809156-008.14 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
41	Sample	K1809156-009.14 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
42	Sample	K1809156-010.14 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
43	Sample	K1809024-001.02 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
44	Sample	K1809024-001.02 ms doc	Extended Reaction 021711 (Extended Reaction 021711)	1
45	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
46	Sample	K1809024-002.02 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
47	Sample	K1808614-002.07	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
48	Sample	K1808614-004.07	Extended Reaction 021711 (Extended Reaction 021711)	2
49	Sample	K1808614-008.07	Extended Reaction 021711 (Extended Reaction 021711)	2
50	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
51	Sample	K1809491-001.02	Extended Reaction 021711 (Extended Reaction 021711)	2
52	Sample	K1809491-001.02 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
53	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
54	Sample	K1809491-002.02 4x	Extended Reaction 021711 (Extended Reaction 021711)	2
55	Sample	K1809491-003.01 4x	Extended Reaction 021711 (Extended Reaction 021711)	2
56	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
57	Sample	K1809489-001.01	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
58	Sample	MB4	Extended Reaction 021711 (Extended Reaction 021711)	1
2	Check Standard	[TOC] LCS ER [21.9 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
59	Sample	K1809489-001.01 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
60	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
61	Sample	K1809385-001.0120x	Extended Reaction 021711 (Extended Reaction 021711)	2
62	Sample	K1809385-001.01 ms 20x	Extended Reaction 021711 (Extended Reaction 021711)	1
63	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
64	Sample	K1809385-002.01 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
65	Sample	K1809385-003.01 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
66	Sample	K1809385-004.02 4x	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
67	Sample	K1808765-001.03 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
68	Sample	K1808765-001.03 ms 20x	Extended Reaction 021711 (Extended Reaction 021711)	1
69	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
70	Sample	K1808765-002.03 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
71	Sample	K1808765-003.03 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
72	Sample	K1808765-004.03 4x	Extended Reaction 021711 (Extended Reaction 021711)	2
73	Sample	K1808765-005.03 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
74	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
C	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1

Fusion Report - 10032018
Wednesday, October 03, 2018 12:47 PM

(View - Reps, Unused Reps, Meta-Data, Signature, History)
Printed on 2018/10/05 11:08 - Friday

Re.ort Summar Information

Company Location:	Gen Chem Lab		
Schedule Name:	10032018	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) (v1) Fusion1 (Fusion1) (v2) Fusion1 (Fusion1) (v3) Fusion1 (Fusion1) (v4) Fusion1 (Fusion1) (v5) Fusion1 (Fusion1) (v8) Fusion1 (Fusion1) (v9) Fusion1 (Fusion1) (v10) Fusion1 (Fusion1) (v11)		
Comment:			

Report Results

Sample Type: Clean — From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/10/03 12:47

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	13.93	17.98	4.04	49.00	05:26
2	TC Clean	9.40	13.47	4.08	50.18	04:02
3	TC Clean	2.67	6.68	4.01	50.26	03:45
4	TC Clean	1.89	6.01	4.12	50.21	03:47

Sample Type: Clean — From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/10/03 13:09

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	1.11	4.92	3.81	49.08	05:13

2	TC Clean	4.63	8.41	3.78	50.09	04:04
3	TC Clean	2.02	6.00	3.98	50.17	03:49
4	TC Clean	1.31	5.43	4.12	50.15	03:50

Sample Type: Clean From Schedule Version 2

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/10/03 13:31

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	9.18	13.01	3.83	49.27	05:20
2	TC Clean	4.27	8.11	3.84	50.23	04:02
3	TC Clean	1.67	5.75	4.08	50.11	03:53
4	TC Clean	1.26	5.21	3.95	50.20	03:54

Sample Type: Blank (Creating v1155) From Schedule Version 3

	Pos	Analysis Type	Sample ID	Start Time
◈	(blank)		Reagent/Acid Blank	2018/10/03 13:53

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.90	4.67	3.78	49.22	05:27
2	TC Clean	3.87	7.61	3.74	50.14	04:02
3	TC Clean	1.53	5.43	3.90	50.15	03:48
4	TC Clean	1.56	5.42	3.86	50.10	03:54
5	Reagent Blank	5.08	8.98	3.91	50.22	05:09
6	Acid Blank	1.66	5.40	3.74	49.24	05:34

Sample Type: Sample From Schedule Version 4

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	D	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/03 14:27

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.96	16.77	3.81	50.18	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

ample Type: Check Standard --> CCV 021711 From Schedule Version 5

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	24.3133 ppm (PASS)	0.0000 ppm	0%	2018/10/03 14:43

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.3133	243.1331	188.58	192.49	3.91	50.17	12:31

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 8

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/03 15:00

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	12.21	16.00	3.79	50.15	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
◈	1	TOC	MB1	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/03 15:17

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	11.23	15.12	3.89	50.15	12:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> LCS ER From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	2	TOC	21.9000	1:1	[TOC] LCS ER [21.9 ppm]	0 / infinity (NA / NA)	21.1109 ppm (PASS)	0.0000 ppm	0%	2018/10/03 15:33

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressur	R Time
2	TOC	21.9 ppm	1	21.1109	211.1088	165.76	169.58	3.81	50.14	12:32

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 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	3	TOC	ICS	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/03 15:50

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	13.79	17.65	3.86	50.14	12:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	4	TOC	K1808614-002.08 doc	5.0786 ppm	0.0919 ppm	1.8100%	2018/10/03 16:06

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	5.1436	51.4362	50.78	54.63	3.84	50.19	12:25
2	TOC	5.0137	50.1367	49.86	53.84	3.98	50.17	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	5	TOC	K1808614-004.08 doc	2.4172 ppm	0.1564 ppm	6.4700%	2018/10/03 16:38

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.5278	25.2776	32.14	35.98	3.83	50.15	12:26
2	TOC	2.3066	23.0660	30.57	34.46	3.89	50.10	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	6	TOC	K1808614-008.08 doc	1.0051 ppm	0.0251 ppm	2.5000%	2018/10/03 17:09

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.0229	10.2288	21.42	25.43	4.02	50.08	12:26
2	TOC	0.9874	9.8737	21.17	25.01	3.84	50.19	12:27

Dilution	Blank Contribution	Method	Calibration
	TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	7	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/03 17:41

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	11.06	14.89	3.83	50.16	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	8	TOC	K1809036-001.13 doc	0.2158 ppm	0.0096 ppm	4.4600%	2018/10/03 17:57

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.2090	2.0897	15.62	19.59	3.97	50.15	12:26
2	TOC	0.2226	2.2259	15.72	19.45	3.73	50.19	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	9	TOC	K1809036-001.13 ms doc	25.6867 ppm	0.0000 ppm	0.0000%	2018/10/03 18:29

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	25.6867	256.8670	197.18	201.08	3.91	50.15	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	24.8373 ppm (PASS)	0.0000 ppm	0%	2018/10/03 18:45

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

B	TOC	25 ppm	1	24.8373	248.3730	192.32	196.13	3.81	50.14	12:31

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 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/03 19:02

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	11.27	15.11	3.83	50.10	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 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	10	TOC	K1809036-002.03 doc	0.2409 ppm	0.0328 ppm	13.6300%	2018/10/03 19:18

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.2641	2.6412	16.01	19.90	3.89	50.08	12:26
2	TOC	0.2177	2.1767	15.68	19.75	4.06	50.09	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	11	TOC	K1809036-003.03 doc	0.8483 ppm	0.0701 ppm	8.2600%	2018/10/03 19:50

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.8978	8.9785	20.53	24.46	3.94	50.07	12:29
2	TOC	0.7988	7.9877	19.82	23.72	3.90	50.08	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	12	TOC	K1809036-004.03 doc	2.1522 ppm	0.0016 ppm	0.0700%	2018/10/03 20:22

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time

1	TOC	2.1511	21.5112	29.46	33.39	3.93	50.07	12:24
2	TOC	2.1534	21.5336	29.48	33.37	3.89	50.08	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
13	TOC	K1809036-005.03 doc	0.2276 ppm	0.0416 ppm	18.2700%	2018/10/03 20:54

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.2570	2.5697	15.96	19.60	3.64	50.07	12:27
2	TOC	0.1982	1.9817	15.54	19.34	3.80	50.08	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
14	TOC	K1809040-001.03 doc	0.9579 ppm	0.0508 ppm	5.3000%	2018/10/03 21:25

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.9938	9.9383	21.21	24.96	3.75	50.07	12:27
2	TOC	0.9220	9.2198	20.70	24.44	3.74	50.05	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
15	TOC	K1809040-001.03 ms doc	26.7344 ppm	0.0000 ppm	0.0000%	2018/10/03 21:57

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	26.7344	267.3439	204.64	208.34	3.70	50.04	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
16	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/03 22:13

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	11.99	15.82	3.83	50.05	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time

◈	17	TOC	K1809040-002.03 doc	2.5170 ppm	0.0001 ppm	0.0000%	2018/10/03 22:30

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.5171	25.1709	32.07	35.86	3.79	50.04	12:26
2	TOC	2.5170	25.1695	32.07	35.92	3.86	50.02	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	18	TOC	K1808827-001.01 doc	2.2546 ppm	0.0438 ppm	1.9400%	2018/10/03 23:01

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.2856	22.8555	30.42	34.42	4.00	50.00	12:28
2	TOC	2.2237	22.2367	29.98	33.85	3.88	49.99	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	19	TOC	K1808827-001.01 ms doc	28.1837 ppm	0.0000 ppm	0.0000%	2018/10/03 23:33

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	28.1837	281.8370	214.97	218.84	3.87	49.98	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	24.5394 ppm (PASS)	0.0000 ppm	0%	2018/10/03 23:49

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.5394	245.3938	190.20	194.13	3.93	49.96	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

Sample Type: Check Standard --> CCB 021711 From Schedule Version 10

	Pos	BAT	Concentration	Dil	Sample ID	Min / Max	Result	Std. Dev.	RSD	Start Time

			(ppm)			(% dev)				
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/04 00:06

Pos	Base Analysis ype	ID	Rep	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	11.81	15.62	3.81	49.94	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 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	20	TOC	MB2	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/04 00:23

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	10.71	14.57	3.86	49.93	12:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> LCS ER — From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	2	TOC	21.9000	1:1	[TOC] LCS ER [21.9 ppm]	0 / infinity (NA / NA)	20.8374 ppm (PASS)	0.0000 ppm	0%	2018/10/04 00:39

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	20.8374	208.3738	163.81	167.67	3.85	49.91	12:32

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 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	21	TOC	K1808827-002.01 doc	3.0732 ppm	0.1607 ppm	5.2300%	2018/10/04 00:55

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.1869	31.8688	36.84	40.75	3.91	49.92	12:26
2	TOC	2.9595	29.5955	35.22	39.24	4.02	49.91	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◇	22	TOC	K1808827-003.01.doc	2.9860 ppm	0.0557 ppm	1.8600%	2018/10/04 01:27

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.0254	30.2536	35.69	39.70	4.01	49.90	12:28
2	TOC	2.9466	29.4664	35.13	39.08	3.95	49.91	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◇	23	TOC	K1808827-004.01.doc	2.1045 ppm	0.0892 ppm	4.2400%	2018/10/04 01:59

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.1675	21.6754	29.58	33.44	3.87	49.88	12:24
2	TOC	2.0414	20.4138	28.68	32.56	3.89	49.87	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◇	24	TOC	K1808827-005.02.doc	1.7397 ppm	0.0214 ppm	1.2300%	2018/10/04 02:30

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.7548	17.5483	26.64	30.43	3.79	49.88	12:28
2	TOC	1.7245	17.2452	26.42	30.27	3.85	49.87	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◇	25	TOC	K1808827-006.02.doc	1.1564 ppm	0.0575 ppm	4.9700%	2018/10/04 03:02

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.1970	11.9703	22.66	26.35	3.69	49.86	12:25
2	TOC	1.1158	11.1578	22.08	26.03	3.95	49.85	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◇	26	TOC	K1808827-007.02.doc	0.3907 ppm	0.0383 ppm	9.8000%	2018/10/04 03:34

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.4178	4.1778	17.11	21.02	3.92	49.84	12:25
2	TOC	0.3636	3.6362	16.72	20.50	3.78	49.84	12:26

Dilution	Blank Contribution	Method	Calibration
:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reactio 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	27	TOC	K1808827-008.02 doc	0.0164 ppm	0.0232 ppm	141.4200%	2018/10/04 04:05

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	14.10	17.90	3.80	49.83	12:29
2	TOC	0.0329	0.3286	14.36	18.09	3.73	49.82	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	28	TOC	K1808827-009.02 doc	1.5506 ppm	0.0493 ppm	3.1800%	2018/10/04 04:37

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.5855	15.8545	25.43	29.10	3.67	49.82	12:26
2	TOC	1.5157	15.1571	24.93	28.77	3.84	49.80	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	24.7372 ppm (PASS)	0.0000 ppm	0%	2018/10/04 05:09

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.7372	247.3724	191.60	195.47	3.86	49.81	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 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time

◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/04 05:26

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
	TOC	0.0 ppm	1	0.0000	0.0000	11.60	15.43	3.83	49.81	:3

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 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	29	TOC	K1808827-010.01 doc	1.2847 ppm	0.0071 ppm	0.5600%	2018/10/04 05:42

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.2898	12.8978	23.32	27.21	3.89	49.79	12:27
2	TOC	1.2797	12.7968	23.25	27.09	3.84	49.81	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	30	TOC	K1809156-001.14 doc	2.2863 ppm	0.1167 ppm	5.1000%	2018/10/04 06:14

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.3688	23.6877	31.01	34.77	3.76	49.78	12:28
2	TOC	2.2037	22.0374	29.83	33.77	3.94	49.76	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	31	TOC	K1809156-001.14 ms doc	28.3959 ppm	0.0000 ppm	0.0000%	2018/10/04 06:46

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	28.3959	283.9588	216.48	220.28	3.80	49.77	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	32	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/04 07:02

Rep	Base			Adjusted		Baseline	Pressure	Run

#	Analysis Type	ppm	µg	(Abs)	NDIR (Abs)	(Abs)	(psig)	Time
1	TOC	0.0000	0.0000	12.31	16.17	3.86	49.76	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	33	TOC	K1809156-002.14 doc	0.4192 ppm	0.0447 ppm	10.6500%	2018/10/04 07:19

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.3876	3.8761	16.89	20.65	3.76	49.74	12:28
2	TOC	0.4508	4.5076	17.34	21.18	3.84	49.76	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	34	TOC	K1809156-003.14 doc	0.3472 ppm	0.0754 ppm	21.7200%	2018/10/04 07:50

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.4005	4.0052	16.98	20.72	3.74	49.75	12:28
2	TOC	0.2939	2.9387	16.22	20.17	3.95	49.76	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	35	TOC	K1809156-004.14 doc	1.0056 ppm	0.0258 ppm	2.5700%	2018/10/04 08:22

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.0239	10.2386	21.43	25.15	3.72	49.76	12:25
2	TOC	0.9874	9.8737	21.17	25.05	3.88	49.77	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	36	TOC	K1809156-005.14 doc	0.0051 ppm	0.0073 ppm	141.4200%	2018/10/04 08:54

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0103	0.1027	14.20	18.01	3.81	49.79	12:26
2	TOC	0.0000	0.0000	13.86	17.71	3.85	49.83	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	37	TOC	K1809156-006.14 doc	0.5536 ppm	0.0425 ppm	7.6700%	2018/10/04 09:25

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.5837	5.8365	18.29	22.04	3.75	49.81	12:23
2	TOC	0.5236	5.2359	17.86	21.83	3.97	49.83	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	38	TOC	K1809156-007.14 doc	0.3063 ppm	0.0577 ppm	18.8200%	2018/10/04 09:57

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.3471	3.4706	16.60	20.48	3.88	49.86	12:24
2	TOC	0.2655	2.6553	16.02	20.02	3.99	49.87	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	24.3229 ppm (PASS)	0.0000 ppm	0%	2018/10/04 10:29

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.3229	243.2285	188.65	192.45	3.80	49.86	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 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/04 10:45

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	11.07	14.99	3.92	50.06	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 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. De . (ppmC)	RSD	Start Time
◈	39	TOC	MB3	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/04 11:02

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	10.43	14.15	3.72	50.00	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> LCS ER — From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	2	TOC	21.9000	1:1	[TOC] LCS ER [21.9 ppm]	0 / infinity (NA / NA)	20.9241 ppm (PASS)	0.0000 ppm	0%	2018/10/04 11:18

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	20.9241	209.2410	164.43	168.37	3.94	49.99	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 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	40	TOC	K1809156-008.14 doc	0.0893 ppm	0.0881 ppm	98.7000%	2018/10/04 11:34

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.1516	1.5158	15.21	19.01	3.80	50.06	12:27
2	TOC	0.0270	0.2697	14.32	18.17	3.85	50.01	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	41	TOC	K1809156-009.14 doc	0.2325 ppm	0.0980 ppm	42.1600%	2018/10/04 12:06

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time

1	TOC	0.3019	3.0187	16.28	20.14	3.86	50.15	12:26
2	TOC	0.1632	1.6323	15.29	19.10	3.80	50.11	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	42	TOC	K1809156-010.14 doc	0.4148 ppm	0.0292 ppm	7.0300%	2018/10/04 12:38

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.4355	4.3546	17.23	20.97	3.74	50.23	12:27
2	TOC	0.3942	3.9421	16.94	20.66	3.73	50.14	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	43	TOC	K1809024-001.02 doc	5.8372 ppm	0.1348 ppm	2.3100%	2018/10/04 13:10

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	5.9325	59.3254	56.41	60.21	3.80	50.17	12:25
2	TOC	5.7418	57.4184	55.05	59.05	4.01	50.09	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	44	TOC	K1809024-001.02 ms doc	31.7852 ppm	0.0000 ppm	0.0000%	2018/10/04 13:41

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	31.7852	317.8523	240.64	244.33	3.69	50.12	12:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	45	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/04 13:58

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.07	15.83	3.76	50.14	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time

◈	46	TOC	K1809024-002.02 doc	2.7272 ppm	0.0620 ppm	2.2700%	2018/10/04 14:14

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.7711	27.7109	33.88	37.50	3.62	50.17	12:22
2	TOC	2.6834	26.8338	33.25	37.33	4.08	50.13	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	47	TOC	K1808614-002.07	5.2330 ppm	0.2449 ppm	4.6800%	2018/10/04 14:46

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	5.4062	54.0617	52.66	56.54	3.89	50.16	12:23
2	TOC	5.0598	50.5984	50.19	54.23	4.04	50.23	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	24.6820 ppm (PASS)	0.0000 ppm	0%	2018/10/04 15:17

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.6820	246.8195	191.21	195.03	3.81	50.11	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 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/04 15:34

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	10.71	14.62	3.92	50.18	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 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	48	TOC	K1808614-004.07	2.3545 ppm	0.0317 ppm	1.3400%	2018/10/04 15:50

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.3769	23.7691	31.07	34.92	3.86	50.23	12:23
2	TOC	2.3321	23.3214	30.75	34.48	3.73	50.18	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	49	TOC	K1808614-008.07	0.8581 ppm	0.0260 ppm	3.0300%	2018/10/04 16:22

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.8765	8.7652	20.38	24.13	3.76	50.19	12:23
2	TOC	0.8397	8.3975	20.11	23.97	3.85	50.24	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	50	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/04 16:54

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	9.94	13.83	3.90	50.17	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	51	TOC	K1809491-001.02	0.8613 ppm	0.0136 ppm	1.5800%	2018/10/04 17:10

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.8709	8.7090	20.34	24.20	3.87	50.23	12:21
2	TOC	0.8517	8.5168	20.20	24.06	3.86	50.36	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	52	TOC	K1809491-001.02 ms	26.4060 ppm	0.0000 ppm	0.0000%	2018/10/04 17:42

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time

1	TOC	26.4060	264.0602	202.30	206.08	3.78	50.23	12:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

s	Analysis Type	ample ID	Result (ppmC)	Std. Dev. (ppmC	RSD	Start Time
53	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/04 17:58

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	10.82	14.66	3.84	50.30	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
54	TOC	K1809491-002.02 4x	0.0644 ppm	0.0206 ppm	32.0300%	2018/10/04 18:14

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0498	0.4984	14.49	18.36	3.87	50.23	12:21
2	TOC	0.0790	0.7903	14.69	18.61	3.92	50.26	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
55	TOC	K1809491-003.01 4x	115.9334 ppm	0.3311 ppm	0.2900%	2018/10/04 18:46

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	116.1676	1161.6758	841.96	845.92	3.97	50.20	12:24
2	TOC	115.6993	1156.9931	838.62	843.40	4.78	50.19	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
56	TOC	RB	0.6779 ppm	0.9587 ppm	141.4200%	2018/10/04 19:18

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.3559	13.5588	23.79	28.16	4.37	50.18	12:26
2	TOC	0.0000	0.0000	13.59	17.53	3.95	50.18	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
57	TOC	K1809489-001.01	11.7456 ppm	0.2677 ppm	2.2800%	2018/10/04 19:50

K1809489-001.01

11.9349 ppm CES 10/5/18
11.5563 ppm

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◉	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	24.4486 ppm (PASS)	0.0000 ppm	0%	2018/10/04 20:22

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.4486	244.4859	189.55	193.35	3.80	50.22	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

Sample Type: Check Standard --> CCB 021711 From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◉	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/04 20:38

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	10.99	14.87	3.88	50.26	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 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◉	58	TOC	MB4	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/04 20:55

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	10.44	14.34	3.90	50.19	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> LCS ER From Schedule Version 10

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	2	TOC	21.9000	1:1	[TOC] LCS ER 1.9 ppm]	0 / infinity (NA / NA)	20.8497 ppm (PASS)	0.0000 m	0%	2018/10/04 21:11

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	20.8497	208.4973	163.90	167.75	3.85	50.07	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 10

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	59	TOC	K1809489-001.01 ms	34.3893 ppm	0.0000 ppm	0.0000%	2018/10/04 21:27

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	34.3893	343.8930	259.19	263.15	3.96	50.04	12:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	60	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/04 21:44

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	11.90	15.91	4.01	50.08	12:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	61	TOC	K1809385-001.0120x	110.2419 ppm	2.2247 ppm	2.0200%	2018/10/04 22:00

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	111.8150	1118.1502	810.94	814.63	3.69	50.16	12:27
2	TOC	108.6689	1086.6886	788.52	792.88	4.36	50.19	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Sample From Schedule Version 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	63	TOC	RB	0.2509 ppm	0.3549 ppm	141.4200%	2018/10/04 22:32

Rep	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run T
1	TOC	0.5018	5.0184	17.71	22.01	4.30	50.19	12:25
2	TOC	0.0000	0.0000	12.24	16.20	3.96	50.21	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	64	TOC	K1809385-002.01 20x	2.5969 ppm	0.0577 ppm	2.2200%	2018/10/04 23:03

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.6376	26.3764	32.93	36.72	3.79	50.20	12:25
2	TOC	2.5561	25.5610	32.34	36.27	3.92	50.22	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	65	TOC	K1809385-003.01 20x	2.4556 ppm	0.1974 ppm	8.0400%	2018/10/04 23:35

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.5951	25.9512	32.62	36.47	3.84	50.17	12:26
2	TOC	2.3160	23.1600	30.63	34.77	4.13	50.17	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	66	TOC	K1809385-004.02 4x	14.1077 ppm	0.1142 ppm	0.8100%	2018/10/05 00:07

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	14.1885	141.8848	115.24	119.30	4.06	50.17	12:24
2	TOC	14.0270	140.2696	114.09	118.17	4.09	50.16	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 11

	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)	24.5965 ppm (PASS)	0.0000 ppm	0%	2018/10/05 00:38

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.5965	245.9649	190.60	194.47	3.87	50.14	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 11

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/05 00:55

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	11.26	15.34	4.08	50.12	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 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	67	TOC	K1808765-001.03 20x	0.6606 ppm	0.0073 ppm	1.1100%	2018/10/05 01:11

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.6554	6.5536	18.80	22.85	4.05	50.11	12:26
2	TOC	0.6657	6.6574	18.87	22.69	3.82	50.10	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	68	TOC	K1808765-001.03 ms 20x	26.3255 ppm	0.0000 ppm	0.0000%	2018/10/05 01:43

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	26.3255	263.2547	201.73	205.63	3.91	50.11	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	69	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/05 02:00

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
	TOC	0.000	0.0000	11.5	15.38	3.85	50.10	12:26
2	TOC	0.0000	0.0000	10.80	14.63	3.83	50.10	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	70	TOC	K1808765-002.03 20x	1.1830 ppm	0.0814 ppm	6.8800%	2018/10/05 02:31

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.2405	12.4053	22.97	26.73	3.76	50.10	12:28
2	TOC	1.1255	11.2546	22.15	26.03	3.88	50.11	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	71	TOC	K1808765-003.03 20x	0.6863 ppm	0.0100 ppm	1.4600%	2018/10/05 03:03

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.6934	6.9339	19.07	22.89	3.82	50.11	12:25
2	TOC	0.6792	6.7921	18.97	22.84	3.87	50.10	12:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	72	TOC	K1808765-004.03 4x	3.2232 ppm	0.0785 ppm	2.4400%	2018/10/05 03:35

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.2787	32.7866	37.49	41.36	3.87	50.08	12:27
2	TOC	3.1677	31.6766	36.70	40.69	3.99	50.08	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	73	TOC	K1808765-005.03 20x	1.0477 ppm	0.0617 ppm	5.8900%	2018/10/05 04:07

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.0914	10.9136	21.91	25.84	3.93	50.08	12:26

2	TOC	1.0041	10.0407	21.28	25.24	3.95	50.07	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	P	s	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	74		TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/05 04:38

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	10.22	14.19	3.98	50.09	12:25
2	TOC	0.0000	0.0000	10.44	14.41	3.97	50.07	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1298 (IC) (v1155)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 11

	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)	23.9597 ppm (PASS)	0.0000 ppm	0%	2018/10/05 05:10

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	23.9597	239.5968	186.06	189.99	3.93	50.07	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 11

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	C	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/05 05:26

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
C	TOC	0.0 ppm	1	0.0000	0.0000	10.81	14.78	3.97	50.06	12:31

Completion State	Success Action	Method	Calibration	STD Conc - Pos C
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
15	1.9667	1.3590	0.0000	0.0000	0.0000	2018/09/26 16:47	Fusion1 (Fusion
v1155	1.6920	1.6620	0.0000	0.0000	0.0000	2018/10/03 14:27	Fusion1 (Fusion1)

Calibrations

Name: Extended Reaction 021711 (TOC)

Version: v17
Ver Creation: 2018/03/13 21:33
Comment:
Operator: Fusion1 (Fusion1)
Basic Analysis Type: TOC

Calibration curve formula: TOC: y = 7.126x + 15.324
r^2 value: TOC: r^2 = 0.99994

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
1.00 ppm	21.6980	1.0000		2018/03/13 20:28
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
Ver Creation: 2013/02/04 11:44
Comment:
Operator: Gen Chem Lab (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

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

PreSpargeTime	4.00 mins	SyringeSpeedDIWater	7
SystemFlow	500 ml/min	NDIRPressurization	60 psig
		SyringeSpeedSampleDispense	5
		SyringeSpeedSampleAspirate	4
		SyringeSpeedUVDispense	7
		yringeSpeedU spira e	
		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	2018/10/05 05:46

Work Request # (Original) K180 9036, 8731, 8732, 8850, 9491, 9385, 8852, 8870, 8891, 8911, 9017, 8910

Tier: III I IV IV IV IV II IV II IV IV IV

Date Analyzed: 10/5/18

Analyst: CES

Run # TOC: 609741, 609744, 609745

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:

8852 Received past hold

9036-2, 5, 8732-3, 8870-13, 8911-12 RPD not within acceptance limits. The sample results are less than 5x the MRL.

RA Run 609745 - LCS fail.

RA 9385-1 over cal range, 8732-1, 2 over diluted.

Final Approved by: [signature] Date: 10/10/18

DQREPORT

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609741 **Method/Testcode:** SM 5310 C/TOC T

ab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1808731-001	Carbon, Total Organic	N/A		Reagent Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/5/18 20:26	N	I
1808731-002	Carbon, Total Organic	N/A		Reagent Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/5/18 20:57	N	I
1808732-001	Carbon, Total Organic	N/A		Water	0.39 mg/L	10 ml	10 mg/L U	20	2	10			10/5/18 21:29	N	IV
1808732-002	Carbon, Total Organic	N/A		Water	0.00 mg/L	10 ml	10 mg/L U	20	2	10			10/5/18 22:49	N	IV
1808732-003	Carbon, Total Organic	N/A		Water	1.00 mg/L	10 ml	1.00 mg/L	1	0.07	0.50			10/5/18 23:52	N	IV
1808850-004	Carbon, Total Organic	N/A		Water	3.88 mg/L	10 ml	78 mg/L	20	2	10			10/6/18 00:24	N	IV
1808850-005	Carbon, Total Organic	N/A		Water	2.11 mg/L	10 ml	42 mg/L	20	2	10			10/6/18 02:49	N	IV
1808850-006	Carbon, Total Organic	N/A		Water	5.30 mg/L	10 ml	21.2 mg/L	4	0.3	2.0			10/6/18 03:21	N	IV
1808850-007	Carbon, Total Organic	N/A		Water	3.74 mg/L	10 ml	75 mg/L	20	2	10			10/6/18 03:53	N	IV
1808850-008	Carbon, Total Organic	N/A		Water	2.09 mg/L	10 ml	20.9 mg/L	10	0.7	5.0			10/6/18 04:24	N	IV
1808850-009	Carbon, Total Organic	N/A		Water	1.03 mg/L	10 ml	10.3 mg/L	10	0.7	5.0			10/6/18 04:56	N	IV
1809036-001	Carbon, Total Organic	N/A		Ground Water	0.34 mg/L	10 ml	0.34 mg/L J	1	0.07	0.50			10/5/18 16:41	Y	III
1809036-002	Carbon, Total Organic	N/A		Ground Water	0.28 mg/L	10 ml	0.28 mg/L J	1	0.07	0.50			10/5/18 17:46	N	III
1809036-003	Carbon, Total Organic	N/A		Ground Water	0.01 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/5/18 18:18	N	III
1809036-004	Carbon, Total Organic	N/A		Ground Water	2.40 mg/L	10 ml	2.40 mg/L	1	0.07	0.50			10/5/18 18:49	N	III
1809036-005	Carbon, Total Organic	N/A		Ground Water	0.36 mg/L	10 ml	0.36 mg/L J	1	0.07	0.50			10/5/18 19:54	N	III
1809385-001	Carbon, Total Organic	N/A		Ground Water	57.68 mg/L	10 ml	2880 mg/L	50	4	25			10/6/18 07:36	Y	IV
1809491-002	Carbon, Total Organic	N/A		Ground Water	2.21 mg/L	10 ml	2.21 mg/L	1	0.07	0.50			10/6/18 05:28	N	IV
1809491-003	Carbon, Total Organic	N/A		Ground Water	22.43 mg/L	10 ml	1120 mg/L	50	4	25			10/6/18 06:32	N	IV
Q1814385-01	Carbon, Total Organic	MS	K1809036-001	Ground Water	25.48 mg/L	10 ml	25.5 mg/L	1	0.07	0.50	101		10/5/18 17:13	N	III
Q1814385-02	Carbon, Total Organic	DUP	K1809036-001	Ground Water	0.32 mg/L	10 ml	0.32 mg/L J	1	0.07	0.50		7	10/5/18 16:41	N	III
Q1814385-03	Carbon, Total Organic	DUP	K1809036-002	Ground Water	0.22 mg/L	10 ml	0.22 mg/L J	1	0.07	0.50		26*	10/5/18 17:46	N	III
Q1814385-04	Carbon, Total Organic	DUP	K1809036-003	Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	10/5/18 18:18	N	III
KQ1814385-05	Carbon, Total Organic	DUP	K1809036-004	Ground Water	2.29 mg/L	10 ml	2.29 mg/L	1	0.07	0.50		4	10/5/18 18:49	N	III
KQ1814385-06	Carbon, Total Organic	DUP	K1809036-005	Ground Water	0.31 mg/L	10 ml	0.31 mg/L J	1	0.07	0.50		16*	10/5/18 19:54	N	III
KQ1814385-07	Carbon, Total Organic	DUP	K1808731-001	Reagent Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	10/5/18 20:26	N	I
KQ1814385-08	Carbon, Total Organic	DUP	K1808731-002	Reagent Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	10/5/18 20:57	N	I

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

10/9/18

10/10/18

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609741 **Method/Testcode:** SM 5310 C/TOC T

La	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
KQ1814385-09	Carbon, Total Organic	MS	K1808732-001	Water	26.05 mg/L	10 ml	521 mg/L	20	2	10	104		10/5/18 22:01	N	IV
KQ1814385-10	Carbon, Total Organic	DUP	K1808732-001	Water	0.34 mg/L	10 ml	7 mg/L J	20	2	10		NC	10/5/18 21:29	N	IV
KQ1814385-11	Carbon, Total Organic	DUP	K1808732-002	Water	0.00 mg/L	10 ml	10 mg/L U	20	2	10		NC	10/5/18 22:49	N	IV
Q1814385-12	Carbon, Total Organic	DUP	K1808732-003	Water	0.89 mg/L	10 ml	0.89 mg/L	1	0.07	0.50		12*	10/5/18 23:52	N	IV
KQ1814385-13	Carbon, Total Organic	DUP	K1808850-004	Water	3.75 mg/L	10 ml	75 mg/L	20	2	10		3	10/6/18 00:24	N	IV
KQ1814385-14	Carbon, Total Organic	DUP	K1808850-005	Water	2.12 mg/L	10 ml	42 mg/L	20	2	10		<1	10/6/18 02:49	N	IV
KQ1814385-15	Carbon, Total Organic	DUP	K1808850-006	Water	5.11 mg/L	10 ml	20.4 mg/L	4	0.3	2.0		4	10/6/18 03:21	N	IV
KQ1814385-16	Carbon, Total Organic	DUP	K1808850-007	Water	3.49 mg/L	10 ml	70 mg/L	20	2	10		7	10/6/18 03:53	N	IV
KQ1814385-17	Carbon, Total Organic	DUP	K1808850-008	Water	1.97 mg/L	10 ml	19.7 mg/L	10	0.7	5.0		6	10/6/18 04:24	N	IV
KQ1814385-18	Carbon, Total Organic	DUP	K1808850-009	Water	0.96 mg/L	10 ml	9.6 mg/L	10	0.7	5.0		7	10/6/18 04:56	N	IV
KQ1814385-19	Carbon, Total Organic	DUP	K1809491-002	Ground Water	2.14 mg/L	10 ml	2.14 mg/L	1	0.07	0.50		3	10/6/18 05:28	N	IV
KQ1814385-20	Carbon, Total Organic	DUP	K1809491-003	Ground Water	21.83 mg/L	10 ml	1090 mg/L	50	4	25		3	10/6/18 06:32	N	IV
KQ1814385-21	Carbon, Total Organic	MS	K1809385-001	Ground Water	80.16 mg/L	10 ml	4010 mg/L	50	4	25	90		10/6/18 08:07	N	IV
KQ1814385-22	Carbon, Total Organic	DUP	K1809385-001	Ground Water	55.17 mg/L	10 ml	2760 mg/L	50	4	25		4	10/6/18 07:36	N	IV
Q1814385-23	Carbon, Total Organic	MB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/5/18 15:51	N	III
KQ1814385-23	Carbon, Total Organic	MB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/5/18 15:51	N	III
KQ1814385-24	Carbon, Total Organic	MB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 01:28	N	III
KQ1814385-24	Carbon, Total Organic	MB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 01:28	N	III
KQ1814385-25	Carbon, Total Organic	LCS		Ground Water	20.74 mg/L	10 ml	20.7 mg/L	1	0.07	0.50	95		10/5/18 16:08	N	III
KQ1814385-25	Carbon, Total Organic	LCS		Ground Water	20.74 mg/L	10 ml	20.7 mg/L	1	0.07	0.50	95		10/5/18 16:08	N	III
KQ1814385-26	Carbon, Total Organic	LCS		Ground Water	20.23 mg/L	10 ml	20.2 mg/L	1	0.07	0.50	92		10/6/18 01:45	N	III
KQ1814385-26	Carbon, Total Organic	LCS		Ground Water	20.23 mg/L	10 ml	20.2 mg/L	1	0.07	0.50	92		10/6/18 01:45	N	III
KQ1814385-27	Carbon, Total Organic	CCV		Ground Water	24.60 mg/L	10 ml	24.6 mg/L	1			98		10/5/18 15:18	N	III
KQ1814385-27	Carbon, Total Organic	CCV		Ground Water	24.60 mg/L	10 ml	24.6 mg/L	1			98		10/5/18 15:18	N	III
KQ1814385-28	Carbon, Total Organic	CCV		Ground Water	24.85 mg/L	10 ml	24.8 mg/L	1			99		10/5/18 19:21	N	III
KQ1814385-28	Carbon, Total Organic	CCV		Ground Water	24.85 mg/L	10 ml	24.8 mg/L	1			99		10/5/18 19:21	N	III
KQ1814385-29	Carbon, Total Organic	CCV		Ground Water	24.54 mg/L	10 ml	24.5 mg/L	1			98		10/6/18 00:55	N	III

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609741 **Method/Testcode:** SM 5310 C/TOC T

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
Q1814385-29	Carbon, Total Organic	CCV		Ground Water	24.54 mg/L	10 ml	24.5 mg/L	1			98		10/6/18 00:55	N	III
Q1814385-30	Carbon, Total Organic	CCV		Ground Water	25.17 mg/L	10 ml	25.2 mg/L	1			101		10/6/18 05:59	N	III
KQ1814385-30	Carbon, Total Organic	CCV		Ground Water	25.17 mg/L	10 ml	25.2 mg/L	1			101		10/6/18 05:59	N	III
KQ1814385-31	Carbon, Total Organic	CCV		Ground Water	24.67 mg/L	10 ml	24.7 mg/L	1			99		10/6/18 11:04	N	III
KQ1814385-31	Carbon, Total Organic	CCV		Ground Water	24.67 mg/L	10 ml	24.7 mg/L	1			99		10/6/18 11:04	N	III
KQ1814385-32	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/5/18 15:35	N	III
KQ1814385-32	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/5/18 15:35	N	III
KQ1814385-33	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/5/18 19:37	N	III
KQ1814385-33	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/5/18 19:37	N	III
KQ1814385-34	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 01:12	N	III
KQ1814385-34	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 01:12	N	III
KQ1814385-35	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 06:16	N	III
KQ1814385-35	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 06:16	N	III
KQ1814385-36	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 11:20	N	III
KQ1814385-36	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 11:20	N	III
KQ1814385-37	Carbon, Total Organic	MS	K1808850-004	Water	29.88 mg/L	10 ml	598 mg/L	20	2	10	104		10/6/18 02:01	N	IV

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609744 **Method/Testcode:** SM 5310 C/TOC T

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
K1808852-001	Carbon, Total Organic	N/A		Water	4.61 mg/L	10 ml	18.4 mg/L	4	0.3	2.0			10/6/18 08:56	N	II
K1808852-002	Carbon, Total Organic	N/A		Water	0.57 mg/L	10 ml	0.57 mg/L	1	0.07	0.50			10/6/18 10:01	N	II
K1808870-009	Carbon, Total Organic	N/A		Surface Water	2.85 mg/L	10 ml	2.85 mg/L	1	0.07	0.50			10/6/18 10:32	N	IV
K1808870-010	Carbon, Total Organic	N/A		Surface Water	3.06 mg/L	10 ml	3.06 mg/L	1	0.07	0.50			10/6/18 12:43	N	IV
K1808870-011	Carbon, Total Organic	N/A		Surface Water	0.85 mg/L	10 ml	0.85 mg/L	1	0.07	0.50			10/6/18 13:14	N	IV
K1808870-012	Carbon, Total Organic	N/A		Surface Water	0.75 mg/L	10 ml	0.75 mg/L	1	0.07	0.50			10/6/18 13:46	N	IV
K1808870-013	Carbon, Total Organic	N/A		Surface Water	0.30 mg/L	10 ml	0.30 mg/L J	1	0.07	0.50			10/6/18 14:18	N	IV
K1808870-014	Carbon, Total Organic	N/A		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 14:49	N	IV
K1808870-015	Carbon, Total Organic	N/A		Surface Water	2.78 mg/L	10 ml	2.78 mg/L	1	0.07	0.50			10/6/18 15:21	N	IV
K1808870-016	Carbon, Total Organic	N/A		Surface Water	2.88 mg/L	10 ml	2.88 mg/L	1	0.07	0.50			10/6/18 16:26	N	IV
K1808891-008	Carbon, Total Organic	N/A		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 16:57	N	II
K1808911-009	Carbon, Total Organic	N/A		Surface Water	0.95 mg/L	10 ml	0.95 mg/L	1	0.07	0.50			10/6/18 17:29	N	IV
K1808911-010	Carbon, Total Organic	N/A		Surface Water	16.04 mg/L	10 ml	64.2 mg/L	4	0.3	2.0			10/6/18 18:33	N	IV
K1808911-011	Carbon, Total Organic	N/A		Surface Water	2.16 mg/L	10 ml	2.16 mg/L	1	0.07	0.50			10/6/18 19:37	N	IV
K1808911-012	Carbon, Total Organic	N/A		Surface Water	0.30 mg/L	10 ml	0.30 mg/L J	1	0.07	0.50			10/6/18 20:08	N	IV
K1808911-013	Carbon, Total Organic	N/A		Surface Water	3.90 mg/L	10 ml	3.90 mg/L	1	0.07	0.50			10/6/18 20:40	N	IV
K1808911-014	Carbon, Total Organic	N/A		Surface Water	4.28 mg/L	10 ml	4.28 mg/L	1	0.07	0.50			10/6/18 22:18	N	IV
K1808911-015	Carbon, Total Organic	N/A		Surface Water	1.74 mg/L	10 ml	1.74 mg/L	1	0.07	0.50			10/6/18 22:50	N	IV
K1808911-016	Carbon, Total Organic	N/A		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 23:21	N	IV
KQ1814386-01	Carbon, Total Organic	MS	K1808852-001	Water	30.11 mg/L	10 ml	120 mg/L	4	0.3	2.0	102		10/6/18 09:28	N	II
KQ1814386-02	Carbon, Total Organic	DUP	K1808852-001	Water	4.38 mg/L	10 ml	17.5 mg/L	4	0.3	2.0		5	10/6/18 08:56	N	II
KQ1814386-03	Carbon, Total Organic	DUP	K1808852-002	Water	0.54 mg/L	10 ml	0.54 mg/L	1	0.07	0.50		4	10/6/18 10:01	N	II
KQ1814386-04	Carbon, Total Organic	MS	K1808870-009	Surface Water	28.72 mg/L	10 ml	28.7 mg/L	1	0.07	0.50	104		10/6/18 12:10	N	IV
KQ1814386-05	Carbon, Total Organic	DUP	K1808870-009	Surface Water	2.70 mg/L	10 ml	2.70 mg/L	1	0.07	0.50		5	10/6/18 10:32	N	IV
KQ1814386-06	Carbon, Total Organic	DUP	K1808870-010	Surface Water	2.95 mg/L	10 ml	2.95 mg/L	1	0.07	0.50		4	10/6/18 12:43	N	IV

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Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609744 **Method/Testcode:** SM 5310 C/TOC T

Lab de	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
Q1814386-07	Carbon, Total Organic	DUP	K1808870-011	Surface Water	0.85 mg/L	10 ml	0.85 mg/L	1	0.07	0.50		<1	10/6/18 13:14	N	IV
Q1814386-08	Carbon, Total Organic	DUP	K1808870-012	Surface Water	0.70 mg/L	10 ml	0.70 mg/L	1	0.07	0.50		7	10/6/18 13:46	N	IV
Q1814386-09	Carbon, Total Organic	DUP	K1808870-013	Surface Water	0.24 mg/L	10 ml	0.24 mg/L J	1	0.07	0.50		23*	10/6/18 14:18	N	IV
Q1814386-10	Carbon, Total Organic	DUP	K1808870-014	Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	10/6/18 14:49	N	IV
Q1814386-11	Carbon, Total Organic	DUP	K1808870-015	Surface Water	2.70 mg/L	10 ml	2.70 mg/L	1	0.07	0.50		3	10/6/18 15:21	N	IV
Q1814386-12	Carbon, Total Organic	DUP	K1808870-016	Surface Water	2.75 mg/L	10 ml	2.75 mg/L	1	0.07	0.50		5	10/6/18 16:26	N	IV
Q1814386-13	Carbon, Total Organic	DUP	K1808891-008	Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	10/6/18 16:57	N	II
Q1814386-14	Carbon, Total Organic	MS	K1808911-009	Surface Water	27.25 mg/L	10 ml	27.2 mg/L	1	0.07	0.50	105		10/6/18 18:01	N	IV
Q1814386-15	Carbon, Total Organic	DUP	K1808911-009	Surface Water	0.89 mg/L	10 ml	0.89 mg/L	1	0.07	0.50		7	10/6/18 17:29	N	IV
Q1814386-16	Carbon, Total Organic	DUP	K1808911-010	Surface Water	15.94 mg/L	10 ml	63.8 mg/L	4	0.3	2.0		<1	10/6/18 18:33	N	IV
Q1814386-17	Carbon, Total Organic	DUP	K1808911-011	Surface Water	2.08 mg/L	10 ml	2.08 mg/L	1	0.07	0.50		4	10/6/18 19:37	N	IV
Q1814386-18	Carbon, Total Organic	DUP	K1808911-012	Surface Water	0.22 mg/L	10 ml	0.22 mg/L J	1	0.07	0.50		31*	10/6/18 20:08	N	IV
Q1814386-19	Carbon, Total Organic	DUP	K1808911-013	Surface Water	3.77 mg/L	10 ml	3.77 mg/L	1	0.07	0.50		3	10/6/18 20:40	N	IV
Q1814386-20	Carbon, Total Organic	DUP	K1808911-014	Surface Water	4.11 mg/L	10 ml	4.11 mg/L	1	0.07	0.50		4	10/6/18 22:18	N	IV
Q1814386-21	Carbon, Total Organic	DUP	K1808911-015	Surface Water	1.64 mg/L	10 ml	1.64 mg/L	1	0.07	0.50		6	10/6/18 22:50	N	IV
Q1814386-22	Carbon, Total Organic	DUP	K1808911-016	Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	10/6/18 23:21	N	IV
Q1814386-23	Carbon, Total Organic	MB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 11:37	N	II
Q1814386-24	Carbon, Total Organic	LCS		Water	18.35 mg/L	10 ml	18.4 mg/L	1	0.07	0.50	84		10/6/18 11:53	N	II
KQ1814386-25	Carbon, Total Organic	CCV		Water	25.17 mg/L	10 ml	25.2 mg/L	1			101		10/6/18 05:59	N	II
Q1814386-26	Carbon, Total Organic	CCV		Water	24.67 mg/L	10 ml	24.7 mg/L	1			99		10/6/18 11:04	N	II
Q1814386-27	Carbon, Total Organic	CCV		Water	24.54 mg/L	10 ml	24.5 mg/L	1			98		10/6/18 15:53	N	II
Q1814386-28	Carbon, Total Organic	CCV		Water	24.44 mg/L	10 ml	24.4 mg/L	1			98		10/6/18 21:12	N	II
KQ1814386-29	Carbon, Total Organic	CCV		Water	24.60 mg/L	10 ml	24.6 mg/L	1			98		10/7/18 02:17	N	II
KQ1814386-30	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 06:16	N	II
KQ1814386-31	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 11:20	N	II
KQ1814386-32	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 16:09	N	II
KQ1814386-33	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 21:28	N	II
KQ1814386-34	Carbon, Total Organic	CCB		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/7/18 02:33	N	II

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

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609745 **Method/Testcode:** 415.1/TOC T

ab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1808910-001	Carbon, Total Organic	N/A		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/7/18 04:26	Y	IV
1808910-002	Carbon, Total Organic	N/A		Water	0.10 mg/L	10 ml	0.1 mg/L J	1	0.07	0.50			10/7/18 05:30	N	IV
1808910-003	Carbon, Total Organic	N/A		Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/7/18 06:02	N	IV
1809017-001	Carbon, Total Organic	N/A		Surface Water	3.29 mg/L	10 ml	3.29 mg/L	1	0.07	0.50			10/6/18 23:53	N	IV
1809017-002	Carbon, Total Organic	N/A		Surface Water	9.21 mg/L	10 ml	9.21 mg/L	1	0.07	0.50			10/7/18 00:25	N	IV
1809017-003	Carbon, Total Organic	N/A		Surface Water	11.73 mg/L	10 ml	11.7 mg/L	1	0.07	0.50			10/7/18 00:57	N	IV
1809017-004	Carbon, Total Organic	N/A		Surface Water	2.33 mg/L	10 ml	2.33 mg/L	1	0.07	0.50			10/7/18 01:28	Y	IV
K1809017-005	Carbon, Total Organic	N/A		Surface Water	2.74 mg/L	10 ml	2.74 mg/L	1	0.07	0.50			10/7/18 02:49	Y	IV
1809017-006	Carbon, Total Organic	N/A		Surface Water	1.17 mg/L	10 ml	1.17 mg/L	1	0.07	0.50			10/7/18 03:54	N	IV
KQ1814387-01	Carbon, Total Organic	DUP	K1809017-001	Surface Water	3.19 mg/L	10 ml	3.19 mg/L	1	0.07	0.50		3	10/6/18 23:53	N	IV
KQ1814387-02	Carbon, Total Organic	DUP	K1809017-002	Surface Water	8.78 mg/L	10 ml	8.78 mg/L	1	0.07	0.50		5	10/7/18 00:25	N	IV
KQ1814387-03	Carbon, Total Organic	DUP	K1809017-003	Surface Water	11.35 mg/L	10 ml	11.3 mg/L	1	0.07	0.50		3	10/7/18 00:57	N	IV
KQ1814387-04	Carbon, Total Organic	MS	K1809017-004	Surface Water	28.00 mg/L	10 ml	28.0 mg/L	1	0.07	0.50	103		10/7/18 02:00	N	IV
KQ1814387-05	Carbon, Total Organic	DUP	K1809017-004	Surface Water	2.20 mg/L	10 ml	2.20 mg/L	1	0.07	0.50		6	10/7/18 01:28	N	IV
KQ1814387-06	Carbon, Total Organic	MS	K1809017-005	Surface Water	28.67 mg/L	10 ml	28.7 mg/L	1	0.07	0.50	104		10/7/18 03:21	N	IV
KQ1814387-07	Carbon, Total Organic	DUP	K1809017-005	Surface Water	2.73 mg/L	10 ml	2.73 mg/L	1	0.07	0.50		<1	10/7/18 02:49	N	IV
KQ1814387-08	Carbon, Total Organic	DUP	K1809017-006	Surface Water	1.09 mg/L	10 ml	1.09 mg/L	1	0.07	0.50		7	10/7/18 03:54	N	IV
KQ1814387-09	Carbon, Total Organic	MS	K1808910-001	Water	25.62 mg/L	10 ml	25.6 mg/L	1	0.07	0.50	102		10/7/18 04:57	N	IV
KQ1814387-10	Carbon, Total Organic	DUP	K1808910-001	Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	10/7/18 04:26	N	IV
KQ1814387-11	Carbon, Total Organic	DUP	K1808910-002	Water	0.09 mg/L	10 ml	0.09 mg/L J	1	0.07	0.50		12	10/7/18 05:30	N	IV
KQ1814387-12	Carbon, Total Organic	DUP	K1808910-003	Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50		NC	10/7/18 06:02	N	IV
KQ1814387-13	Carbon, Total Organic	MB		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 21:45	N	IV
KQ1814387-13	Carbon, Total Organic	MB		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 21:45	N	IV
KQ1814387-14	Carbon, Total Organic	LCS		Surface Water	17.25 mg/L	10 ml	17.3 mg/L	1	0.07	0.50	79*		10/6/18 22:01	N	IV
KQ1814387-14	Carbon, Total Organic	LCS		Surface Water	17.25 mg/L	10 ml	17.3 mg/L	1	0.07	0.50	79*		10/6/18 22:01	N	IV
KQ1814387-15	Carbon, Total Organic	CCV		Surface Water	24.44 mg/L	10 ml	24.4 mg/L	1			98		10/6/18 21:12	N	IV

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

10/10/18

CES 10/9/18

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 609745 **Method/Testcode:** SM 5310 C/TOC T

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
KQ1814387-15	Carbon, Total Organic	CCV		Surface Water	24.44 mg/L	10 ml	24.4 mg/L	1			98		10/6/18 21:12	N	IV
KQ1814387-16	Carbon, Total Organic	CCV		Surface Water	24.60 mg/L	10 ml	24.6 mg/L	1			98		10/7/18 02:17	N	IV
KQ1814387-16	Carbon, Total Organic	CCV		Surface Water	24.60 mg/L	10 ml	24.6 mg/L	1			98		10/7/18 02:17	N	IV
KQ1814387-17	Carbon, Total Organic	CCV		Surface Water	24.43 mg/L	10 ml	24.4 mg/L	1			98		10/7/18 06:33	N	IV
KQ1814387-17	Carbon, Total Organic	CCV		Surface Water	24.43 mg/L	10 ml	24.4 mg/L	1			98		10/7/18 06:33	N	IV
KQ1814387-18	Carbon, Total Organic	CCB		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 21:28	N	IV
KQ1814387-18	Carbon, Total Organic	CCB		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/6/18 21:28	N	IV
KQ1814387-19	Carbon, Total Organic	CCB		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/7/18 02:33	N	IV
KQ1814387-19	Carbon, Total Organic	CCB		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/7/18 02:33	N	IV
KQ1814387-20	Carbon, Total Organic	CCB		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/7/18 06:50	N	IV
KQ1814387-20	Carbon, Total Organic	CCB		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/7/18 06:50	N	IV

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

TOC: 609741, 609744, 609745

Schedule: 10052018

Version: 11
Instrument: Fusion1
Last Saved by: Fusion1 (Fusion1)
Last Saved on: 2018/10/05 17:07 - Friday

Position	Sample Type	Sample ID	Method ID (Calibration ID)	Reps
(Clean)	Clean	Clean		1
(Clean)	Clean	Clean		1
(Clean)	Clean	Clean		1
(Blank)	Blank	Reagent/Acid Blank		1
D	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
1	Sample	MB1	Extended Reaction 021711 (Extended Reaction 021711)	1
2	Check Standard	[TOC] LCS ER [21.9 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
3	Sample	ICS	Extended Reaction 021711 (Extended Reaction 021711)	1
4	Sample	K1809036-001.02	Extended Reaction 021711 (Extended Reaction 021711)	2
5	Sample	K1809036-001.02 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
6	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
7	Sample	K1809036-002.08	Extended Reaction 021711 (Extended Reaction 021711)	2
8	Sample	K1809036-003.08	Extended Reaction 021711 (Extended Reaction 021711)	2
9	Sample	K1809036-004.08	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	K1809036-005.08	Extended Reaction 021711 (Extended Reaction 021711)	2
11	Sample	K1808731-001	Extended Reaction 021711 (Extended Reaction 021711)	2
12	Sample	K1808731-002	Extended Reaction 021711 (Extended Reaction 021711)	2
13	Sample	K1808732-001.08 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
14	Sample	K1808732-001.08 ms 20x	Extended Reaction 021711 (Extended Reaction 021711)	1
15	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
16	Sample	K1808732-002.08 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
17	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
18	Sample	K1808732-003.08	Extended Reaction 021711 (Extended Reaction 021711)	2
19	Sample	K1808850-004.03 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	K1808850-004.03 ms 20x	Extended Reaction 021711 (Extended Reaction 021711)	1
22	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
23	Sample	K1808850-005.03 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
24	Sample	K1808850-006.03 4x	Extended Reaction 021711 (Extended Reaction 021711)	2
25	Sample	K1808850-007.03 20x	Extended Reaction 021711 (Extended Reaction 021711)	2
26	Sample	K1808850-008.03 10x	Extended Reaction 021711 (Extended Reaction 021711)	2
27	Sample	K1808850-009.03 10x	Extended Reaction 021711 (Extended Reaction 021711)	2
28	Sample	K1809491-002.01	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
29	Sample	K1809491-003.02 50x	Extended Reaction 021711 (Extended Reaction 021711)	2
30	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
31	Sample	K1809385-001.03 50x	Extended Reaction 021711 (Extended Reaction 021711)	2
32	Sample	K1809385-001.03 ms 50x	Extended Reaction 021711 (Extended Reaction 021711)	1
33	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
34	Sample	K1808852-001.01 4x	Extended Reaction 021711 (Extended Reaction 021711)	2
35	Sample	K1808852-001.01 ms 4x	Extended Reaction 021711 (Extended Reaction 021711)	1
36	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
37	Sample	K1808852-002.01	Extended Reaction 021711 (Extended Reaction 021711)	2
38	Sample	K1808870-009.07	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

StarLIMS Run: K1809036, 8731, 8732, 8850, 9491, 9385, 8852, 8870, 8891, 8911, 9017, 8910

Analysis: TOC, DOC

Method: SM 5310 C, 415.1

CCV: 11-GEN-05-69K 50 ppm LCS: 11-GEN-05-68N 21.9 ppm

ICAL Date: 3/13/18

ICAL ID: 11-GEN-05-65A

ICS ID: 11-GEN-05-67D

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-05-69L

21 % H3PO4: 11-GEN-05-69M

Equipment ID: K-TOC-03

PIPETTE ID: 124276B, 129001F

FILTER ID: NA

Analyzed By: CES	Date Analyzed: 10/5/18
Reviewed By:	Date Reviewed: 10/10/18

Schedule: 10052018

Position	Sample Type	Sample ID	Method ID (Calibration ID)	Reps
39	Sample	MB3	Extended Reaction 021711 (Extended Reaction 021711)	1
	heck Standard	[TOC] LCS ER [21.9 ppm]	Extended Reaction 021711 (Extended Reaction 021711	
40	Sample	K1808870-009.07 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
41	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
42	Sample	K1808870-010.07	Extended Reaction 021711 (Extended Reaction 021711)	2
43	Sample	K1808870-011.07	Extended Reaction 021711 (Extended Reaction 021711)	2
44	Sample	K1808870-012.07	Extended Reaction 021711 (Extended Reaction 021711)	2
45	Sample	K1808870-013.07	Extended Reaction 021711 (Extended Reaction 021711)	2
46	Sample	K1808870-014.07	Extended Reaction 021711 (Extended Reaction 021711)	2
47	Sample	K1808870-015.07	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
48	Sample	K1808870-016.07	Extended Reaction 021711 (Extended Reaction 021711)	2
49	Sample	K1808891-008.04	Extended Reaction 021711 (Extended Reaction 021711)	2
50	Sample	K1808911-009.13	Extended Reaction 021711 (Extended Reaction 021711)	2
51	Sample	K1808911-009.13 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
52	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
53	Sample	K1808911-010.13 4x	Extended Reaction 021711 (Extended Reaction 021711)	2
54	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
55	Sample	K1808911-011.13	Extended Reaction 021711 (Extended Reaction 021711)	2
56	Sample	K1808911-012.13	Extended Reaction 021711 (Extended Reaction 021711)	2
57	Sample	K1808911-013.13	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
58	Sample	MB4	Extended Reaction 021711 (Extended Reaction 021711)	1
2	Check Standard	[TOC] LCS ER [21.9 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
59	Sample	K1808911-014.13	Extended Reaction 021711 (Extended Reaction 021711)	2
60	Sample	K1808911-015.13	Extended Reaction 021711 (Extended Reaction 021711)	2
61	Sample	K1808911-016.13	Extended Reaction 021711 (Extended Reaction 021711)	2
62	Sample	K1809017-001.06	Extended Reaction 021711 (Extended Reaction 021711)	2
63	Sample	K1809017-002.06	Extended Reaction 021711 (Extended Reaction 021711)	2
64	Sample	K1809017-003.06	Extended Reaction 021711 (Extended Reaction 021711)	2
65	Sample	K1809017-004.06	Extended Reaction 021711 (Extended Reaction 021711)	2
66	Sample	K1809017-004.06 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
67	Sample	K1809017-005.15	Extended Reaction 021711 (Extended Reaction 021711)	2
68	Sample	K1809017-005.15 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
69	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
70	Sample	K1809017-006.06	Extended Reaction 021711 (Extended Reaction 021711)	2
71	Sample	K1808910-001.20	Extended Reaction 021711 (Extended Reaction 021711)	2
72	Sample	K1808910-001.20 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
73	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
74	Sample	K1808910-002.05	Extended Reaction 021711 (Extended Reaction 021711)	2
75	Sample	K1808910-003.05	Extended Reaction 021711 (Extended Reaction 021711)	2
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
C	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1

Fusion Report - 10052018
Friday, October 05, 2018 01:22 PM

(View - Reps, Unused Reps, Meta-Data, Signature, History)
Printed on 2018/10/08 15:11 - Monday

Report Summary Information

Company Location:	Gen Chem Lab		
Schedule Name:	10052018	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) (v1) Fusion1 (Fusion1) (v4) Fusion1 (Fusion1) (v5) Fusion1 (Fusion1) (v6) Fusion1 (Fusion1) (v7) Fusion1 (Fusion1) (v8) Fusion1 (Fusion1) (v9) Fusion1 (Fusion1) (v11)		
Comment:			

10/10/18

Report Results

Sample Type: Clean

From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/10/05 13:22

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	12.72	17.11	4.39	49.15	05:26
2	TC Clean	4.55	8.60	4.05	49.97	04:04
3	TC Clean	1.66	5.64	3.98	50.10	03:51
4	TC Clean	1.13	5.15	4.02	50.10	03:50

Sample Type: Clean

From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/10/05 13:44

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.60	4.54	3.94	49.18	05:18

2	TC Clean	3.72	7.60	3.88	50.09	04:05
3	TC Clean	1.66	5.74	4.08	50.07	03:50
4	TC Clean	1.31	5.42	4.12	50.05	03:48

ample Type: Clean From Schedule Versio

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/10/05 14:06

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.76	4.74	3.99	49.10	05:17
2	TC Clean	3.77	7.75	3.98	50.08	04:02
3	TC Clean	2.12	6.10	3.98	50.09	03:55
4	TC Clean	1.38	5.32	3.94	50.08	03:53

Sample Type: Blank (Creating v1156) From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(blank)		Reagent/Acid Blank	2018/10/05 14:28

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.75	4.51	3.76	49.18	05:29
2	TC Clean	3.95	7.75	3.80	50.04	04:01
3	TC Clean	1.97	5.83	3.85	49.96	03:46
4	TC Clean	1.62	5.60	3.98	50.08	03:46
5	Reagent Blank	6.28	10.23	3.95	50.10	05:05
6	Acid Blank	1.18	5.19	4.01	49.26	05:34

Sample Type: Sample From Schedule Version 4

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	D	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/05 15:02

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	13.65	17.56	3.91	50.13	12:31

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

1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 — From Schedule Version 5

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	in / Ma (% dev)	Result	Std. Dev.	RSD	Start Time
◆	B	TOC	25.0000	1:2	[TOC] CCV 021711 [25 ppm]	0 / infinity (NA / NA)	24.5982 ppm (PASS)	0.0000 ppm	0%	2018/10/05 15:18

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.5982	245.9818	190.61	194.72	4.10	50.12	12:26

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 6

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◆	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/05 15:35

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	12.45	16.39	3.95	50.12	12:29

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 6

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	1	TOC	MB1	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/05 15:51

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	11.74	15.54	3.80	50.12	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> LCS ER — From Schedule Version 7

	Pos	BAT	Concentration	Dil	Sample ID	Min / Max	Result	Std. Dev.	RSD	Start Time

			(ppm)			(% dev)				
◈	2	TOC	21.9000	1:1	[TOC] LCS ER [21.9 ppm]	0 / infinity (NA / NA)	20.7401 ppm (PASS)	0.0000 ppm	0%	2018/10/05 16:08

Pos	Base Analysis ype	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	20.7401	207.4013	163.12	166.94	3.82	50.12	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 8

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	3	TOC	ICS	0.0930 ppm	0.0000 ppm	0.0000%	2018/10/05 16:25

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0930	0.9302	14.87	18.78	3.91	50.12	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Sample — From Schedule Version 9

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	4	TOC	K1809036-001.02	0.3330 ppm	0.0157 ppm	4.7100%	2018/10/05 16:41

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.3441	3.4406	16.66	20.49	3.83	50.11	12:26
2	TOC	0.3219	3.2189	16.50	20.34	3.84	50.12	12:21

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Sample — From Schedule Version 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	5	TOC	K1809036-001.02 ms	25.4814 ppm	0.0000 ppm	0.0000%	2018/10/05 17:13

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	25.4814	254.8135	195.79	199.60	3.81	50.12	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC)	Extended Reaction	Extended Reaction

(v1156) 021711 (v3) 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	6	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/05 17:29

Re #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run ıme
1	TOC	0.0000	0.0000	12.98	16.79	3.81	50.12	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	7	TOC	K1809036-002.08	0.2515 ppm	0.0467 ppm	18.5800%	2018/10/05 17:46

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.2846	2.8456	16.24	20.09	3.86	50.13	12:27
2	TOC	0.2185	2.1847	15.77	19.72	3.95	50.14	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	8	TOC	K1809036-003.08	0.0043 ppm	0.0060 ppm	141.4200%	2018/10/05 18:18

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0085	0.0854	14.27	18.05	3.78	50.12	12:26
2	TOC	0.0000	0.0000	14.11	18.05	3.93	50.10	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	9	TOC	K1809036-004.08	2.3431 ppm	0.0733 ppm	3.1300%	2018/10/05 18:49

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.3950	23.9496	31.28	35.18	3.91	50.03	12:25
2	TOC	2.2913	22.9126	30.54	34.41	3.87	50.00	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 11

	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	24.8468	0.0000	0%	2018/10/05 19:21

					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	24.8468	248.4684	192.39	196.30	3.91	50.02	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

Sample Type: Check Standard --> CCB 021711 From Schedule Version 11

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/05 19:37

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	12.77	16.80	4.02	50.00	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 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	10	TOC	K1809036-005.08	0.3330 ppm	0.0386 ppm	11.5900%	2018/10/05 19:54

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.3603	3.6034	16.78	20.78	4.00	49.99	12:26
2	TOC	0.3058	3.0575	16.39	20.40	4.01	49.97	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	11	TOC	K1808731-001	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/05 20:26

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.07	15.92	3.85	49.96	12:30
2	TOC	0.0000	0.0000	12.40	16.12	3.72	49.95	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	12	TOC	K1808731-002	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/05 20:57

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	11.80	15.57	3.77	49.93	[illegible]
2	TOC	0.0000	0.0000	12.09	15.91	3.83	49.92	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	13	TOC	K1808732-001.08 20x	0.3665 ppm	0.0397 ppm	10.8300%	2018/10/05 21:29

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.3946	3.9458	17.02	20.90	3.88	49.90	12:23
2	TOC	0.3385	3.3845	16.62	20.48	3.86	49.92	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	14	TOC	K1808732-001.08 ms 20x	26.0469 ppm	0.0000 ppm	0.0000%	2018/10/05 22:01

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	26.0469	260.4688	199.82	203.58	3.75	49.92	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	15	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/05 22:17

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	13.16	16.98	3.82	49.91	12:27
2	TOC	0.0000	0.0000	12.30	16.34	4.04	49.89	12:21

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	16	TOC	K1808732-002.08 20x	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/05 22:49

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.89	16.82	3.92	49.88	12:26

2	TOC	0.0000	0.0000	12.92	16.94	4.02	49.87	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	17	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/05 23:20

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.07	15.99	3.93	49.90	12:28
2	TOC	0.0000	0.0000	12.49	16.33	3.84	49.89	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	18	TOC	K1808732-003.08	0.9407 ppm	0.0776 ppm	8.2500%	2018/10/05 23:52

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.9956	9.9561	21.30	25.21	3.91	49.87	12:29
2	TOC	0.8859	8.8587	20.52	24.48	3.95	49.87	12:22

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	19	TOC	K1808850-004.03 20x	3.8140 ppm	0.0895 ppm	2.3500%	2018/10/06 00:24

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.8772	38.7725	41.84	45.76	3.92	49.86	12:28
2	TOC	3.7507	37.5067	40.94	44.84	3.90	49.88	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 11

	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)	**24.5404** ppm (PASS)	0.0000 ppm	0%	2018/10/06 00:55

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.5404	245.4036	190.20	194.20	4.00	49.88	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 11

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/06 01:12

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	13.28	17.09	3.81	49.85	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 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	20	TOC	MB2	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/06 01:28

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.53	16.42	3.89	49.84	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> LCS ER From Schedule Version 11

	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)	20.2306 ppm (PASS)	0.0000 ppm	0%	2018/10/06 01:45

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	20.2306	202.3060	159.49	163.37	3.88	49.85	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 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	21	TOC	K1808850-004.03 ms 20x	29.8823 ppm	0.0000 ppm	0.0000%	2018/10/06 02:01

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	29.8823	298.8233	227.16	231.01	3.86	49.86	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	22	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/06 02:18

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	13.82	17.79	3.97	49.83	12:25
2	TOC	0.0000	0.0000	13.10	16.94	3.84	49.83	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	23	TOC	K1808850-005.03 20x	2.1168 ppm	0.0098 ppm	0.4600%	2018/10/06 02:49

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.1098	21.0981	29.24	33.03	3.78	49.85	12:24
2	TOC	2.1237	21.2371	29.34	33.22	3.87	49.81	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	24	TOC	K1808850-006.03 4x	5.2043 ppm	0.1368 ppm	2.6300%	2018/10/06 03:21

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	5.3010	53.0102	51.99	55.78	3.80	49.82	12:25
2	TOC	5.1075	51.0751	50.61	54.45	3.85	49.83	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	25	TOC	K1808850-007.03 20x	3.6160 ppm	0.1724 ppm	4.7700%	2018/10/06 03:53

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.7379	37.3790	40.85	44.70	3.85	49.82	12:25

2	TOC	3.4942	34.9415	39.11	43.04	3.93	49.83	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	26	TOC	K1808850-008.03 10x	2.0307 ppm	0.0833 ppm	4.1000%	2018/10/06 04:24

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.0896	20.8961	29.10	32.89	3.79	49.80	12:24
2	TOC	1.9719	19.7187	28.26	32.09	3.83	49.80	12:29

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	27	TOC	K1808850-009.03 10x	0.9964 ppm	0.0501 ppm	5.0300%	2018/10/06 04:56

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.0318	10.3181	21.56	25.47	3.90	49.77	12:24
2	TOC	0.9609	9.6095	21.06	25.10	4.04	49.78	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	28	TOC	K1809491-002.01	2.1754 ppm	0.0473 ppm	2.1800%	2018/10/06 05:28

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.2089	22.0889	29.95	34.01	4.06	49.80	12:23
2	TOC	2.1419	21.4195	29.47	33.64	4.16	49.79	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 11

	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)	25.1689 ppm (PASS)	0.0000 ppm	0%	2018/10/06 05:59

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	25.1689	251.6889	194.68	198.59	3.91	49.80	12:31

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

ample Type: Check Standard --> CCB 21711 From Schedule Version 11

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/06 06:16

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	13.16	17.03	3.87	49.80	12:34

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 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	29	TOC	K1809491-003.02 50x	22.1283 ppm	0.4264 ppm	1.9300%	2018/10/06 06:32

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	22.4298	224.2977	174.05	178.00	3.95	49.78	12:27
2	TOC	21.8268	218.2678	169.75	173.80	4.05	49.80	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	30	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/06 07:04

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	13.17	17.20	4.03	49.76	12:27
2	TOC	0.0000	0.0000	12.37	16.45	4.08	49.78	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	31	TOC	K1809385-001.03 50x	56.4251 ppm	1.7775 ppm	3.1500%	2018/10/06 07:36

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	57.6819	576.8193	425.26	429.17	3.91	49.78	12:28

2	TOC	55.1682	551.6823	407.35	411.44	4.09	49.77	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis ype	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	32	TOC	K1809385-001.03 ms 50x	80.1645 ppm	0.0000 ppm	0.0000%	2018/10/06 08:07

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	80.1645	801.6448	585.47	589.46	3.99	49.74	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	33	TOC	RB	0.1160 ppm	0.1641 ppm	141.4200%	2018/10/06 08:24

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.2321	2.3208	15.86	19.90	4.03	49.85	12:26
2	TOC	0.0000	0.0000	13.11	17.06	3.95	49.89	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	34	TOC	K1808852-001.01 4x	4.4950 ppm	0.1568 ppm	3.4900%	2018/10/06 08:56

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.6058	46.0583	47.03	50.96	3.93	49.93	12:24
2	TOC	4.3841	43.8411	45.45	49.35	3.90	49.97	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	35	TOC	K1808852-001.01 ms 4x	30.1097 ppm	0.0000 ppm	0.0000%	2018/10/06 09:28

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	30.1097	301.0966	228.78	232.57	3.80	49.99	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time

◆	36	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/06 09:44

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	14.14	18.09	3.95	49.99	12:35

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	37	TOC	K1808852-002.01	0.5529 ppm	0.0174 ppm	3.1400%	2018/10/06 10:01

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.5652	5.6522	18.24	22.23	3.99	50.01	12:22
2	TOC	0.5407	5.4066	18.06	21.91	3.84	50.03	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	38	TOC	K1808870-009.07	2.7756 ppm	0.1011 ppm	3.6400%	2018/10/06 10:32

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.8471	28.4710	34.50	38.46	3.96	50.03	12:27
2	TOC	2.7041	27.0410	33.48	37.41	3.93	50.04	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711

From Schedule Version 11

	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)	24.6700 ppm (PASS)	0.0000 ppm	0%	2018/10/06 11:04

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.6700	246.7002	191.13	195.00	3.88	50.04	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 11

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time

◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/06 11:20

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	12.72	16.74	4.03	50.04	12:29

Completion State: Success - Criteria met.

Success Action: Do Nothing

Method: Extended Reaction 021711 (v3)

Calibration: Extended Reaction 021711 (v17)

STD Conc - Pos D: 0 ppmC

Sample Type: Sample

From Schedule Version 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	39	TOC	MB3	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/06 11:37

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	11.80	15.71	3.91	50.02	12:32

Dilution: 1:10

Blank Contribution: (TC) 14.2102 (IC) (v1156)

Method: Extended Reaction 021711 (v3)

Calibration: Extended Reaction 021711 (v17)

Sample Type: Check Standard --> LCS ER

From Schedule Version 11

	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)	18.3510 ppm (PASS)	0.0000 ppm	0%	2018/10/06 11:53

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	18.3510	183.5104	146.10	150.03	3.94	50.01	12:33

Completion State: Success - Criteria met.

Success Action: Do Nothing

Method: Extended Reaction 021711 (v3)

Calibration: Extended Reaction 021711 (v17)

STD Conc - Pos 2: 21.9 ppmC

Sample Type: Sample

From Schedule Version 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	40	TOC	K1808870-009.07 ms	28.7231 ppm	0.0000 ppm	0.0000%	2018/10/06 12:10

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	28.7231	287.2308	218.90	222.92	4.03	50.01	12:33

Dilution: 1:10

Blank Contribution: (TC) 14.2102 (IC)

Method: Extended Reaction

Calibration: Extended Reaction

(v1156) 021711 (v3) 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	41	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/06 12:26

Rep #	Base Analysis Type	p	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run ime
1	TOC	0.0000	0.0000	13.52	17.49	3.97	49.99	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	42	TOC	K1808870-010.07	3.0056 ppm	0.0797 ppm	2.6500%	2018/10/06 12:43

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.0619	30.6194	36.03	40.09	4.06	49.99	12:26
2	TOC	2.9493	29.4926	35.23	39.22	3.99	49.98	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	43	TOC	K1808870-011.07	0.8490 ppm	0.0046 ppm	0.5400%	2018/10/06 13:14

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.8522	8.5219	20.28	24.24	3.96	49.97	12:28
2	TOC	0.8457	8.4574	20.24	24.25	4.01	49.97	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	44	TOC	K1808870-012.07	0.7265 ppm	0.0374 ppm	5.1500%	2018/10/06 13:46

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.7530	7.5298	19.58	23.68	4.11	49.97	12:24
2	TOC	0.7001	7.0008	19.20	23.28	4.09	49.97	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	45	TOC	K1808870-013.07	0.2688 ppm	0.0435 ppm	16.1700%	2018/10/06 14:18

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time

1	TOC	0.2996	2.9958	16.34	20.43	4.09	49.97	12:26
2	TOC	0.2381	2.3812	15.91	20.01	4.10	50.17	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	46	TOC	K1808870-014.07	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/06 14:49

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	13.66	17.66	4.00	49.94	12:28
2	TOC	0.0000	0.0000	13.78	17.58	3.80	49.94	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	47	TOC	K1808870-015.07	2.7384 ppm	0.0573 ppm	2.0900%	2018/10/06 15:21

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.7789	27.7890	34.01	37.92	3.91	49.94	12:24
2	TOC	2.6979	26.9793	33.44	37.34	3.90	49.93	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 11

	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)	24.5376 ppm (PASS)	0.0000 ppm	0%	2018/10/06 15:53

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.5376	245.3755	190.18	194.01	3.83	49.92	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

Sample Type: Check Standard --> CCB 021711 From Schedule Version 11

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/06 16:09

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	13.16	16.86	3.70	49.91	12:26

Completion State	Success Action	Method	Calibration	STD Conc - Pos D
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	0 mC

Sample Type: Sample From Schedule Version 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	48	TOC	K1808870-016.07	2.8186 ppm	0.0915 ppm	3.2500%	2018/10/06 16:26

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.8833	28.8330	34.76	38.59	3.83	49.90	12:23
2	TOC	2.7539	27.5392	33.84	37.84	4.01	49.91	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	49	TOC	K1808891-008.04	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/06 16:57

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.57	16.59	4.02	49.94	12:23
2	TOC	0.0000	0.0000	12.61	16.56	3.95	49.93	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	50	TOC	K1808911-009.13	0.9203 ppm	0.0479 ppm	5.2100%	2018/10/06 17:29

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.9542	9.5421	21.01	24.91	3.90	49.93	12:25
2	TOC	0.8864	8.8643	20.53	24.46	3.93	49.90	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	51	TOC	K1808911-009.13 ms	27.2481 ppm	0.0000 ppm	0.0000%	2018/10/06 18:01

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	27.2481	272.4809	208.38	212.29	3.91	49.90	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
52	QC	RB	0.0000 ppm	0.0000 ppm	0.0000%	018/10/06 18:17

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.91	16.82	3.91	49.90	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
53	TOC	K1808911-010.13 4x	15.9911 ppm	0.0657 ppm	0.4100%	2018/10/06 18:33

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	16.0375	160.3754	128.50	132.38	3.88	49.92	12:25
2	TOC	15.9446	159.4464	127.83	131.94	4.10	49.95	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
54	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/06 19:05

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.50	16.50	4.00	49.97	12:25
2	TOC	0.0000	0.0000	11.91	15.88	3.97	50.01	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
55	TOC	K1808911-011.13	2.1205 ppm	0.0558 ppm	2.6300%	2018/10/06 19:37

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.1599	21.5991	29.60	33.51	3.91	50.05	12:26
2	TOC	2.0810	20.8105	29.04	32.84	3.80	50.06	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
56	TOC	K1808911-012.13	0.2597 ppm	0.0568 ppm	21.8500%	2018/10/06 20:08

Rep	Base			Adjusted		Baseline	Pressure	Run

#	Analysis Type	ppm	µg	(Abs)	NDIR (Abs)	(Abs)	(psig)	Time
1	TOC	0.2999	2.9986	16.35	20.18	3.83	50.09	12:25
2	TOC	0.2196	2.1959	15.78	19.78	4.00	50.12	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) 1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v 7

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	57	TOC	K1808911-013.13	3.8340 ppm	0.0929 ppm	2.4200%	2018/10/06 20:40

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.8997	38.9970	42.00	45.79	3.79	50.11	12:25
2	TOC	3.7684	37.6835	41.06	45.06	4.00	50.16	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 11

	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)	24.4421 ppm (PASS)	0.0000 ppm	0%	2018/10/06 21:12

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.4421	244.4213	189.50	193.38	3.88	50.14	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

Sample Type: Check Standard --> CCB 021711 From Schedule Version 11

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/06 21:28

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	12.41	16.27	3.86	50.12	12:28

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 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	58	TOC	MB4	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/06 21:45

Rep	Base - nalysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig	Run Time
1	TOC	0.0000	0.0000	11.73	15.56	3.83	50.12	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> LCS ER From Schedule Version 11

	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)	17.2534 ppm (PASS)	0.0000 ppm	0%	2018/10/06 22:01

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	17.2534	172.5339	138.27	142.29	4.02	50.12	12:30

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 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	59	TOC	K1808911-014.13	4.1972 ppm	0.1232 ppm	2.9400%	2018/10/06 22:18

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	4.2843	42.8434	44.74	48.72	3.98	50.17	12:26
2	TOC	4.1101	41.1005	43.50	47.67	4.18	50.17	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	60	TOC	K1808911-015.13	1.6864 ppm	0.0691 ppm	4.1000%	2018/10/06 22:50

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.7353	17.3528	26.58	30.53	3.95	50.12	12:26
2	TOC	1.6376	16.3761	25.88	29.70	3.82	50.11	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC)	Extended Reaction	Extended Reaction

(v1156) 021711 (v3) 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	61	TOC	K1808911-016.13	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/06 23:21

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	DIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.44	16.42	3.97	50.09	12:29
2	TOC	0.0000	0.0000	12.64	16.48	3.84	50.12	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	62	TOC	K1809017-001.06	3.2352 ppm	0.0709 ppm	2.1900%	2018/10/06 23:53

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	3.2853	32.8534	37.62	41.45	3.82	50.12	12:23
2	TOC	3.1850	31.8501	36.91	40.91	4.01	50.08	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	63	TOC	K1809017-002.06	8.9949 ppm	0.3106 ppm	3.4500%	2018/10/07 00:25

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	9.2145	92.1450	79.87	83.84	3.97	50.07	12:27
2	TOC	8.7753	87.7527	76.74	80.62	3.88	50.06	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	64	TOC	K1809017-003.06	11.5380 ppm	0.2674 ppm	2.3200%	2018/10/07 00:57

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	11.7271	117.2707	97.78	101.81	4.03	50.06	12:26
2	TOC	11.3489	113.4889	95.08	99.04	3.96	50.04	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	65	TOC	K1809017-004.06	2.2640 ppm	0.0930 ppm	4.1100%	2018/10/07 01:28

Rep	Base	ppm	µg	Adjusted	NDIR (Abs)	Baseline	Pressure	Run

#	Analysis Type			(Abs)		(Abs)	(psig)	Time
1	TOC	2.3297	23.2971	30.81	34.84	4.03	50.03	12:26
2	TOC	2.1982	21.9822	29.88	33.95	4.07	50.00	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) 156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	66	TOC	K1809017-004.06 ms	28.0035 ppm	0.0000 ppm	0.0000%	2018/10/07 02:00

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	28.0035	280.0347	213.77	217.71	3.94	50.01	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 11

	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)	24.5976 ppm (PASS)	0.0000 ppm	0%	2018/10/07 02:17

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.5976	245.9761	190.61	194.58	3.97	50.02	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 11

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/07 02:33

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	12.85	16.91	4.06	49.95	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 11

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	67	TOC	K1809017-005.15	2.7379 ppm	0.0090 ppm	0.3300%	2018/10/07 02:49

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.7442	27.4424	33.77	37.77	4.00	49.96	12:27
2	TOC	2.7315	27.3147	33.67	37.61	3.94	49.96	12:22

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	68	TOC	K1809017-005.15 ms	28.6675 ppm	0.0000 ppm	0.0000%	2018/10/07 03:21

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	28.6675	286.6751	218.50	222.58	4.08	49.95	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	69	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/07 03:38

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.72	16.79	4.07	49.96	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	70	TOC	K1809017-006.06	1.1262 ppm	0.0569 ppm	5.0500%	2018/10/07 03:54

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.1664	11.6639	22.52	26.53	4.01	49.97	12:21
2	TOC	1.0860	10.8598	21.95	25.79	3.85	49.94	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	71	TOC	K1808910-001.20	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/07 04:26

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	13.74	17.68	3.94	49.97	12:26
2	TOC	0.0000	0.0000	13.73	17.61	3.88	50.01	12:22

Dilution	Blank Contribution	Method	Calibration

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	72	TOC	K1808910-001.20 ms	25.6234 ppm	0.0000 ppm	0.0000%	2018/10/07 04:57

ep #	-ase Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	25.6234	256.2336	196.81	200.80	4.00	49.98	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	73	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/07 05:14

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.33	16.40	4.07	50.00	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	74	TOC	K1808910-002.05	0.0932 ppm	0.0078 ppm	8.4100%	2018/10/07 05:30

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0988	0.9877	14.91	18.88	3.97	50.01	12:26
2	TOC	0.0877	0.8768	14.84	18.95	4.12	50.04	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	75	TOC	K1808910-003.05	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/07 06:02

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.18	16.18	4.00	50.03	12:26
2	TOC	0.0000	0.0000	12.11	16.06	3.95	50.06	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.2102 (IC) (v1156)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 11

	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	24.4312	0.0000	0%	2018/10/07 06:33

					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	24.4312	244.3118	189.42	193.48	4.05	50.09	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 11

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	C	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/07 06:50

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
C	TOC	0.0 ppm	1	0.0000	0.0000	12.28	16.20	3.92	50.10	12:32

Completion State	Success Action	Method	Calibration	STD Conc - Pos C
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
v1155	1.6920	1.6620	0.0000	0.0000	0.0000	2018/10/03 14:27	Fusion1 (Fusion1)
v1156	2.0937	1.1800	0.0000	0.0000	0.0000	2018/10/05 15:01	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
1.00 ppm	21.6980	1.000		018/03
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	2018/10/07 07:09

Work Request # (Original) K1808907, 9163, 9164, 9385, 8732, 9040, 9166

Tier: III IV III IV IV III IV

Date Analyzed: 10/9/18

Analyst: CES

Run # DOC: 610327

Analysis: DOC/TOC

TOC: 610329

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:

Final Approved by: [signature] Date: 10/10/18

DQREPORT

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 610327 **Method/Testcode:** SM 5310 C/TOC D

d	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1808907-001	Carbon, Dissolved Organic (DOC)	N/A		Surface Water	6.57 mg/L	10 ml	6.57 mg/L	1	0.07	0.50			10/9/18 21:04	N	III
1809163-001	Carbon, Dissolved Organic (DOC)	N/A		Surface Water	1.70 mg/L	10 ml	1.70 mg/L	1	0.07	0.50			10/9/18 22:09	N	IV
1809164-001	Carbon, Dissolved Organic (DOC)	N/A		Surface Water	0.35 mg/L	10 ml	0.35 mg/L J	1	0.07	0.50			10/9/18 23:30	N	III
1809164-002	Carbon, Dissolved Organic (DOC)	N/A		Surface Water	1.73 mg/L	10 ml	1.73 mg/L	1	0.07	0.50			10/10/18 00:02	Y	III
1809164-003	Carbon, Dissolved Organic (DOC)	N/A		Surface Water	0.46 mg/L	10 ml	0.46 mg/L J	1	0.07	0.50			10/10/18 01:06	N	III
1809164-004	Carbon, Dissolved Organic (DOC)	N/A		Surface Water	1.50 mg/L	10 ml	1.50 mg/L	1	0.07	0.50			10/10/18 01:38	N	III
Q1814464-01	Carbon, Dissolved Organic (DOC)	MS	K1808907-001	Surface Water	32.38 mg/L	10 ml	32.4 mg/L	1	0.07	0.50	103		10/9/18 21:36	N	III
Q1814464-02	Carbon, Dissolved Organic (DOC)	DUP	K1808907-001	Surface Water	6.21 mg/L	10 ml	6.21 mg/L	1	0.07	0.50		6	10/9/18 21:04	N	III
Q1814464-03	Carbon, Dissolved Organic (DOC)	MS	K1809163-001	Surface Water	27.42 mg/L	10 ml	27.4 mg/L	1	0.07	0.50	103		10/9/18 22:40	N	IV
KQ1814464-04	Carbon, Dissolved Organic (DOC)	DUP	K1809163-001	Surface Water	1.67 mg/L	10 ml	1.67 mg/L	1	0.07	0.50		1	10/9/18 22:09	N	IV
Q1814464-05	Carbon, Dissolved Organic (DOC)	DUP	K1809164-001	Surface Water	0.33 mg/L	10 ml	0.33 mg/L J	1	0.07	0.50		6	10/9/18 23:30	N	III
Q1814464-06	Carbon, Dissolved Organic (DOC)	MS	K1809164-002	Surface Water	27.38 mg/L	10 ml	27.4 mg/L	1	0.07	0.50	103		10/10/18 00:34	N	III
Q1814464-07	Carbon, Dissolved Organic (DOC)	DUP	K1809164-002	Surface Water	1.67 mg/L	10 ml	1.67 mg/L	1	0.07	0.50		4	10/10/18 00:02	N	III
Q1814464-08	Carbon, Dissolved Organic (DOC)	DUP	K1809164-003	Surface Water	0.43 mg/L	10 ml	0.43 mg/L J	1	0.07	0.50		9	10/10/18 01:06	N	III
KQ1814464-09	Carbon, Dissolved Organic (DOC)	DUP	K1809164-004	Surface Water	1.43 mg/L	10 ml	1.43 mg/L	1	0.07	0.50		5	10/10/18 01:38	N	III
KQ1814464-10	Carbon, Dissolved Organic (DOC)	MB		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/9/18 19:43	N	III
KQ1814464-11	Carbon, Dissolved Organic (DOC)	LCS		Surface Water	21.71 mg/L	10 ml	21.7 mg/L	1	0.07	0.50	99		10/9/18 20:00	N	III
KQ1814464-12	Carbon, Dissolved Organic (DOC)	CCV		Surface Water	24.45 mg/L	10 ml	24.5 mg/L	1			98		10/9/18 19:10	N	III
KQ1814464-13	Carbon, Dissolved Organic (DOC)	CCV		Surface Water	24.51 mg/L	10 ml	24.5 mg/L	1			98		10/9/18 22:57	N	III
KQ1814464-14	Carbon, Dissolved Organic (DOC)	CCV		Surface Water	24.95 mg/L	10 ml	24.9 mg/L	1			100		10/10/18 04:01	N	III
KQ1814464-15	Carbon, Dissolved Organic (DOC)	CCB		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/9/18 19:27	N	III
KQ1814464-16	Carbon, Dissolved Organic (DOC)	CCB		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/9/18 23:13	N	III
KQ1814464-17	Carbon, Dissolved Organic (DOC)	CCB		Surface Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/10/18 04:17	N	III

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

10/10/18

CES 10/10/18

00943920

Analytical Results Summary

Instrument Name: K-TOC-03 **Analyst:** CSETHE **Analysis Lot:** 610329 **Method/Testcode:** SM 5310 C/TOC T

ode	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
1808732-001	Carbon, Total Organic	N/A		Water	12.85 mg/L	10 ml	12.8 mg/L	1	0.07	0.50			10/10/18 05:07	N	IV
1808732-002	Carbon, Total Organic	N/A		Water	1.51 mg/L	10 ml	1.51 mg/L	1	0.07	0.50			10/10/18 05:39	N	IV
1809040-001	Carbon, Total Organic	N/A		Ground Water	0.36 mg/L	10 ml	0.36 mg/L J	1	0.07	0.50			10/10/18 06:43	N	IV
1809040-002	Carbon, Total Organic	N/A		Ground Water	2.30 mg/L	10 ml	2.30 mg/L	1	0.07	0.50			10/10/18 07:47	N	IV
1809166-001	Carbon, Total Organic	N/A		Water	1.48 mg/L	10 ml	370 mg/L	250	20	130			10/10/18 08:52	N	IV
1809385-001	Carbon, Total Organic	N/A		Ground Water	11.44 mg/L	10 ml	2860 mg/L	250	20	130			10/10/18 02:10	Y	IV
1809385-003	Carbon, Total Organic	N/A		Ground Water	2.67 mg/L	10 ml	53 mg/L	20	2	10			10/10/18 03:29	N	IV
Q1814465-01	Carbon, Total Organic	MS	K1809385-001	Ground Water	37.18 mg/L	10 ml	9300 mg/L	250	20	130	103		10/10/18 02:41	N	IV
Q1814465-02	Carbon, Total Organic	DUP	K1809385-001	Ground Water	11.16 mg/L	10 ml	2790 mg/L	250	20	130		2	10/10/18 02:10	N	IV
Q1814465-03	Carbon, Total Organic	DUP	K1809385-003	Ground Water	2.58 mg/L	10 ml	52 mg/L	20	2	10		3	10/10/18 03:29	N	IV
Q1814465-04	Carbon, Total Organic	DUP	K1808732-001	Water	12.27 mg/L	10 ml	12.3 mg/L	1	0.07	0.50		5	10/10/18 05:07	N	IV
Q1814465-05	Carbon, Total Organic	MS	K1808732-002	Water	27.66 mg/L	10 ml	27.7 mg/L	1	0.07	0.50	105		10/10/18 06:10	N	IV
Q1814465-06	Carbon, Total Organic	DUP	K1808732-002	Water	1.45 mg/L	10 ml	1.45 mg/L	1	0.07	0.50		4	10/10/18 05:39	N	IV
Q1814465-07	Carbon, Total Organic	MS	K1809040-001	Ground Water	26.12 mg/L	10 ml	26.1 mg/L	1	0.07	0.50	103		10/10/18 07:15	N	IV
Q1814465-08	Carbon, Total Organic	DUP	K1809040-001	Ground Water	0.34 mg/L	10 ml	0.34 mg/L J	1	0.07	0.50		4	10/10/18 06:43	N	IV
Q1814465-09	Carbon, Total Organic	DUP	K1809040-002	Ground Water	2.28 mg/L	10 ml	2.28 mg/L	1	0.07	0.50		<1	10/10/18 07:47	N	IV
Q1814465-10	Carbon, Total Organic	MS	K1809166-001	Water	26.27 mg/L	10 ml	6570 mg/L	250	20	130	99		10/10/18 09:24	N	IV
Q1814465-11	Carbon, Total Organic	DUP	K1809166-001	Water	1.43 mg/L	10 ml	360 mg/L	250	20	130		3	10/10/18 08:52	N	IV
Q1814465-12	Carbon, Total Organic	MB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/10/18 04:34	N	IV
Q1814465-13	Carbon, Total Organic	LCS		Ground Water	21.75 mg/L	10 ml	21.8 mg/L	1	0.07	0.50	99		10/10/18 04:50	N	IV
Q1814465-14	Carbon, Total Organic	CCV		Ground Water	24.51 mg/L	10 ml	24.5 mg/L	1			98		10/9/18 22:57	N	IV
Q1814465-15	Carbon, Total Organic	CCV		Ground Water	24.95 mg/L	10 ml	24.9 mg/L	1			100		10/10/18 04:01	N	IV
Q1814465-16	Carbon, Total Organic	CCV		Ground Water	24.36 mg/L	10 ml	24.4 mg/L	1			98		10/10/18 08:19	N	IV
Q1814465-17	Carbon, Total Organic	CCV		Ground Water	24.24 mg/L	10 ml	24.2 mg/L	1			97		10/10/18 10:12	N	IV
Q1814465-18	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/9/18 23:13	N	IV
Q1814465-19	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/10/18 04:17	N	IV

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

10/10/18 CES 10/10/18

Analytical Results Summary

Instrument Name: K-TOC-0 **Analyst:** CSETHE **Analysis Lot:** 610329 **Method/Testcode:** SM 5310 C/TOC T

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
KQ1814465-20	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/10/18 08:36	N	IV
KQ1814465-21	Carbon, Total Organic	CCB		Ground Water	0.00 mg/L	10 ml	0.50 mg/L U	1	0.07	0.50			10/10/18 10:29	N	IV

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

StarLIMS Run: K1808907, 9163, 9164, 9385, 8732, 9040, 9166

Analysis: TOC, DOC

Method: SM 5310 C, 415.1

CCV: 1 1-GEN-05-69K 50 ppm LCS: 11-GEN-05-69N 21.9 ppm

ICAL Date: 3/13/18

ICAL ID: 11-GEN-05-65A

ICS ID: 11-GEN-05-67D

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-05-69L

21 % H3PO4: 11-GEN-05-69M

Equipment ID: K-TOC-03

PIPETTE ID: 124276B, 129001F

FILTER ID: 48878

Analyzed By: CES	Date Analyzed: 10/9/18
Reviewed By: [signature]	Date Reviewed: 10/10/18

DOC: 610327

TOC: 610329

Schedule: 10092018

Version: 7
Instrument: Fusion1
Last Saved by: Fusion1 (Fusion1)
Last Saved on: 2018/10/10 14:29 - 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)	1
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
1	Sample	MB1	Extended Reaction 021711 (Extended Reaction 021711)	1
2	Check Standard	[TOC] LCS ER [21.9 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
3	Sample	ICS	Extended Reaction 021711 (Extended Reaction 021711)	1
4	Sample	FB 10/9/18	Extended Reaction 021711 (Extended Reaction 021711)	2
5	Sample	K1808907-001.01 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
6	Sample	K1808907-001.01 ms doc	Extended Reaction 021711 (Extended Reaction 021711)	1
7	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
8	Sample	K1809163-001.06 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
9	Sample	K1809163-001.06 ms doc	Extended Reaction 021711 (Extended Reaction 021711)	1
B	Check Standard	[TOC] CCV 021711 [25 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
D	Check Standard	[TOC] CCB 021711 [0.0 ppm]	Extended Reaction 021711 (Extended Reaction 021711)	1
10	Sample	K1809164-001.06 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
11	Sample	K1809164-002.27 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
12	Sample	K1809164-002.27 ms doc	Extended Reaction 021711 (Extended Reaction 021711)	1
13	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
14	Sample	K1809164-003.06 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
15	Sample	K1809164-004.06 doc	Extended Reaction 021711 (Extended Reaction 021711)	2
16	Sample	K1809385-001.03 250x	Extended Reaction 021711 (Extended Reaction 021711)	2
17	Sample	K1809385-001.03 ms 250x	Extended Reaction 021711 (Extended Reaction 021711)	1
18	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	2
19	Sample	K1809385-003.02 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	K1808732-001.08	Extended Reaction 021711 (Extended Reaction 021711)	2
22	Sample	K1808732-002.08	Extended Reaction 021711 (Extended Reaction 021711)	2
23	Sample	K1808732-002.08 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
24	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
25	Sample	K1809040-001.08	Extended Reaction 021711 (Extended Reaction 021711)	2
26	Sample	K1809040-001.08 ms	Extended Reaction 021711 (Extended Reaction 021711)	1
27	Sample	RB	Extended Reaction 021711 (Extended Reaction 021711)	1
28	Sample	K1809040-002.08	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	K1809166-001.01 250x	Extended Reaction 021711 (Extended Reaction 021711)	2
30	Sample	K1809166-001.01 ms 250x	Extended Reaction 021711 (Extended Reaction 021711)	1
31	Sample	RB	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

Fusion Report - 10092018
Tuesday, October 09, 2018 04:20 PM

(View - Reps, Unused Reps, Meta-Data, Signature, History)
Printed on 2018/10/10 14:25 - Wednesday

Report Summary Information

Company Location:	Gen Chem Lab		
Schedule Name:	10092018	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) (v1) Fusion1 (Fusion1) (v2) Fusion1 (Fusion1) (v3) Fusion1 (Fusion1) (v5) Fusion1 (Fusion1) (v6)		
Comment:			

Report Results

10/10/18

Sample Type: Clean — From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/10/09 16:20

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	13.48	17.24	3.76	49.13	08:00
2	TC Clean	7.08	10.95	3.86	49.69	07:18
3	TC Clean	2.26	6.26	4.01	49.68	07:02
4	TC Clean	1.84	5.67	3.83	49.68	07:00

Sample Type: Clean — From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(clean)		Clean	2018/10/09 16:54

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.84	4.63	3.79	49.11	07:59
2	TC Clean	4.12	7.93	3.81	49.68	07:18
3	TC Clean	1.74	5.70	3.96	49.69	07:02

4	TC Clean	1.53	5.35	3.82	49.69	07:01

Sample Type: Clean — From Schedule Version 1

	Pos	Analysis Typ	Sample ID	Start Time
◈	(clean)		Clean	2018/10/09 17:28

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.82	4.55	3.73	49.14	07:58
2	TC Clean	4.12	7.93	3.81	49.66	07:18
3	TC Clean	1.70	5.62	3.92	49.67	07:04
4	TC Clean	1.38	5.39	4.02	49.70	07:01

Sample Type: Blank (Creating v1157) — From Schedule Version 1

	Pos	Analysis Type	Sample ID	Start Time
◈	(blank)		Reagent/Acid Blank	2018/10/09 18:02

Rep #	Base Analysis Type	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	IC Clean	0.82	4.56	3.75	49.14	08:00
2	TC Clean	4.14	7.93	3.80	49.73	07:17
3	TC Clean	1.62	5.53	3.91	49.74	07:03
4	TC Clean	1.47	5.35	3.87	49.74	06:58
5	Reagent Blank	5.35	9.16	3.80	49.77	08:13
6	Acid Blank	1.54	5.28	3.74	49.22	08:04

Sample Type: Sample — From Schedule Version 2

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	D	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/09 18:54

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.50	16.31	3.81	49.97	12:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 3

	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)	24.4546 ppm (PASS)	0.0000 ppm	0%	2018/10/09 19:10

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.4546	244.5462	189.59	193.45	3.86	50.00	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 5

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/09 19:27

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	11.50	15.50	3.99	49.98	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 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%	2018/10/09 19:43

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	10.95	14.99	4.04	50.02	12:33

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> LCS ER From Schedule Version 5

	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)	21.7074 ppm (PASS)	0.0000 ppm	0%	2018/10/09 20:00

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	21.7074	217.0741	170.01	174.11	4.09	50.01	12:28

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 µ mC

Sample Type: Sample From Schedule Version 5

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	3	TOC	ICS	0.0098 ppm	0.0000 ppm	0.0000%	2018/10/09 20:16

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0098	0.0978	14.22	18.19	3.97	50.01	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	4	TOC	FB 10/9/18	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/09 20:33

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	10.82	14.83	4.00	50.01	12:29
2	TOC	0.0000	0.0000	11.22	15.28	4.06	50.01	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	5	TOC	K1808907-001.01 doc	6.3928 ppm	0.2544 ppm	3.9800%	2018/10/09 21:04

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	6.5727	65.7266	60.99	64.88	3.89	50.04	12:24
2	TOC	6.2129	62.1285	58.42	62.48	4.06	50.01	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Sample From Schedule Version 6

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	6	TOC	K1808907-001.01 ms doc	32.3751 ppm	0.0000 ppm	0.0000%	2018/10/09 21:36

Rep	Base			Adjusted		Baseline	Pressure	Run

#	Analysis Type	ppm	µg	(Abs)	NDIR (Abs)	(Abs)	(psig)	Time
1	TOC	32.3751	323.7510	244.86	248.73	3.88	49.96	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	7	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/09 21:52

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.68	16.60	3.92	49.92	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	8	TOC	K1809163-001.06 doc	1.6872 ppm	0.0178 ppm	1.0500%	2018/10/09 22:09

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.6998	16.9976	26.26	30.20	3.94	49.92	12:26
2	TOC	1.6746	16.7464	26.08	29.99	3.91	49.91	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	9	TOC	K1809163-001.06 ms doc	27.4181 ppm	0.0000 ppm	0.0000%	2018/10/09 22:40

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	27.4181	274.1814	209.53	213.52	3.99	49.89	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 6

	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)	24.5140 ppm (PASS)	0.0000 ppm	0%	2018/10/09 22:57

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.5140	245.1398	190.01	193.90	3.89	49.86	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 6

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◆	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/09 23:13

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	12.25	16.17	3.92	49.83	12:33

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 DOC CES 10/10/18 From Schedule Version 6

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	10	TOC	K1809164-001.06	0.3438 ppm	0.0140 ppm	4.0700%	2018/10/09 23:30

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.3537	3.5373	16.67	20.67	4.00	49.82	12:25
2	TOC	0.3339	3.3394	16.53	20.52	4.00	49.81	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	11	TOC	K1809164-002.27 doc	1.6981 ppm	0.0452 ppm	2.6600%	2018/10/10 00:02

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.7301	17.3007	26.48	30.38	3.90	49.79	12:28
2	TOC	1.6661	16.6608	26.02	29.90	3.88	49.79	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◆	12	TOC	K1809164-002.27 ms doc	27.3818 ppm	0.0000 ppm	0.0000%	2018/10/10 00:34

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	27.3818	273.8180	209.28	212.99	3.72	49.79	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	13	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/10 00:50

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.82	16.58	3.76	49.78	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	14	TOC	K1809164-003.06 doc	0.4456 ppm	0.0270 ppm	6.0600%	2018/10/10 01:06

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.4647	4.6473	17.46	21.27	3.81	49.75	12:26
2	TOC	0.4266	4.2656	17.19	21.09	3.90	49.76	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	15	TOC	K1809164-004.06 doc	1.4651 ppm	0.0509 ppm	3.4700%	2018/10/10 01:38

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.5011	15.0105	24.84	28.68	3.84	49.74	12:26
2	TOC	1.4291	14.2906	24.33	28.24	3.91	49.71	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	16	TOC	K1809385-001.03 250x	11.2965 ppm	0.1990 ppm	1.7600%	2018/10/10 02:10

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	11.4373	114.3728	95.65	99.55	3.90	49.73	12:23
2	TOC	11.1558	111.5578	93.65	97.56	3.91	49.74	12:24

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	17	TOC	K1809385-001.03 ms 250x	37.1840 ppm	0.0000 ppm	0.0000%	2018/10/10 02:41

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	37.1840	371.8401	279.13	283.12	3.99	49.72	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	18	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/10 02:58

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.57	16.55	3.99	49.72	12:26
2	TOC	0.0000	0.0000	11.84	15.64	3.80	49.72	12:23

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	19	TOC	K1809385-003.02 20x	2.6256 ppm	0.0611 ppm	2.3300%	2018/10/10 03:29

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.6689	26.6886	33.17	36.99	3.82	49.72	12:27
2	TOC	2.5824	25.8242	32.55	36.37	3.82	49.70	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 6

	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)	24.9486 ppm (PASS)	0.0000 ppm	0%	2018/10/10 04:01

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.9486	249.4858	193.11	196.86	3.75	49.68	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

Sample Type: Check Standard --> CCB 021711 From Schedule Version 6

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm	0.0000 ppm	0%	2018/10/10 04:17

							(PASS)				

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	11.99	15.85	3.86	49.67	12:26

Completion State	Success Action	Method	Calibration	STD Conc - Pos
Success - Criteria met.	Do Nothing	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)	0 ppmC

Sample Type: Sample — From Schedule Version 6

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	20	TOC	MB2	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/10 04:34

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	11.34	15.07	3.73	49.66	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> LCS ER — From Schedule Version 6

	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)	21.7516 ppm (PASS)	0.0000 ppm	0%	2018/10/10 04:50

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
2	TOC	21.9 ppm	1	21.7516	217.5162	170.33	174.25	3.92	49.65	12:32

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 6

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	21	TOC	K1808732-001.08	12.5615 ppm	0.4065 ppm	3.2400%	2018/10/10 05:07

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	12.8490	128.4898	105.71	109.76	4.04	49.64	12:28
2	TOC	12.2741	122.7405	101.62	105.61	4.00	49.64	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC)	Extended Reaction	Extended Reaction

(v1157) 021711 (v3) 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	22	TOC	K1808732-002.08	1.4844 ppm	0.0432 ppm	2.9100%	2018/10/10 05:39

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.5149	15.1494	24.94	28.78	3.84	49.63	12:25
2	TOC	1.4539	14.5390	24.51	28.31	3.80	49.62	12:28

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	23	TOC	K1808732-002.08 ms	27.6619 ppm	0.0000 ppm	0.0000%	2018/10/10 06:10

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	27.6619	276.6190	211.27	215.26	3.99	49.63	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	24	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/10 06:27

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	13.02	16.88	3.86	49.62	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	25	TOC	K1809040-001.08	0.3481 ppm	0.0103 ppm	2.9600%	2018/10/10 06:43

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.3554	3.5541	16.68	20.72	4.04	49.62	12:23
2	TOC	0.3408	3.4082	16.58	20.54	3.96	49.61	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	26	TOC	K1809040-001.08 ms	26.1179 ppm	0.0000 ppm	0.0000%	2018/10/10 07:15

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	26.1179	261.1786	200.27	204.17	3.90	49.62	12:30

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	27	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/10 07:31

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.17	16.08	3.91	49.61	12:32

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	28	TOC	K1809040-002.08	2.2915 ppm	0.0119 ppm	0.5200%	2018/10/10 07:47

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	2.2999	22.9994	30.54	34.39	3.85	49.61	12:29
2	TOC	2.2831	22.8310	30.42	34.21	3.79	49.77	12:26

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 From Schedule Version 6

	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)	24.3558 ppm (PASS)	0.0000 ppm	0%	2018/10/10 08:19

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
B	TOC	25 ppm	1	24.3558	243.5583	188.89	192.91	4.03	49.89	12:35

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 6

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/10 08:36

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

D	TOC	0.0 ppm	1	0.0000	0.0000	11.96	15.87	3.91	49.92	12:28

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 6

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	29	TOC	K1809166-001.01 250x	1.4554 ppm	0.0293 ppm	2.0100%	2018/10/10 08:52

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	1.4761	14.7607	24.67	28.36	3.69	49.94	12:27
2	TOC	1.4347	14.3468	24.37	28.13	3.76	49.96	12:27

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	30	TOC	K1809166-001.01 ms 250x	26.2735 ppm	0.0000 ppm	0.0000%	2018/10/10 09:24

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	26.2735	262.7349	201.38	205.41	4.03	49.98	12:31

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

	Pos	Analysis Type	Sample ID	Result (ppmC)	Std. Dev. (ppmC)	RSD	Start Time
◈	31	TOC	RB	0.0000 ppm	0.0000 ppm	0.0000%	2018/10/10 09:40

Rep #	Base Analysis Type	ppm	µg	Adjusted (Abs)	NDIR (Abs)	Baseline (Abs)	Pressure (psig)	Run Time
1	TOC	0.0000	0.0000	12.10	16.13	4.04	49.99	12:27
2	TOC	0.0000	0.0000	11.20	15.15	3.95	49.98	12:25

Dilution	Blank Contribution	Method	Calibration
1:10	(TC) 14.1483 (IC) (v1157)	Extended Reaction 021711 (v3)	Extended Reaction 021711 (v17)

Sample Type: Check Standard --> CCV 021711 — From Schedule Version 6

	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)	24.2351 ppm (PASS)	0.0000 ppm	0%	2018/10/10 10:12

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

	Type									
B	TOC	25 ppm	1	24.2351	242.3515	188.03	191.84	3.81	50.00	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 6

	Pos	BAT	Concentration (ppm)	Dil	Sample ID	Min / Max (% dev)	Result	Std. Dev.	RSD	Start Time
◈	D	TOC	0.0000	1:2	[TOC] CCB 021711 [0.0 ppm]	0 / infinity (NA / NA)	0.0000 ppm (PASS)	0.0000 ppm	0%	2018/10/10 10:29

Pos	Base Analysis Type	ID	Rep #	ppm	µg	Adjusted	NDIR	Baseline	Pressure	Run Time
D	TOC	0.0 ppm	1	0.0000	0.0000	11.44	15.47	4.03	50.00	12:29

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
v1156	2.0937	1.1800	0.0000	0.0000	0.0000	2018/10/05 15:01	Fusion1 (Fusion1)
v1157	1.7843	1.5390	0.0000	0.0000	0.0000	2018/10/09 18:54	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
1.00 ppm	21.6980	1.0000		2018/03/13 20:28
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	2018/10/10 10:47

LABORATORY REPORT

October 3, 2018

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

RE: HS18091438

Dear RJ:

Enclosed are the results of the samples submitted to our laboratory on September 28, 2018. For your reference, these analyses have been assigned our service request number P1805135.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental



Kate Kaneko
Project Manager

Client: ALS Laboratory Group Service Request No: P1805135
Project: HS18091438

CASE NARRATIVE

The samples were received intact under chain of custody on September 28, 2018 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Carbon Dioxide Analysis

The samples were analyzed for carbon dioxide using a gas chromatograph equipped with a thermal conductivity detector (TCD). A known amount of liquid was displaced by injecting 8.0 milliliters of helium creating a headspace in the sample vial. Each sample vial was agitated using a sonic disrupter for fifteen minutes and then allowed to equilibrate for at least four hours. A volume of the headspace was withdrawn using a gas-tight syringe and analyzed using a manual injection technique. The amount of dissolved gases (carbon dioxide) in the original sample was calculated using Henry's Law. This method was performed with guidance from RSK 175 as described in laboratory SOP VOA-DISGAS. This analyte is included on the laboratory's NELAP and DoD-ELAP scope of accreditation.

Methane, Ethene and Ethane Analysis

The samples were also analyzed for methane, ethene and ethane using a gas chromatograph equipped with a flame ionization detector (FID). A known amount of liquid was displaced by injecting 8.0 milliliters of helium creating a headspace in the sample vial. Each sample vial was agitated using a sonic disrupter for fifteen minutes and then allowed to equilibrate for at least two hours. A volume of the headspace was withdrawn using a gas-tight syringe and analyzed using a manual injection technique. The amount of dissolved gases (methane, ethene and ethane) in the original sample was calculated using Henry's Law. This method was performed with guidance from RSK 175. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the laboratory's NELAP or DoD-ELAP accreditation.

The Matrix Spike (MS) and Duplicate Matrix Spike (DMS) recoveries were outside the acceptance limits sue to suspected matrix interference. However, the Laboratory Control Sample (LCS) and Duplicate Laboratory Control Sample (DLCS) recoveries were within the acceptance limits indicating that the analysis was in control. The recoveries have been flagged accordingly. No further corrective action was taken.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.

ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Alaska DEC	http://dec.alaska.gov/eh/lab.aspx	17-019
Arizona DHS	http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home	AZ0694
Florida DOH (NELAP)	http://www.floridahealth.gov/licensing-and-regulation/environmental-laboratories/index.html	E871020
Louisiana DEQ (NELAP)	http://www.deq.louisiana.gov/page/la-lab-accreditation	05071
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/professionals/labCert.shtml	2016036
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	1347317
New Jersey DEP (NELAP)	http://www.nj.gov/dep/enforcement/oqa.html	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://www.oregon.gov/oha/ph/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-005
Pennsylvania DEP	http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx	68-03307 (Registration)
PJLA (DoD ELAP)	http://www.pjlabs.com/search-accredited-labs	65818 (Testing)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/agency/qa/env_lab_accreditation.html	T104704413-18-9
Utah DOH (NELAP)	http://health.utah.gov/lab/lab_cert_env	CA016272018-9
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: ALS Laboratory Group
Project ID: HS18091438

Service Request: P1805135

Date Received: 9/28/2018
Time Received: 09:30

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	RSK 175 - CO2	RSK 175 - Gases
HS18091438-01	P1805135-001	Water	9/26/2018	09:20	X	X
HS18091438-02	P1805135-002	Water	9/26/2018	11:15	X	X
HS18091438-03	P1805135-003	Water	9/26/2018	11:15	X	X
HS18091438-04	P1805135-004	Water	9/26/2018	12:30	X	X

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

P1805135

Subcontract Chain of Custody

COC ID: 9909

SUBCONTRACT TO:

ALS Environmental
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Phone: +1 805 526 7161

CUSTOMER INFORMATION:

Company:	ALS Houston
Contact:	RJ Modashia
Address:	10450 Stancliff Rd, Ste 210
Phone:	+1 281 530 5656
Email:	RJ.Modashia@alsglobal.com
Alternate Contact:	Jumoke M. Lawal
Email:	jumoke.lawal@alsglobal.com

INVOICE INFORMATION:

Company:	ALS Houston
Contact:	Accounts Payable
Address:	10450 Stancliff Rd, Ste 210
Phone:	+1 281 530 5656
Reference:	HS18091438
TSR:	Danielle Winnings

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18091438-01**	**35AWW06_092618**	**Groundwater**	**26 Sep 2018 09:20**
	MEE plus CO2 Sub to ALS SimiValley			05 Oct 2018
2.	**HS18091438-02**	**35AWW20_092618**	**Groundwater**	**26 Sep 2018 11:15**
	MEE plus CO2 Sub to ALS SimiValley			05 Oct 2018
3.	**HS18091438-03**	**35AWW20_092618_a**	**Groundwater**	**26 Sep 2018 11:15**
	MEE plus CO2 Sub to ALS SimiValley			05 Oct 2018
4.	**HS18091438-04**	**LHSMW07_092618**	**Groundwater**	**26 Sep 2018 12:30**
	MEE plus CO2 Sub to ALS SimiValley			05 Oct 2018

3°C Wt Ice

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

MS/MSD - HS18091438-01

Neat vials for CO2

QC Level: DOD IV (DoD Data Package)

Received by: 9/28/18 0930

P1805135

Subcontract Chain of Custody

COC ID: 9909

Relinquished By:	J. Juarez	Date/Time:	9/27/18 18:00
Received By:	[signature]	Date/Time:	9/28/18 0950
Cooler ID(s):		Temperature(s):	

ALS Environmental
Sample Acceptance Check Form

Client: ALS Laboratory Group Work order: P1805135
Project: RSK CO2 MEE DoD
Sample(s) received on: 9/28/18 Date opened: 9/28/18 by: AARON GONZALEZ

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Did **sample containers** arrive in good condition?	☒	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
5	Was **sample volume** received adequate for analysis?	☒	☐	☐
6	Are samples within specified holding times?	☒	☐	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature: 3° C Blank Temperature: ° C Thermometer ID CO907034581 Wet Ic			
8	Were **custody seals** on outside of cooler/Box/Container?	☒	☐	☐
	Location of seal(s)? Cooler lid Sealing Lid?	☒	☐	☐
	Were signature and date included?	☒	☐	☐
	Were seals intact?	☒	☐	☐
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☐	☐	☒
	Is there a client indication that the submitted samples are **pH** preserved?	☐	☐	☒
	Were **VOA vials** checked for presence/absence of air bubbles?	☐	☐	☒
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☐	☒
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1805135-001.01	40mL VOA NP		5			MR 10/1/18
P1805135-001.02	40mL VOA NP		5			MR 10/1/18
P1805135-001.03	40mL VOA NP		5			MR 10/1/18
P1805135-001.04	40ml VOA HCL		1			MR 10/2/18
P1805135-001.05	40ml VOA HCL		1			MR 10/2/18
P1805135-001.06	40ml VOA HCL		1			MR 10/2/18
P1805135-001.07	40mL VOA NP					
P1805135-001.08	40mL VOA NP					
P1805135-001.09	40mL VOA NP					
P1805135-001.10	40ml VOA HCL					
P1805135-001.11	40ml VOA HCL					
P1805135-001.12	40ml VOA HCL					
P1805135-002.01	40mL VOA NP		7			MR 10/1/18
P1805135-002.02	40mL VOA NP					
P1805135-002.04	40ml VOA HCL		1			MR 10/2/18

Explain any discrepancies: (include lab sample ID numbers):

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS Environmental
Sample Acceptance Check Form

Client: ALS Laboratory Group Work order: P1805135

Project: RSK CO2 MEE DoD

Sample(s) received on: 9/28/18 Date opened: 9/28/18 by: AARON GONZALEZ

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1805135-002.05	40ml VOA HCL					
P1805135-003.01	40mL VOA NP		7			MR 10/1/18
P1805135-003.02	40mL VOA NP					
P1805135-003.04	40ml VOA HCL		1			MR 10/2/18
P1805135-003.05	40ml VOA HCL					
P1805135-004.01	40mL VOA NP		7			MR 10/1/18
P1805135-004.02	40mL VOA NP					
P1805135-004.04	40ml VOA HCL		1			MR 10/2/18
P1805135-004.05	40ml VOA HCL					

Explain any discrepancies: (include lab sample ID numbers):

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Project ID: **HS18091438** ALS Project ID: P1805135

Carbon Dioxide

Test Code: RSK 175
Instrument ID: HP5890A/GC10/TCD
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date(s) Collected: 9/26/18
Date Received: 9/28/18
Date Analyzed: 10/1/18

Client Sample ID	ALS Sample ID	Injection Volume ml(s)	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
HS18091438-01	P1805135-001	0.050	**860,000**	2,000	1,700	740	
HS18091438-02	P1805135-002	0.050	**740,000**	2,000	1,700	740	
HS18091438-03	P1805135-003	0.050	**770,000**	2,000	1,700	740	
HS18091438-04	P1805135-004	0.050	**760,000**	2,000	1,700	740	
Method Control Sample	P181001-MB	0.10	860	1,000	860	370	**U**

The Method Control Sample is laboratory water carried through the entire analytical process.
U = Compound was analyzed for, but not detected above the laboratory detection limit.
LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

MATRIX SPIKE / DUPLICATE MATRIX SPIKE SUMMARY

Client: **ALS Laboratory Group**
Client Sample ID: **HS18091438-01**
Client Project ID: **HS18091438**

ALS Project ID: P1805135
ALS Sample ID: P1805135-001MS
P1805135-001DMS

Test Code: RSK 175
Instrument ID: HP5890A/GC10/TCD
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 9/26/18
Date Received: 9/28/18
Date Analyzed: 10/1/18
Volume(s) Analyzed: 0.050 ml(s)

CAS #	Compound	Spike Amount MS / DMS ug/L	Sample Amount ug/L	Result MS ug/L	Result DMS ug/L	% Recovery MS	% Recovery DMS	DOD Acceptance Limits	RPD	RPD Limit	Data Qualifier
124-38-9	Carbon Dioxide	45,800	856,000	900,000	905,000	**96**	**107**	80-122	11	30	

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Client: **ALS Laboratory Group**
Client Sample ID: **Duplicate Lab Control Sample** ALS Project ID: P1805135
Client Project ID: **HS18091438** ALS Sample ID: P181001-DLCS

Test Code: RSK 175 Date Collected: NA
Instrument ID: HP5890A/GC10/TCD Date Received: NA
Analyst: Wade Henton Date Analyzed: 10/01/18
Matrix: Water Volume(s) Analyzed: NA ml(s)
Test Notes:

CAS #	Compound	Spike Amount LCS / DLCS ug/L	Result$_1$ LCS ug/L	Result$_1$ DLCS ug/L	% Recovery LCS	% Recovery DLCS	DOD Acceptance Limits	RPD	RPD Limit	Data Qualifier
124-38-9	Carbon Dioxide	22,900	18,500	18,400	**81**	**80**	80-122	1	15	

$_1$ = The concentration shown includes a subtraction of the Method Control Sample value, even if the result is less than the MRL.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Sample ID: **HS18091438-01**
Client Project ID: **HS18091438**

ALS Project ID: P1805135
ALS Sample ID: P1805135-001

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 9/26/18
Date Received: 9/28/18
Date Analyzed: 10/2/18
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	**3.0**	1.3	1.0	0.51	
74-85-1	Ethene	0.55	1.0	0.55	0.24	**U**
74-84-0	Ethane	0.47	0.60	0.47	0.16	**U**

U = Compound was analyzed for, but not detected above the laboratory detection limit.
LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Sample ID: **HS18091438-02**
Client Project ID: **HS18091438**

ALS Project ID: P1805135
ALS Sample ID: P1805135-002

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 9/26/18
Date Received: 9/28/18
Date Analyzed: 10/2/18
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	**37**	1.3	1.0	0.51	
74-85-1	Ethene	**0.66**	1.0	0.55	0.24	**J**
74-84-0	Ethane	0.47	0.60	0.47	0.16	**U**

U = Compound was analyzed for, but not detected above the laboratory detection limit.
LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Sample ID: **HS18091438-03**
Client Project ID: **HS18091438**

ALS Project ID: P1805135
ALS Sample ID: P1805135-003

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 9/26/18
Date Received: 9/28/18
Date Analyzed: 10/2/18
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	**30**	1.3	1.0	0.51	
74-85-1	Ethene	**0.50**	1.0	0.55	0.24	**J**
74-84-0	Ethane	0.47	0.60	0.47	0.16	**U**

U = Compound was analyzed for, but not detected above the laboratory detection limit.
LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Sample ID: **HS18091438-04**
Client Project ID: **HS18091438**

ALS Project ID: P1805135
ALS Sample ID: P1805135-004

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 9/26/18
Date Received: 9/28/18
Date Analyzed: 10/2/18
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	**27**	1.3	1.0	0.51	
74-85-1	Ethene	**4.0**	1.0	0.55	0.24	
74-84-0	Ethane	0.47	0.60	0.47	0.16	**U**

U = Compound was analyzed for, but not detected above the laboratory detection limit.
LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Sample ID: **Method Control Sample**
Client Project ID: **HS18091438**

ALS Project ID: P1805135
ALS Sample ID: P181002-MB

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 10/02/18
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	1.0	1.3	1.0	0.51	**U**
74-85-1	Ethene	0.55	1.0	0.55	0.24	**U**
74-84-0	Ethane	0.47	0.60	0.47	0.16	**U**

The Method Control Sample is laboratory water carried through the entire analytical process.
U = Compound was analyzed for, but not detected above the laboratory detection limit.
LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

ALS ENVIRONMENTAL

MATRIX SPIKE / DUPLICATE MATRIX SPIKE SUMMARY

Client: **ALS Laboratory Group**
Client Sample ID: **HS18091438-01**
Client Project ID: **HS18091438**

ALS Project ID: P1805135
ALS Sample ID: P1805135-001MS
P1805135-001DMS

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 9/26/18
Date Received: 9/28/18
Date Analyzed: 10/2/18
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Spike Amount MS / DMS µg/L	Sample Amount µg/L	Result MS µg/L	Result DMS µg/L	% Recovery MS	% Recovery DMS	DOD Acceptance Limits	RPD	RPD Limit	Data Qualifier
74-82-8	Methane	2.52	2.98	4.58	3.69	**63**	**28**	73-125	77	30	**N, R**
74-85-1	Ethene	4.40	ND	2.79	2.89	**63**	**66**	72-133	5	30	**N**
74-84-0	Ethane	4.72	ND	2.84	2.77	**60**	**59**	74-131	2	30	**N**

N = The matrix spike recovery is not within control limits. See case narrative.
R = Duplicate precision not met.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Client: **ALS Laboratory Group**
Client Sample ID: **Duplicate Lab Control Sample**
Client Project ID: **HS18091438**

ALS Project ID: P1805135
ALS Sample ID: P181002-LCS
P181002-DLCS

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 10/02/18
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Spike Amount LCS / DLCS µg/L	Result$_1$ LCS µg/L	Result$_1$ DLCS µg/L	% Recovery LCS	% Recovery DLCS	DOD Acceptance Limits	RPD	RPD Limit	Data Qualifier
74-82-8	Methane	2.50	2.66	2.82	**106**	**113**	73-125	6	12	
74-85-1	Ethene	4.37	4.45	4.41	**102**	**101**	72-133	1	7	
74-84-0	Ethane	4.69	4.73	4.68	**101**	**100**	74-131	1	6	

$_1$ = The concentration shown includes a subtraction of the Method Control Sample value, even if the result is less than the MRL.

10515 Research Drive
Knoxville, TN 37932
Phone: (865) 573-8188
Fax: (865) 573-8133

Client: RJ Modashia
ALS Laboratory Group
10450 Stancliff Rd
Suite 210
Houston, TX 77040

Phone: 281-575-2279

Fax:

Identifier: 114PI **Date Rec:** 09/27/2018 **Report Date:** 10/03/2018

Client Project #: NW01312.0150 **Client Project Name:** LHAAP-58

Purchase Order #:

Analysis Requested: CENSUS

Reviewed By:



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Tel. (865) 573-8188 Fax. (865) 573-8133

CENSUS

Client: **ALS Laboratory Group**
Project: LHAAP-58

MI Project Number: **114PI**
Date Received: 09/27/2018

Sample Information

Client Sample ID:		**35AWW06_092618**	**35AWW20_092618**	**LHSMW07_092618**
Sample Date:		09/26/2018	09/26/2018	09/26/2018
Units:		cells/mL	cells/mL	cells/mL
Analyst/Reviewer:		JS	JS	JS
Dechlorinating Bacteria				
Dehalococcoides	*DHC*	**3.60E+00**	<1.30E+00	**1.16E+04**
tceA Reductase	TCE	<2.50E+00	<1.30E+00	<1.60E+00
BAV1 Vinyl Chloride Reductase	BVC	<2.50E+00	<1.30E+00	**8.00E-01 (J)**
Vinyl Chloride Reductase	VCR	**1.40E+00 (J)**	<1.30E+00	**5.99E+03**
Dehalobacter spp.	*DHBt*	**7.05E+05**	**3.77E+06**	**3.54E+06**

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 **9/27/2018**

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
DHC	09/27/2018	10/03/2018	0 °C	104%	non-detect	non-detect
BVC	09/27/2018	10/03/2018	0 °C	98%	non-detect	non-detect
DHBt	09/27/2018	10/03/2018	0 °C	101%	non-detect	non-detect
TCE	09/27/2018	10/03/2018	0 °C	99%	non-detect	non-detect
VCR	09/27/2018	10/03/2018	0 °C	104%	non-detect	non-detect

How to Retrieve and Use Estimated Percentile Ranks from the Microbial Insights Database

The MI Database

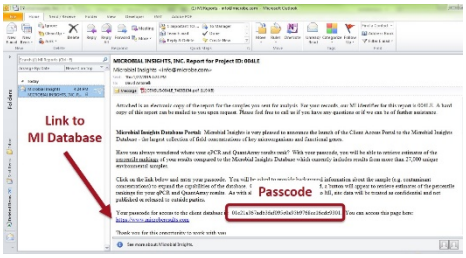
The Microbial Insights Database is the largest collection of field concentrations of key microorganisms and functional genes currently containing qPCR and QuantArray results for more than 40,000 unique groundwater, soil, and sediment samples from all 50 states and 33 countries worldwide.

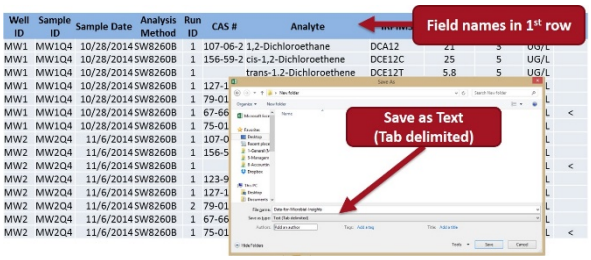
Is that low, medium or high?

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.

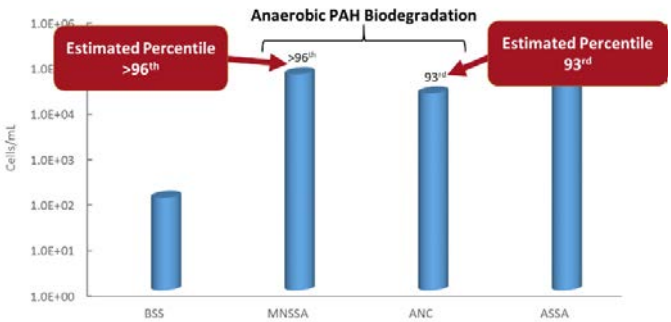
You can even upload chemical and geochemical data from EDDs. Just save as a Tab Delimited text file.

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.

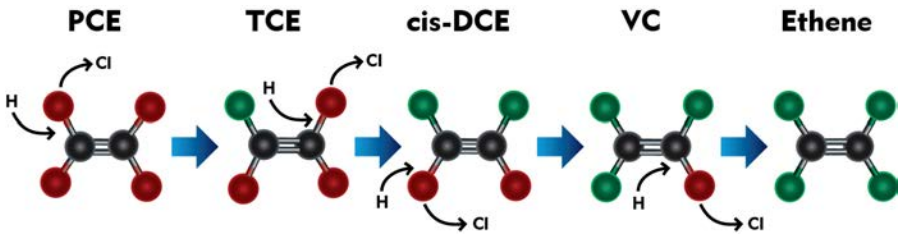
- Demonstrating high concentrations of ANC and MNSSA gave an additional line of evidence indicating growth substantial populations of anaerobic PAH degraders and suggested a greater probability that monitored natural attenuation (MNA) will be successful.



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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Knoxville, TN 37932
Phone: 865.573.8188
Fax: 865.573.8133
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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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Knoxville, TN 37932
Phone: 865.573.8188
Fax: 865.573.8133
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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.

2340 Stock Creek Blvd. Rockford, TN 37853-3044
Tel. (865) 573-8188 Fax. (865) 573-8133

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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Fax: 865.573.8133
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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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Fax: 865.573.8133
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Knoxville, TN 37932
Phone: 865.573.8188
Fax: 865.573.8133
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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.

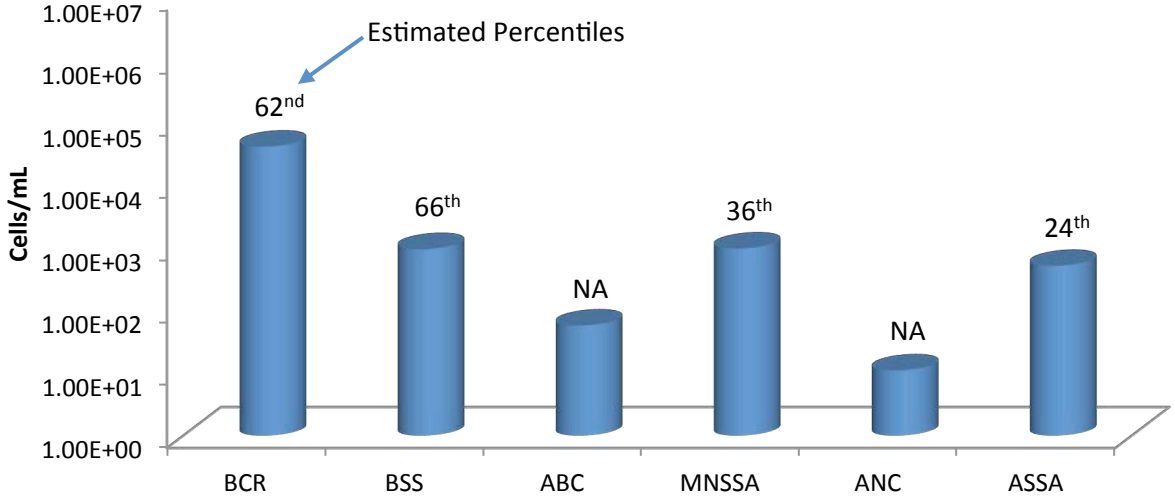
Is that a low, medium, or high concentration? The estimated percentile ranks retrieved from the MI Database answer that question by comparing your qPCR and QuantArray results to those of the literally thousands of other environmental samples submitted to MI for analysis over the last 20+ years.

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.

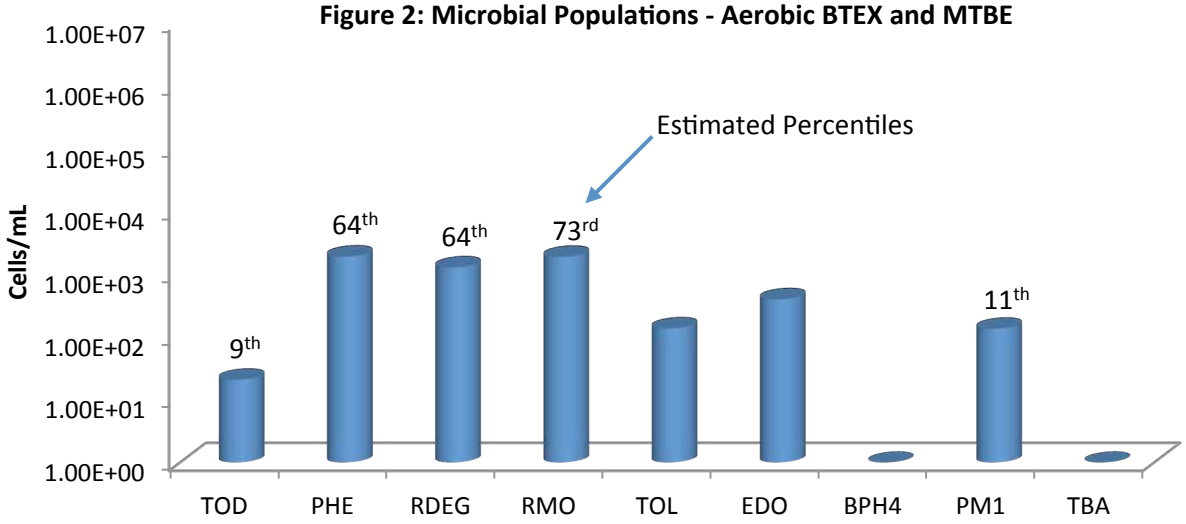
Figure 1: Microbial Populations - Anaerobic BTEX and PAHs



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.

Figure 2: Microbial Populations - Aerobic BTEX and MTBE



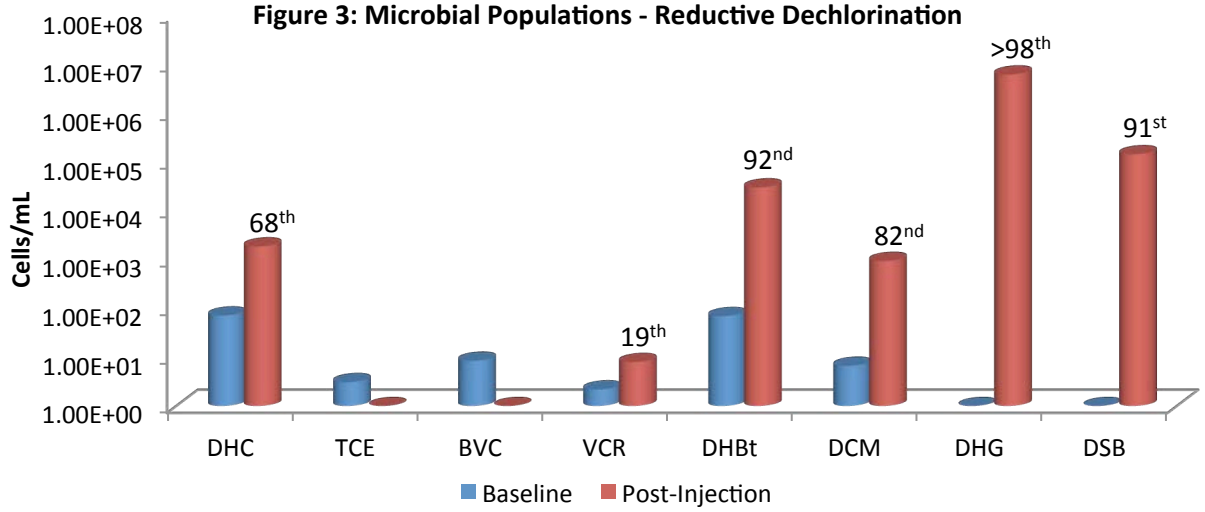
Aerobic BTEX and MTBE Biodegradation (Figure 2):

- 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.

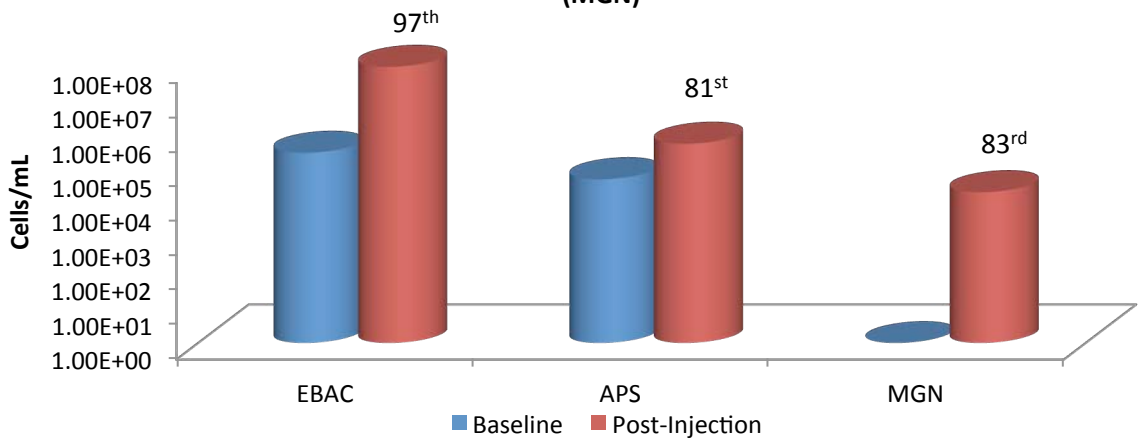
Figure 3: Microbial Populations - Reductive Dechlorination



- 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

Lu, X., J.T. Wilson, and D.H. Kampbell. 2006. Relationship between *Dehalococcoides* DNA in ground water and rates of reductive dechlorination at field scale. *Water Research* 40 no. 16: 3131-3140.

REPORT TO:

Name: MARCIA OLIVE
Company: BHATE ENVIRONMENTAL
Address: 445 UNION BLVD. STE. 129
LAKEWOOD, CO. 80228
email: molive@bhate.com
Phone: (720) 463-3905
Fax:

Project Manager: Kim Nemmers
Project Name: LITHAP-58
Project No.: NW01312.0150

INVOICE TO: (For Invoices paid by a third party it is imperative that all information be provided)

Name:
Company:
Address:
email:
Phone:
Fax:

Purchase Order No.
Subcontract No.
MI Quote No.

microbialinsights
10515 Research Dr
Knoxville, TN 37932
865-573-8188
www.microbe.com

Please Check One:
☑ More samples to follow
☐ No Additional Samples

Report Type: ☐ Standard (default) ☐ Microbial Insights Level III raw data(15% surcharge) ☐ Microbial Insights Level IV (25% surcharge) ☐ Comprehensive Interpretive(15%) ☐ Historical Interpretive (30%)

EDD type: ☐ Microbial Insights Standard (default) ☐ All other available EDDs (5% surcharge) Specify EDD Type:

Please contact us with any questions about the analyses or filling out the COC at (865) 573-8188 (9:00 am to 5:00 pm EST, M-F). After hours email: customerservice@microbe.com

Sample Information					Analyses					CENSUS: Please select the target organism/gene																								
MI ID (Laboratory Use Only)	Sample Name	Date Sampled	Time Sampled	Matrix	PLFA	DGGE+3ID	DGGE+5ID	QuantArray Chlor	QuantArray Petro	DHC (Dehalococcoides)	DHC Functional genes (bvc, tca, vcr)	DHBt (Dehalobacter)	DSM (Desulfuromonas)	DSB (Desulfitobacterium)	EBAC (Total)	SRB (Sulfate Reducing Bacteria-APS)	MGN (Methanogens)	MOB (Methanotrophs)	SMMO	DNF (Denitrifiers-nirS and nirK)	AOB (ammonia oxidizing bacteria)	PM1 (MTBE aerobic)	RMO (Toluene Monooxygenase)	RDEG (Toluene Monooxygenase)	PHE (Phenol Hydroxylase)	NAH (Napthalene-aerobic)	BSSA (Toluene/Xylene-Anaerobic)	add. qPCR:	add. qPCR:	RNA (Expression Option)*	Other:	Other:	Other:
114PI1	35AWW06_092618	9/26/18	0920								X	X																						
2	35AWW20_092618	9/26/18	1115								X	X																						
3	LHSMW07_092618	9/26/18	1230								X	X																						

Relinquished by: Scott Blesing 9/26/18 14:00
Received by: [signature] Date 9/27/18 10:42

It is vital that chain of custody is filled out correctly & that all relative information is provided.
Failure to provide sufficient and/or correct information regarding reporting, invoicing & analyses requested information may result in delays for which MI will not be liable.

October 10, 2018 Service Request No:R1809340

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

Laboratory Results for: LHAAP / Site 58

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory September 27, 2018
For your reference, these analyses have been assigned our service request number **R1809340.**

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental 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. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
PHONE +1 585 288 5380 | FAX +1 585 288 8475
ALS Group USA, Corp.
dba ALS Environmental

ALS Environmental
ALS Group USA, Corp
1565 Jefferson Road, Building 300, Suite 360
Rochester, NY 14623
T : +1 585 288 5380
F : +1 585 288 8475
www.alsglobal.com

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ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

1565 Jefferson Rd, Building 300, Rochester, NY 14623 | 585-288-5380 | www.alsglobal.com

Client: ALS Environmental - US
Project: LHAAP / Site 58
Sample Matrix: Water

Service Request: R1809340
Date Received: 09/27/2018

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier IV, validation deliverables including all summary forms and associated raw data. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt:

Four water samples were received for analysis at ALS Environmental on 09/27/2018. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at 6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Semivoa GC:

Method Organic Acids, 10/04/2018: The upper control criterion was exceeded for one or more analytes in the Laboratory Control Sample (LCS). There were no detections of the analyte(s) in the associated field samples. The error associated with elevated recovery equates to a high bias. The sample data is not significantly affected. No further corrective action was appropriate.
Method Organic Acids, 10/05/2018: The upper control criterion was exceeded for one or more analytes in the Laboratory Control Sample (LCS). There were no detections of the analyte(s) in the associated field samples. The error associated with elevated recovery equates to a high bias. The sample data is not significantly affected. No further corrective action was appropriate.
Pyruvic acid fails high in the ms/msd aswell.

General Chemistry:

Ferrous Iron was not performed in the field as recommended by the EPA to meet an "immediate" or 15 minute Holding Time. Samples analyzed in the laboratory have been flagged with an "H" to indicate the "immediate" holding time has been exceeded.

Approved by _____ Date 10/10/2018

SAMPLE DETECTION SUMMARY

CLIENT ID: 35AWW06_092618			Lab ID: R1809340-001			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Iron, Divalent (Ferrous Iron)	27.8		0.3	1.0	mg/L	SM 3500-Fe B.4.c
Pyruvic Acid	0.20	J	0.16	2.0	mg/L	Organic Acids
Acetic Acid	1400		10	40	mg/L	Organic Acids
Butanoic Acid (Butyric Acid)	1400		3.2	20	mg/L	Organic Acids
Propionic Acid	600		1.9	20	mg/L	Organic Acids

CLIENT ID: 35AWW20_092618			Lab ID: R1809340-002			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Iron, Divalent (Ferrous Iron)	1.38		0.03	0.10	mg/L	SM 3500-Fe B.4.c
Acetic Acid	110		1.0	4.0	mg/L	Organic Acids

CLIENT ID: 35AWW20_092618_a			Lab ID: R1809340-003			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Iron, Divalent (Ferrous Iron)	1.41		0.03	0.10	mg/L	SM 3500-Fe B.4.c
Acetic Acid	100		1.0	4.0	mg/L	Organic Acids

CLIENT ID: LHSMW07_092618			Lab ID: R1809340-004			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Iron, Divalent (Ferrous Iron)	0.93		0.03	0.10	mg/L	SM 3500-Fe B.4.c
Acetic Acid	140		1.0	4.0	mg/L	Organic Acids
Propionic Acid	0.78	J	0.19	2.0	mg/L	Organic Acids

Sample Receipt Information

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Client: ALS Environmental - US **Service Request:**R1809340
Project: LHAAP / Site 58/NWO1312.0150

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
R1809340-001	35AWW06_092618	9/26/2018	0920
R1809340-002	35AWW20_092618	9/26/2018	1115
R1809340-003	35AWW20_092618_a	9/26/2018	1115
R1809340-004	LHSMW07_092618	9/26/2018	1230

00943981

bhate ENVIRONMENTAL CONSTRUCTION GROUP

1608 13th Avenue South, Suite 300
Birmingham Alabama 35205
Tel: 205-918-4000
Fax: 205-918-4050

Chain of Custody and Analytical Request

Page: ____ of ____

Project/Phase No: NWO1312.0150

COC Number(1): ____

LIMS Number: ____

Facility/Base I.D.: LHAAP

Project/Site Name: LHAAP / Site 58

Client Name:

Collected by: Scott Beesinger

Field Sample ID (30 Characters Max)	ERPIMS LOCID (15 Characters Max)	Date Collected (dd-mmm-yyyy)	Time Collected (Military) (hhmm)	Sample Depth (beginning - ending)	SA Code (2)	Sample Number (3)	Sample Matrix (4)	Number of containers	VFA	Ferrous Iron	Ambient Blank Lot Control Number	Equipment Blank Lot Control Number	Trip Blank Lot Control Number	Cooler ID
35AWW06_092618		26 Sep 2018	0920	-		N	WG	2	X	X				
35AWW06_092618_MS		26 Sep 2018	0920	-		MS	WG	2	X	X				
35AWW06_092618_MSD		26 Sep 2018	0920	-		SD	WG	2	X	X				
35AWW20_092618		26 Sep 2018	1115			N	WG	2	X	X				
35AWW20_092618_a		26 Sep 2018	1115			FD	WG	2	X	X				
LHSMW07_092618		26 Sep 2018	1230	-		N	WG	2	X	X				
				-										
				-										
				-										
				-										
				-										

Sample Analysis Requested (5) | Quality Assurance Samples (6)

COMMENTS: ____

Custody Transfers Prior to Receipt by Laboratory

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1. Scott Beesinger	9/26/18	1400	1. Dwight	9/27/18	0915
2.			2.		
3.			3.		

Sample Delivery Details / Laboratory Receipt

Delivered Directly to Lab: ____ Shipped ____ No.:

Method of Shipment: ____

Fed Ex ____ Airbill Number:

Analytical Lab: ALS 10450 Stancliff Rd. Suite 210 Houston, TX 77099 (281) 530-5656

ATTN: SONIA WEST Lab Recipient: Delivery Date/Time:

1.) Chain of Custody Number = date collected + custody number (e.g. 09-02-1999-01)

2.) Sample Type (SA) Codes: N = Normal Sample, TB = Trip Blank (-c) Sample, FD = Field Duplicate (-a) Samples, FR = Field Replicate (-b) Samples, EB = Equipment Blank (-d) Samples, MS = Matrix Spike, SD = Matrix Spike Duplicate, AB = Ambient

3.) Sample Number: Unique sample number collected from a particular location per day. (e.g. Groundwater sample collected from MW-1 on 10/10/99 = 01, if sampled again on 10/10/99 = 02, etc.)

4.) Matrix Codes: GS = Soil Gas, WG = Groundwater, WS = Surface Water, SO = Soil, SE = Sediment, SL = Sludge, SS = Surface Soil Samples, WQ = Aqueous Blank Samples (trip, equipment, ambient, etc), SQ = Soil Blanks

5.) Sample Analysis Requested: Analytical method requested and number of containers provided for each.

6.) Quality assurance samples are assigned by date (ddmmyy) and the sample number associated with the sample (01, 02, etc) (e.g. Equipment blank collected in association with MW-1 on 10/10/99 will be designated 10109901 in the Equipment ...

R1809340 5
AL8 Group USA, Corp.
LHAAP / Site 58

Cooler Receipt and Preservation Check Form

R1809340 5
ALS Group USA, Corp.
LHAAP / Site 58

Project/Client Chute Folder Number

Cooler received on 9/27/18 by: @

COURIER: ALS UPS (FEDEX) VELOCITY CLIENT

1	Were **Custody seals** on outside of cooler?	Y (N)	5a	**Perchlorate** samples have required headspace?	Y N (NA)
2	**Custody papers** properly completed (ink, signed)?	(Y) N	5b	Did VOA vials, Alk,or Sulfide have sig* **bubbles**?	Y N (NA)
3	Did all bottles arrive in good **condition** (unbroken)?	(Y) N	6	Where did the bottles originate? ALS/ROC	(CLIENT)
4	Circle: (Wet Ice) **Dry Ice Gel packs** present?	(Y) N	7	Soil VOA received as: Bulk Encore 5035set	(NA)

8. Temperature Readings Date: 9/27/18 Time: 0930 ID: IR#7 (IR#10) From: (Temp Blank) Sample Bottle

Observed Temp (°C)	1.7						
Correction Factor (°C)	–						
Corrected Temp (°C)	1.7						
Temp from:Type of bottle	–						
Within 0-6°C?	(Y) N	Y N	Y N	Y N	Y N	Y N	Y N
If <0°C, were samples frozen?	Y N	Y N	Y N	Y N	Y N	Y N	Y N

If out of Temperature, note packing/ice condition: _____ Ice melted Poorly Packed (described below) Same Day Rule

&Client Approval to Run Samples: _____ Standing Approval Client aware at drop-off Client notified by: _____

All samples held in storage location: R-082 by @ on 9/27/18 at 0935
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown/Preservation Check**: Date: 9/27/18 Time: 2024 by: JW

9. Were all bottle labels complete (*i.e.* analysis, preservation, etc.)? (YES) NO
10. Did all bottle labels and tags agree with custody papers? (YES) NO
11. Were correct containers used for the tests indicated? (YES) NO
12. Were 5035 vials acceptable (no extra labels, not leaking)? YES NO (N/A)
13. Air Samples: Cassettes / Tubes Intact with MS? Canisters Pressurized Tedlar® Bags Inflated (N/A)

pH	Lot of test paper	Reagent	Preserved? Yes	Preserved? No	Lot Received	Exp	Sample ID Adjusted	Vol. Added	Lot Added	Final pH
≥12		NaOH								
≤2		HNO_3								
≤2		H_2SO_4								
<4		$NaHSO_4$								
5-9		For 608pest			No=Notify for 3day					
Residual Chlorine (-)		For CN, Phenol, 625, 608pest, 522			If +, contact PM to add $Na_2S_2O_3$ (625, 608, CN), ascorbic (phenol).					
		$Na_2S_2O_3$								
		ZnAcetate	-	-			**VOAs and 1664 Not to be tested before analysis. Otherwise, all bottles of all samples with chemical preservatives are checked (not just representatives).			
		HCl	**	**						

Bottle lot numbers: client, client label

Explain all Discrepancies/ Other Comments:

CLRES	BULK
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	SUB
SO3	MARRS
ALS	REV

Labels secondary reviewed by: JW

PC Secondary Review: MM 9/28/18

*significant air bubbles: VOA > 5-6 mm : WC >1 in. diameter

ALS Group USA, Corp.
dba ALS Environmental

Internal Chain of Custody Report

Client: ALS Laboratory Group **Service Request:** R1809340
Project: LHAAP / Site 58/NWO1312.0150

Bottle ID	Methods	Date	Time	Sample Location / User	Disposed On
R1809340-001.01					
	SM 3500-Fe B.4.c				
		9/27/2018	2024	SMO / DWARD	
		9/27/2018	2101	RT000299 / DWARD	
		9/27/2018	2102	R-015 / DWARD	
R1809340-001.02					
	Organic Acids				
		9/27/2018	2024	SMO / DWARD	
		9/27/2018	2024	R-002 / DWARD	
		10/4/2018	1507	In Lab / BALLGEIER	
		10/4/2018	1507	R-002 / BALLGEIER	
R1809340-001.03					
		9/27/2018	2024	SMO / DWARD	
		9/27/2018	2024	R-002 / DWARD	
R1809340-001.04					
		9/27/2018	2024	SMO / DWARD	
		9/27/2018	2024	R-002 / DWARD	
		10/4/2018	1506	In Lab / BALLGEIER	
		10/4/2018	1508	R-002 / BALLGEIER	
R1809340-001.05					
		9/27/2018	2024	SMO / DWARD	
		9/27/2018	2101	RT000299 / DWARD	
		9/27/2018	2102	R-015 / DWARD	
R1809340-001.06					
		9/27/2018	2024	SMO / DWARD	
		9/27/2018	2102	RT000299 / DWARD	
		9/27/2018	2102	R-015 / DWARD	
R1809340-002.01					
	SM 3500-Fe B.4.c				
		9/27/2018	2024	SMO / DWARD	
		9/27/2018	2101	RT000299 / DWARD	
		9/27/2018	2102	R-015 / DWARD	
R1809340-002.02					
	Organic Acids				
		9/27/2018	2024	SMO / DWARD	
		9/27/2018	2024	R-002 / DWARD	
		10/4/2018	1507	In Lab / BALLGEIER	

ALS Group USA, Corp.
dba ALS Environmental

Internal Chain of Custody Report

Client: ALS Laboratory Group **Service Request:** R1809340
Project: LHAAP / Site 58/NWO1312.0150

Bottle ID	Methods	Date	Time	Sample Location / User	Disposed On
	Organic Acids				
		10/4/2018	1507	R-002 / BALLGEIER	
R1809340-003.01					
	SM 3500-Fe B.4.c				
		9/27/2018	2024	SMO / DWARD	
		9/27/2018	2102	RT000299 / DWARD	
		9/27/2018	2102	R-015 / DWARD	
R1809340-003.02					
	Organic Acids				
		9/27/2018	2024	SMO / DWARD	
		9/27/2018	2024	R-002 / DWARD	
		10/4/2018	1507	In Lab / BALLGEIER	
		10/4/2018	1507	R-002 / BALLGEIER	
R1809340-004.01					
	SM 3500-Fe B.4.c				
		9/27/2018	2024	SMO / DWARD	
		9/27/2018	2102	RT000299 / DWARD	
		9/27/2018	2102	R-015 / DWARD	
R1809340-004.02					
	Organic Acids				
		9/27/2018	2024	SMO / DWARD	
		9/27/2018	2024	R-002 / DWARD	
		10/4/2018	1507	In Lab / BALLGEIER	
		10/4/2018	1507	R-002 / BALLGEIER	

Miscellaneous Forms

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

ALS Environmental

REPORT QUALIFIERS AND DEFINITIONS

U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.

J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Arclors).

B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.

E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.

E Organics- Concentration has exceeded the calibration range for that specific analysis.

D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.

* Indicates that a quality control parameter has exceeded laboratory limits. Under the ñNotesò column of the Form I, this qualifier denotes analysis was performed out of Holding Time.

H Analysis was performed out of hold time for tests that have an ñimmediateò hold time criteria.

Spike was diluted out.

\+ Correlation coefficient for MSA is <0.995.

N Inorganics- Matrix spike recovery was outside laboratory limits.

N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.

S Concentration has been determined using Method of Standard Additions (MSA).

W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.

P Concentration >40% difference between the two GC columns.

C Confirmed by GC/MS

Q DoD reports: indicates a pesticide/Aroclor is not confirmed (Ó100% Difference between two GC columns).

X See Case Narrative for discussion.

MRL Method Reporting Limit. Also known as:
LOQ Limit of Quantitation (LOQ)
The lowest concentration at which the method analyte may be reliably quantified under the method conditions.

MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).

LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.

ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.

ACCREDITED IN ACCORDANCE WITH nelac

Rochester Lab ID # for State Certifications[1]

Connecticut ID # PH0556	Maine ID #NY0032	Pennsylvania ID# 68-786
Delaware Approved	New Hampshire ID # 2941	Rhode Island ID # 158
DoD ELAP #65817	New York ID # 10145	Virginia #460167
Florida ID # E87674	North Carolina #676	

[1] Analyses were performed according to our laboratoryôs NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to https://www.alsglobal.com/locations/americas/north-america/usa/new-york/rochester-environmental

ALS Laboratory Group

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
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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Analyst Summary report

Client: ALS Environmental - US
Project: LHAAP / Site 58/NWO1312.0150
Service Request: R1809340

Sample Name: 35AWW06_092618
Lab Code: R1809340-001
Sample Matrix: Water
Date Collected: 09/26/18
Date Received: 09/27/18

Analysis Method	Extracted/Digested By	Analyzed By
Organic Acids		BALLGEIER
SM 3500-Fe B.4.c		MROGERSON

Sample Name: 35AWW20_092618
Lab Code: R1809340-002
Sample Matrix: Water
Date Collected: 09/26/18
Date Received: 09/27/18

Analysis Method	Extracted/Digested By	Analyzed By
Organic Acids		BALLGEIER
SM 3500-Fe B.4.c		MROGERSON

Sample Name: 35AWW20_092618_a
Lab Code: R1809340-003
Sample Matrix: Water
Date Collected: 09/26/18
Date Received: 09/27/18

Analysis Method	Extracted/Digested By	Analyzed By
Organic Acids		BALLGEIER
SM 3500-Fe B.4.c		MROGERSON

Sample Name: LHSMW07_092618
Lab Code: R1809340-004
Sample Matrix: Water
Date Collected: 09/26/18
Date Received: 09/27/18

Analysis Method	Extracted/Digested By	Analyzed By
Organic Acids		BALLGEIER
SM 3500-Fe B.4.c		MROGERSON

INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.

Sample Results

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Semivolatile Organic Compounds by GC

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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 09:20
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	35AWW06_092618	**Units:**	mg/L
Lab Code:	R1809340-001	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	**0.20**	**J**	2.0	1.0	0.16	10	10/05/18 12:49	
Acetic Acid	**1400**		40	20	10	10	10/05/18 12:49	
Butanoic Acid (Butyric Acid)	**1400**		20	10	3.2	10	10/05/18 12:49	
Lactic Acid	ND	U	20	10	1.4	10	10/05/18 12:49	
Propionic Acid	**600**		20	10	1.9	10	10/05/18 12:49	

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 11:15
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	35AWW20_092618	**Units:**	mg/L
Lab Code:	R1809340-002	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND	U	0.20	0.10	0.016	1	10/04/18 21:21	
Acetic Acid	**110**		4.0	2.0	1.0	1	10/04/18 21:21	
Butanoic Acid (Butyric Acid)	ND	U	2.0	1.0	0.32	1	10/04/18 21:21	
Lactic Acid	ND	U	2.0	1.0	0.14	1	10/04/18 21:21	
Propionic Acid	ND	U	2.0	1.0	0.19	1	10/04/18 21:21	

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 11:15
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	35AWW20_092618_a	**Units:**	mg/L
Lab Code:	R1809340-003	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND	U	0.20	0.10	0.016	1	10/04/18 21:53	
Acetic Acid	**100**		4.0	2.0	1.0	1	10/04/18 21:53	
Butanoic Acid (Butyric Acid)	ND	U	2.0	1.0	0.32	1	10/04/18 21:53	
Lactic Acid	ND	U	2.0	1.0	0.14	1	10/04/18 21:53	
Propionic Acid	ND	U	2.0	1.0	0.19	1	10/04/18 21:53	

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 12:30
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	LHSMW07_092618	**Units:**	mg/L
Lab Code:	R1809340-004	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND	U	0.20	0.10	0.016	1	10/04/18 22:25	
Acetic Acid	**140**		4.0	2.0	1.0	1	10/04/18 22:25	
Butanoic Acid (Butyric Acid)	ND	U	2.0	1.0	0.32	1	10/04/18 22:25	
Lactic Acid	ND	U	2.0	1.0	0.14	1	10/04/18 22:25	
Propionic Acid	**0.78**	**J**	2.0	1.0	0.19	1	10/04/18 22:25	

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 09:20
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	35AWW06_092618	**Basis:**	NA
Lab Code:	R1809340-001		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**27.8**	mg/L	1.0	0.8	0.3	10	09/27/18 20:00	*

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 11:15
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	35AWW20_092618	**Basis:**	NA
Lab Code:	R1809340-002		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**1.38**	mg/L	0.10	0.08	0.03	1	09/27/18 20:00	*

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 11:15
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	35AWW20_092618_a	**Basis:**	NA
Lab Code:	R1809340-003		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**1.41**	mg/L	0.10	0.08	0.03	1	09/27/18 20:00	*

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 12:30
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	LHSMW07_092618	**Basis:**	NA
Lab Code:	R1809340-004		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**0.93**	mg/L	0.10	0.08	0.03	1	09/27/18 20:00	*

QC Summary Forms

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QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18
Sample Matrix:	Water	**Date Received:**	09/27/18
		Date Analyzed:	10/5/18

Duplicate Matrix Spike Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Sample Name:	35AWW06_092618	**Units:**	mg/L
Lab Code:	R1809340-001	**Basis:**	NA
Analysis Method:	Organic Acids		

		Matrix Spike RQ1810656-06			Duplicate Matrix Spike RQ1810656-07					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Pyruvic Acid	0.20 J	28.3	20.2	139 *	28.4	20.2	139 *	73-122	<1	30
Acetic Acid	1400	1560	199	87 #	1560	199	85 #	80-130	<1	30
Butanoic Acid (Butyric Acid)	1400	1620	203	123 #	1620	203	121 #	86-128	<1	30
Lactic Acid	ND U	188	206	91	189	206	92	81-114	<1	30
Propionic Acid	600	785	200	92	782	200	90	63-153	<1	30

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
Project: LHAAP / Site 58/NWO1312.0150
Sample Matrix: Water

Service Request: R1809340
Date Analyzed: 10/04/18 17:51

Method Blank Summary

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Sample Name: Method Blank
Lab Code: RQ1810603-04

Instrument ID:R-HPLC-05
File ID:I:\ACQUDATA\hplc05\data\100418\A0002377.D\

Analysis Method: Organic Acids
Analysis Lot:609639

This Method Blank applies to the following analyses.

Sample Name	Lab Code	File ID	Date Analyzed
Lab Control Sample	RQ1810603-05	I:\ACQUDATA\hplc05\data\100418\A0002378.D\	10/04/18 18:26
Duplicate Lab Control Sample	RQ1810603-06	I:\ACQUDATA\hplc05\data\100418\A0002379.D\	10/04/18 19:00
35AWW20_092618	R1809340-002	I:\ACQUDATA\hplc05\data\100418\A0002383.D\	10/04/18 21:21
35AWW20_092618_a	R1809340-003	I:\ACQUDATA\hplc05\data\100418\A0002384.D\	10/04/18 21:53
LHSMW07_092618	R1809340-004	I:\ACQUDATA\hplc05\data\100418\A0002385.D\	10/04/18 22:25

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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58/NWO1312.0150
Sample Matrix: Water

Service Request: R1809340
Date Analyzed: 10/05/18 11:04

Method Blank Summary

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Sample Name: Method Blank
Lab Code: RQ1810656-03

Instrument ID:R-HPLC-05
File ID:I:\ACQUDATA\hplc05\data\100518\A0002393.D\

Analysis Method: Organic Acids
Analysis Lot:609806

This Method Blank applies to the following analyses.

Sample Name	Lab Code	File ID	Date Analyzed
Lab Control Sample	RQ1810656-04	I:\ACQUDATA\hplc05\data\100518\A0002394.D\	10/05/18 11:39
Duplicate Lab Control Sample	RQ1810656-05	I:\ACQUDATA\hplc05\data\100518\A0002395.D\	10/05/18 12:02
35AWW06_092618	R1809340-001	I:\ACQUDATA\hplc05\data\100518\A0002396.D\	10/05/18 12:49
35AWW06_092618MS	RQ1810656-06	I:\ACQUDATA\hplc05\data\100518\A0002397.D\	10/05/18 13:24
35AWW06_092618DMS	RQ1810656-07	I:\ACQUDATA\hplc05\data\100518\A0002398.D\	10/05/18 13:59

ALS Group USA, Corp.
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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Sample Name:	Method Blank	**Units:**	mg/L
Lab Code:	RQ1810603-04	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	10/04/18 17:51	
Acetic Acid	ND U	4.0	2.0	1.0	1	10/04/18 17:51	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	10/04/18 17:51	
Lactic Acid	ND U	2.0	1.0	0.14	1	10/04/18 17:51	
Propionic Acid	ND U	2.0	1.0	0.19	1	10/04/18 17:51	

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Sample Name:	Method Blank	**Units:**	mg/L
Lab Code:	RQ1810656-03	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	10/05/18 11:04	
Acetic Acid	ND U	4.0	2.0	1.0	1	10/05/18 11:04	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	10/05/18 11:04	
Lactic Acid	ND U	2.0	1.0	0.14	1	10/05/18 11:04	
Propionic Acid	ND U	2.0	1.0	0.19	1	10/05/18 11:04	

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QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Analyzed:**	10/04/18 18:26
Sample Matrix:	Water		

Lab Control Sample Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Sample Name:	Lab Control Sample	**Instrument ID:**	R-HPLC-05
Lab Code:	RQ1810603-05	**File ID:**	I:\ACQUDATA\hplc05\data\100418\A0002378.D\
Analysis Method:	Organic Acids	**Analysis Lot:**	609639

This Lab Control Sample applies to the following analyses.

Sample Name	Lab Code	File ID	Date Analyzed
Method Blank	RQ1810603-04	I:\ACQUDATA\hplc05\data\100418\A0002377.D\	10/04/18 17:51
Duplicate Lab Control Sample	RQ1810603-06	I:\ACQUDATA\hplc05\data\100418\A0002379.D\	10/04/18 19:00
35AWW20_092618	R1809340-002	I:\ACQUDATA\hplc05\data\100418\A0002383.D\	10/04/18 21:21
35AWW20_092618_a	R1809340-003	I:\ACQUDATA\hplc05\data\100418\A0002384.D\	10/04/18 21:53
LHSMW07_092618	R1809340-004	I:\ACQUDATA\hplc05\data\100418\A0002385.D\	10/04/18 22:25

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58/NWO1312.0150
Sample Matrix: Water

Service Request: R1809340
Date Analyzed: 10/05/18 11:39

Lab Control Sample Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Sample Name: Lab Control Sample
Lab Code: RQ1810656-04

Instrument ID:R-HPLC-05
File ID:I:\ACQUDATA\hplc05\data\100518\A0002394.D\

Analysis Method: Organic Acids
Analysis Lot:609806

This Lab Control Sample applies to the following analyses.

Sample Name	Lab Code	File ID	Date Analyzed
Method Blank	RQ1810656-03	I:\ACQUDATA\hplc05\data\100518\A0002393.D\	10/05/18 11:04
Duplicate Lab Control Sample	RQ1810656-05	I:\ACQUDATA\hplc05\data\100518\A0002395.D\	10/05/18 12:02
35AWW06_092618	R1809340-001	I:\ACQUDATA\hplc05\data\100518\A0002396.D\	10/05/18 12:49
35AWW06_092618MS	RQ1810656-06	I:\ACQUDATA\hplc05\data\100518\A0002397.D\	10/05/18 13:24
35AWW06_092618DMS	RQ1810656-07	I:\ACQUDATA\hplc05\data\100518\A0002398.D\	10/05/18 13:59

ALS Group USA, Corp.
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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58/NWO1312.0150
Sample Matrix: Water

Service Request: R1809340
Date Analyzed: 10/04/18

Duplicate Lab Control Sample Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Units:mg/L
Basis:NA

		Lab Control Sample			Duplicate Lab Control Sample					
		RQ1810603-05			RQ1810603-06					
Analyte Name	**Analytical Method**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Pyruvic Acid	Organic Acids	2.97	2.02	147 *	3.00	2.02	148 *	73-122	1	30
Acetic Acid	Organic Acids	20.7	19.9	104	20.9	19.9	105	80-130	<1	30
Butanoic Acid (Butyric Acid)	Organic Acids	18.2	20.3	90	17.5	20.3	86	86-128	4	30
Lactic Acid	Organic Acids	20.3	20.6	98	20.5	20.6	99	81-114	1	30
Propionic Acid	Organic Acids	18.8	20.0	94	18.9	20.0	95	63-153	<1	30

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dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58/NWO1312.0150
Sample Matrix: Water

Service Request: R1809340
Date Analyzed: 10/05/18

Duplicate Lab Control Sample Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Units:mg/L
Basis:NA

		Lab Control Sample			Duplicate Lab Control Sample					
		RQ1810656-04			RQ1810656-05					
Analyte Name	**Analytical Method**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Pyruvic Acid	Organic Acids	2.99	2.02	148 *	2.97	2.02	147 *	73-122	<1	30
Acetic Acid	Organic Acids	20.7	19.9	104	20.8	19.9	105	80-130	<1	30
Butanoic Acid (Butyric Acid)	Organic Acids	18.4	20.3	90	17.8	20.3	88	86-128	3	30
Lactic Acid	Organic Acids	20.3	20.6	98	20.2	20.6	98	81-114	<1	30
Propionic Acid	Organic Acids	19.1	20.0	95	18.6	20.0	93	63-153	2	30

General Chemistry

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Phone (585) 288-5380 Fax (585) 288-8475
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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	NA
Lab Code:	R1809340-MB		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	ND U	mg/L	0.10	0.08	0.03	1	09/27/18 20:00	

ALS Group USA, Corp.
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QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18
Sample Matrix:	Water	**Date Received:**	09/27/18
		Date Analyzed:	09/27/18

Duplicate Matrix Spike Summary
Iron, Divalent (Ferrous Iron)

Sample Name:	35AWW06_092618	**Units:**	mg/L
Lab Code:	R1809340-001	**Basis:**	NA
Analysis Method:	SM 3500-Fe B.4.c		

		Matrix Spike R1809340-001MS			Duplicate Matrix Spike R1809340-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Iron, Divalent (Ferrous Iron)	27.8	30.7	4.0	73 #	29.9	4.0	54 #	67-129	3	20

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.

ALS Group USA, Corp.
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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58/NWO1312.0150
Sample Matrix: Water

Service Request: R1809340
Date Analyzed: 09/27/18

Lab Control Sample Summary
General Chemistry Parameters

Units:mg/L
Basis:NA

Lab Control Sample
R1809340-LCS

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	0.39	0.40	97	67-129

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QA/QC Report

Client: ALS Environmental - US **Service Request:**R1809340
Project: LHAAP / Site 58/NWO1312.0150

Continuing Calibration Blank (CCB) Summary
Iron, Divalent (Ferrous Iron)

Analysis Method: SM 3500-Fe B.4.c **Units:**mg/L

	Analysis Lot	Lab Code	Date Analyzed	LOQ	LOD	MDL	Result	Q
CCB1	609189	RQ1810495-02	09/27/18 20:00	0.10	0.08	0.03	ND	U
CCB2	609189	RQ1810495-05	09/27/18 20:00	0.10	0.08	0.03	ND	U

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QA/QC Report

Client: ALS Environmental - US **Service Request:** R1809340
Project: LHAAP / Site 58/NWO1312.0150

Continuing Calibration Verification (CCV) Summary

Iron, Divalent (Ferrous Iron)

Analysis Method: SM 3500-Fe B.4.c **Units:** mg/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	609189	RQ1810495-01	09/27/18 20:00	2.00	1.99	99	90-110
CCV2	609189	RQ1810495-06	09/27/18 20:00	2.00	1.99	99	90-110

Raw Data

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Semivolatile Organic Compounds by GC

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 09:20
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	35AWW06_092618	**Units:**	mg/L
Lab Code:	R1809340-001	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	**0.20**	**J**	2.0	1.0	0.16	10	10/05/18 12:49	
Acetic Acid	**1400**		40	20	10	10	10/05/18 12:49	
Butanoic Acid (Butyric Acid)	**1400**		20	10	3.2	10	10/05/18 12:49	
Lactic Acid	ND	U	20	10	1.4	10	10/05/18 12:49	
Propionic Acid	**600**		20	10	1.9	10	10/05/18 12:49	

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 11:15
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	35AWW20_092618	**Units:**	mg/L
Lab Code:	R1809340-002	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND	U	0.20	0.10	0.016	1	10/04/18 21:21	
Acetic Acid	**110**		4.0	2.0	1.0	1	10/04/18 21:21	
Butanoic Acid (Butyric Acid)	ND	U	2.0	1.0	0.32	1	10/04/18 21:21	
Lactic Acid	ND	U	2.0	1.0	0.14	1	10/04/18 21:21	
Propionic Acid	ND	U	2.0	1.0	0.19	1	10/04/18 21:21	

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 11:15
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	35AWW20_092618_a	**Units:**	mg/L
Lab Code:	R1809340-003	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND	U	0.20	0.10	0.016	1	10/04/18 21:53	
Acetic Acid	**100**		4.0	2.0	1.0	1	10/04/18 21:53	
Butanoic Acid (Butyric Acid)	ND	U	2.0	1.0	0.32	1	10/04/18 21:53	
Lactic Acid	ND	U	2.0	1.0	0.14	1	10/04/18 21:53	
Propionic Acid	ND	U	2.0	1.0	0.19	1	10/04/18 21:53	

ALS Group USA, Corp.
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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 12:30
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	LHSMW07_092618	**Units:**	mg/L
Lab Code:	R1809340-004	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND	U	0.20	0.10	0.016	1	10/04/18 22:25	
Acetic Acid	**140**		4.0	2.0	1.0	1	10/04/18 22:25	
Butanoic Acid (Butyric Acid)	ND	U	2.0	1.0	0.32	1	10/04/18 22:25	
Lactic Acid	ND	U	2.0	1.0	0.14	1	10/04/18 22:25	
Propionic Acid	**0.78**	**J**	2.0	1.0	0.19	1	10/04/18 22:25	

Quantitation Report (QT Reviewed)

1st BA 10/08/18
2nd BA 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002396.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 12:49:31
Operator : b.allgeier
Sample : r1809340-001|10
Misc :
ALS Vial : 5 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:17 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	0.000	0	N.D.	ppm	
2) T	Pyruvic acid	3.615	7921	0.017	ppm	m
3) T	Lactic Acid	0.000	0	N.D.	ppm	d
4) T	Acetic Acid	4.361	8200601	138.595	ppm	
5) T	Propionic Acid	9.106	3578822	60.056	ppm	
6) T	Butyric Acid	24.414	8636581	137.312	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

00944025

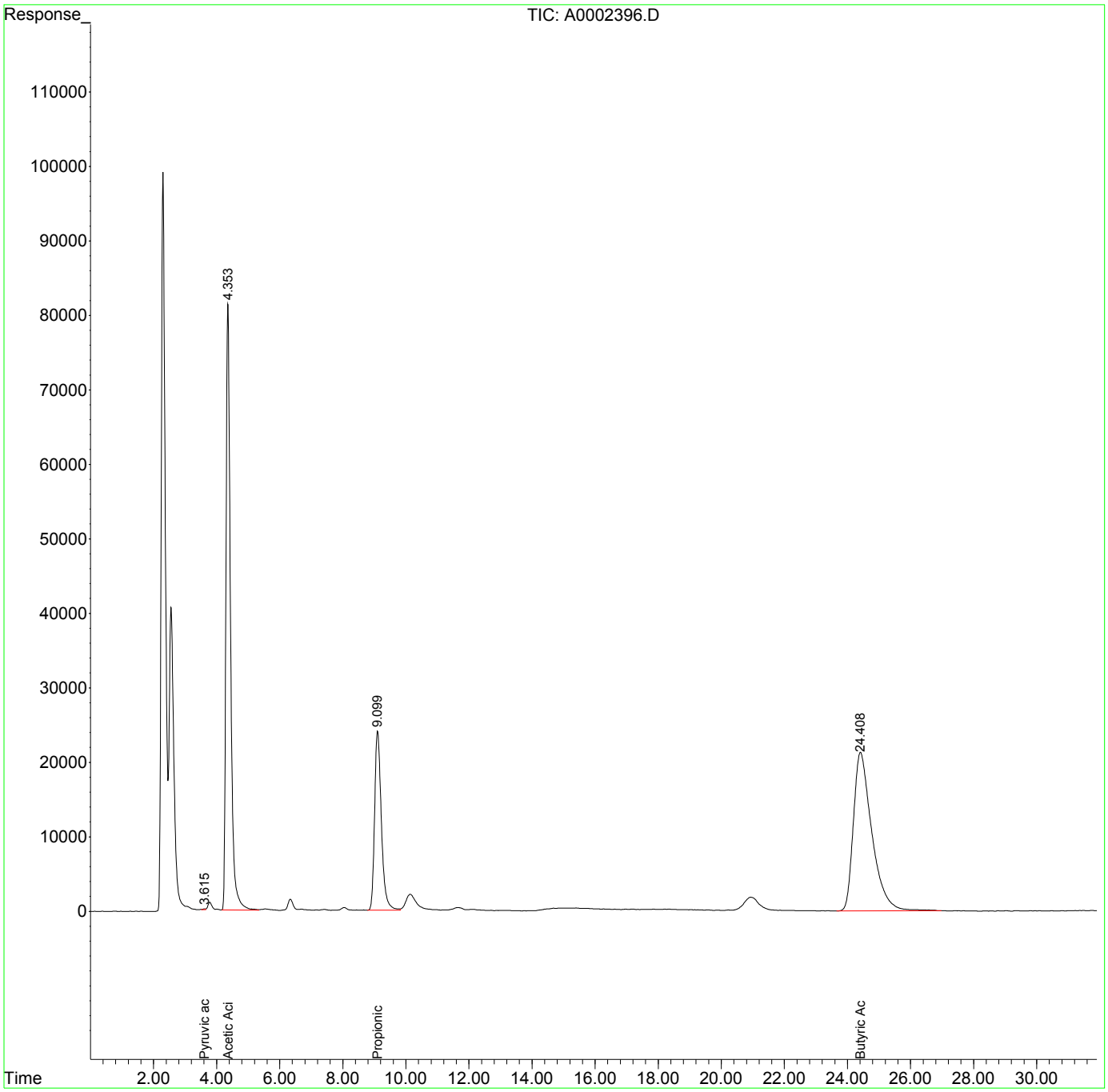
1st BA 10/08/18

2nd BA 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002396.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 12:49:31
Operator : b.allgeier
Sample : r1809340-001|10
Misc :
ALS Vial : 5 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:17 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



Quantitation Report (QT Reviewed)

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002383.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 21:21:05
Operator : b.allgeier
Sample : r1809340-002
Misc :
ALS Vial : 17 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:09 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	0.000	0	N.D.	ppm	
2) T	Pyruvic acid	0.000	0	N.D.	ppm	d
3) T	Lactic Acid	0.000	0	N.D.	ppm	d
4) T	Acetic Acid	4.375	6435786	108.769	ppm	
5) T	Propionic Acid	0.000	0	N.D.	ppm	d
6) T	Butyric Acid	0.000	0	N.D.	ppm	d

(f)=RT Delta > 1/2 Window (m)=manual int.

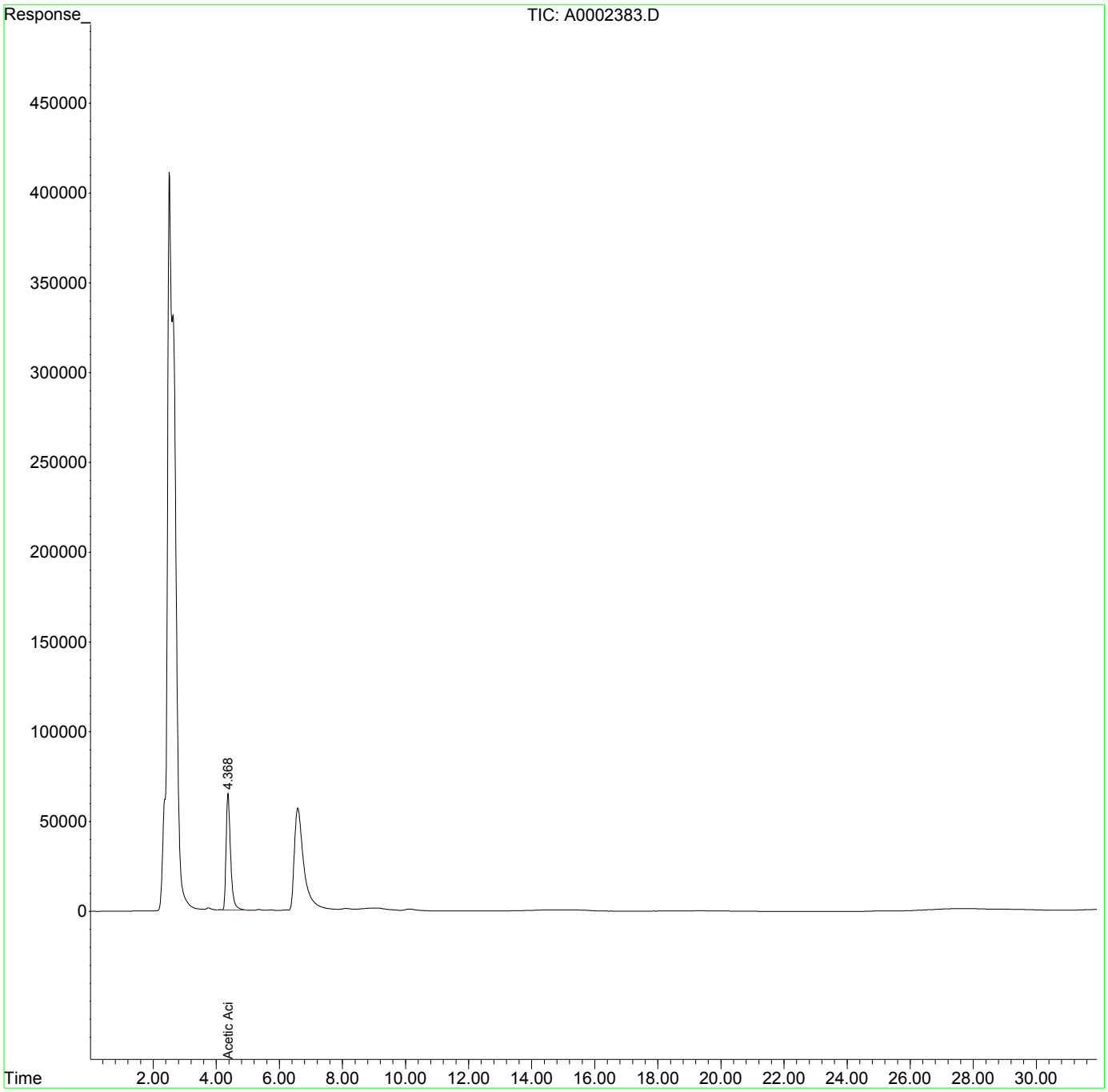
00944027

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002383.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 21:21:05
Operator : b.allgeier
Sample : r1809340-002
Misc :
ALS Vial : 17 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:09 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944028

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002384.D
Signal(s) : dad1A.ch
Acq On : ~~30-Dec-2000, 16:48:23~~ 04-Oct-2018, 21:53:00
Operator : b.allgeier
Sample : r1809340-003
Misc :
ALS Vial : 18 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:11 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	0.000	0	N.D.	ppm	
2) T	Pyruvic acid	0.000	0	N.D.	ppm	d
3) T	Lactic Acid	0.000	0	N.D.	ppm	d
4) T	Acetic Acid	4.381	6103275	103.149	ppm	
5) T	Propionic Acid	0.000	0	N.D.	ppm	
6) T	Butyric Acid	0.000	0	N.D.	ppm	

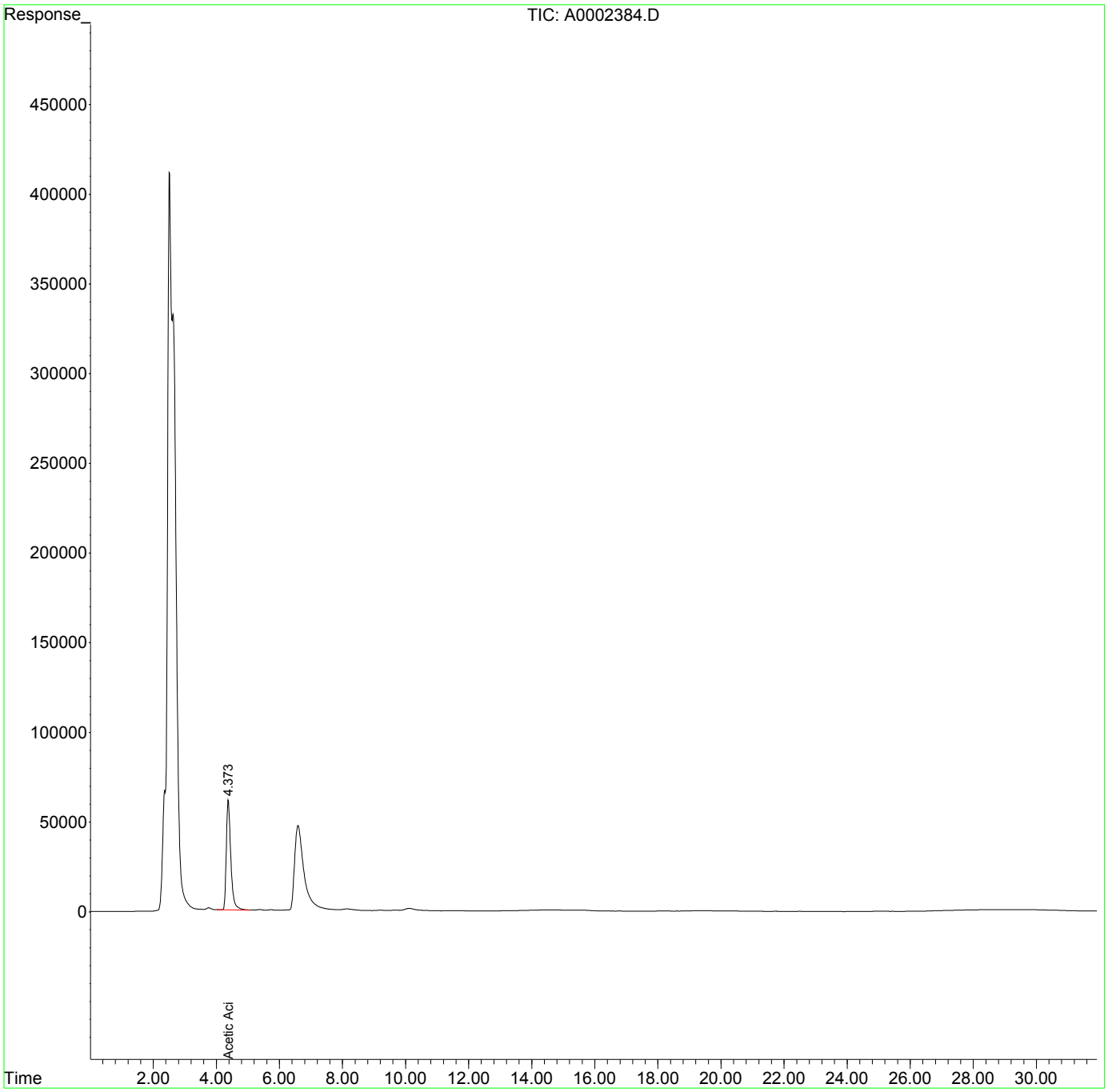
(f)=RT Delta > 1/2 Window (m)=manual int.

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002384.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:23
Operator : b.allgeier
Sample : r1809340-003
Misc :
ALS Vial : 18 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:11 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



Quantitation Report (QT Reviewed)

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002385.D
Signal(s) : dad1A.ch
Acq On : ~~29-Dec-2000, 23:10:21~~ 04-Oct-2018, 22:25:00
Operator : b.allgeier
Sample : r1809340-004
Misc :
ALS Vial : 19 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:13 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	0.000	0	N.D.	ppm	
2) T	Pyruvic acid	0.000	0	N.D.	ppm	d
3) T	Lactic Acid	0.000	0	N.D.	ppm	d
4) T	Acetic Acid	4.370	8516321	143.931	ppm	
5) T	Propionic Acid	9.154	46233	0.776	ppm	
6) T	Butyric Acid	0.000	0	N.D.	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

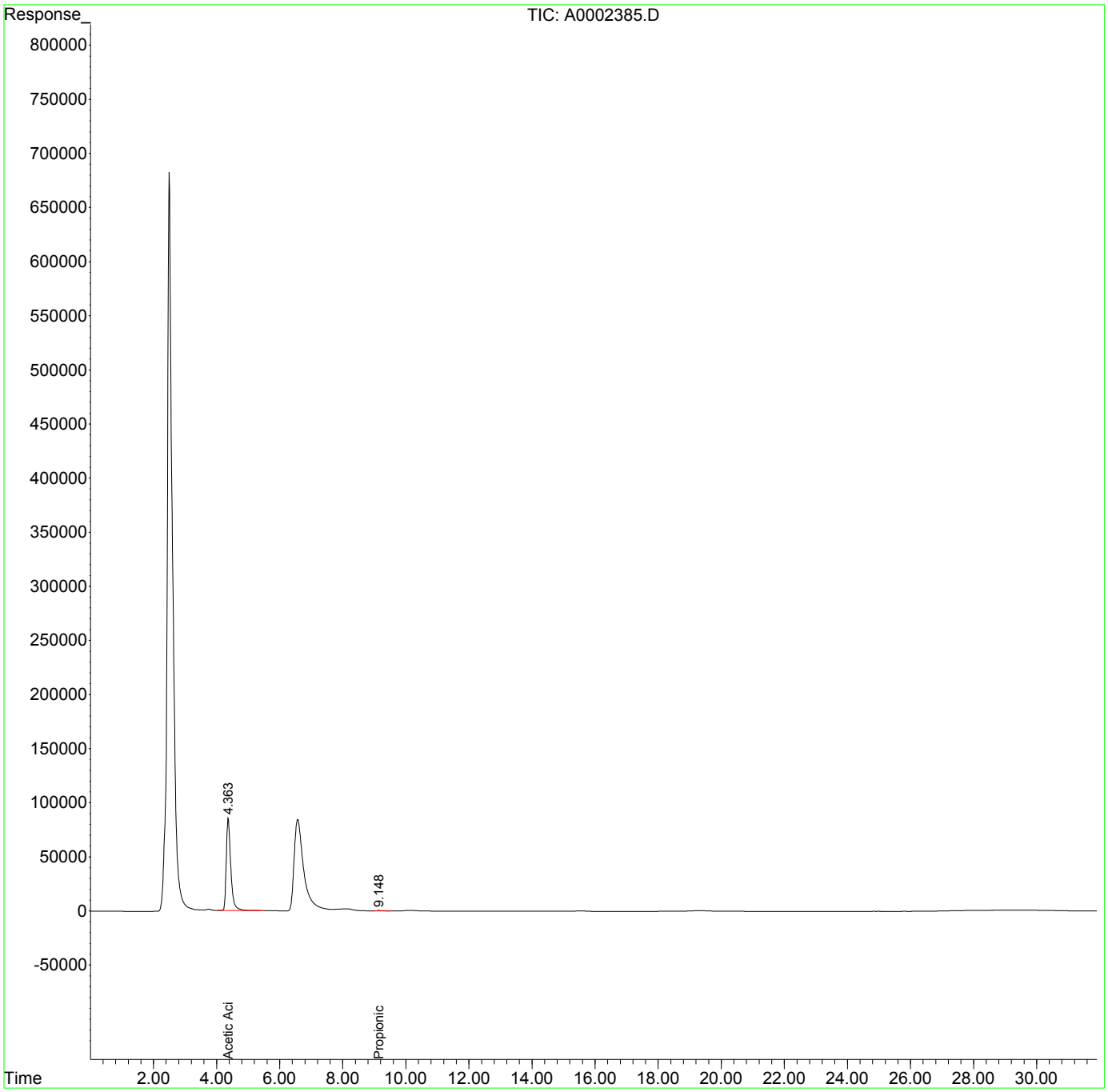
00944031

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002385.D
Signal(s) : dad1A.ch
Acq On : 29-Dec-2000, 23:10:21
Operator : b.allgeier
Sample : r1809340-004
Misc :
ALS Vial : 19 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:13 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944032

1st BA 10/05/18
2nd mcf 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002377.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:51:39
Operator : b.allgeier
Sample : met blk
Misc :
ALS Vial : 11 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:27:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units
Target Compounds					
1) t	Formic acid	0.000	0	N.D.	ppm
2) T	Pyruvic acid	0.000	0	N.D.	ppm
3) T	Lactic Acid	0.000	0	N.D.	ppm
4) T	Acetic Acid	0.000	0	N.D.	ppm
5) T	Propionic Acid	0.000	0	N.D.	ppm
6) T	Butyric Acid	0.000	0	N.D.	ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

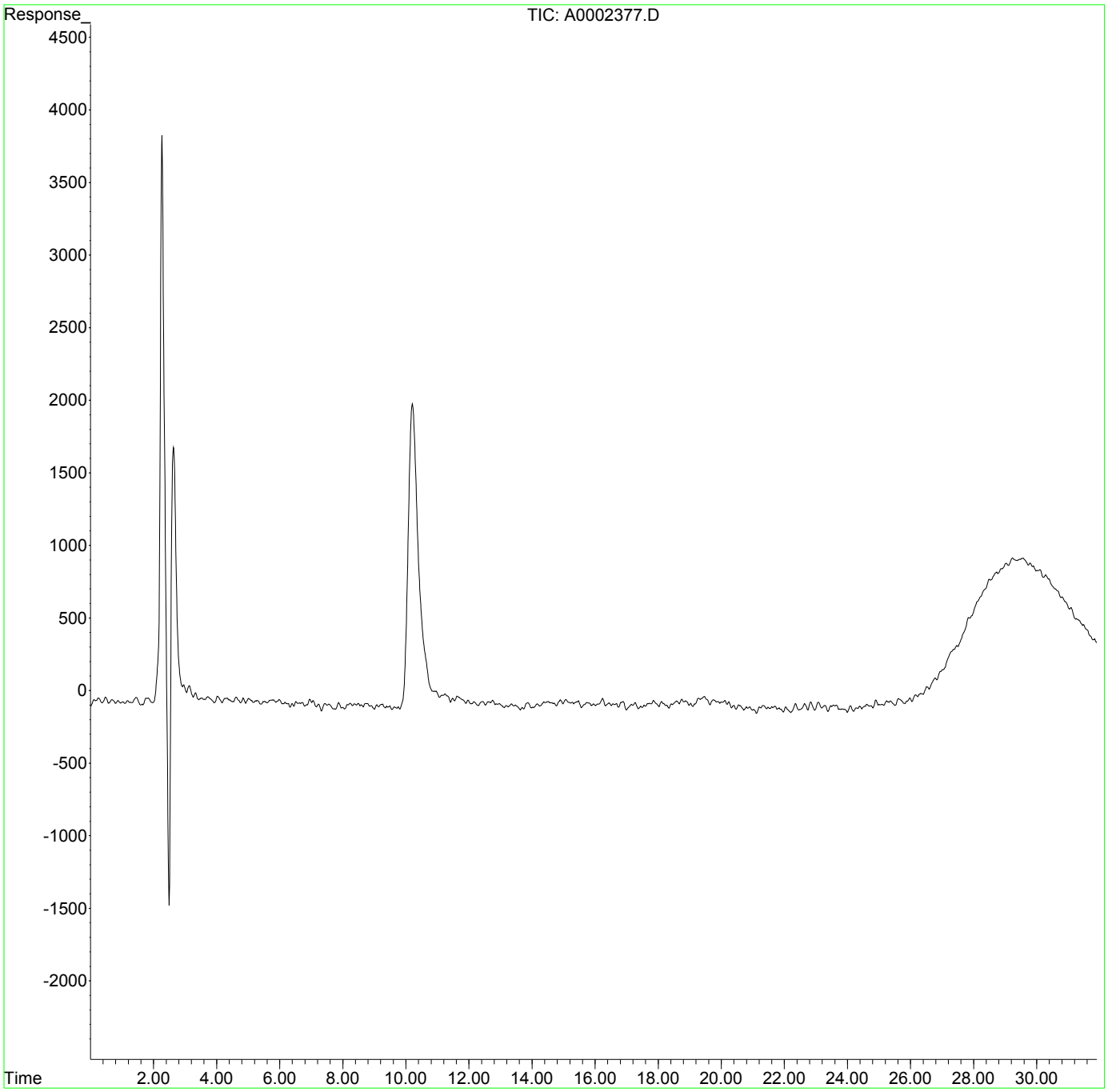
00944033

1st BA 10/05/18
2nd MLP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002377.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:51:39
Operator : b.allgeier
Sample : met blk
Misc :
ALS Vial : 11 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:27:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



Quantitation Report (QT Reviewed)

1st BA 10/08/18
2nd BA 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002393.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 11:04:39
Operator : b.allgeier
Sample : met blk
Misc :
ALS Vial : 2 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:11 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units
Target Compounds					
1) t	Formic acid	0.000	0	N.D.	ppm
2) T	Pyruvic acid	0.000	0	N.D.	ppm
3) T	Lactic Acid	0.000	0	N.D.	ppm
4) T	Acetic Acid	0.000	0	N.D.	ppm
5) T	Propionic Acid	0.000	0	N.D.	ppm
6) T	Butyric Acid	0.000	0	N.D.	ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

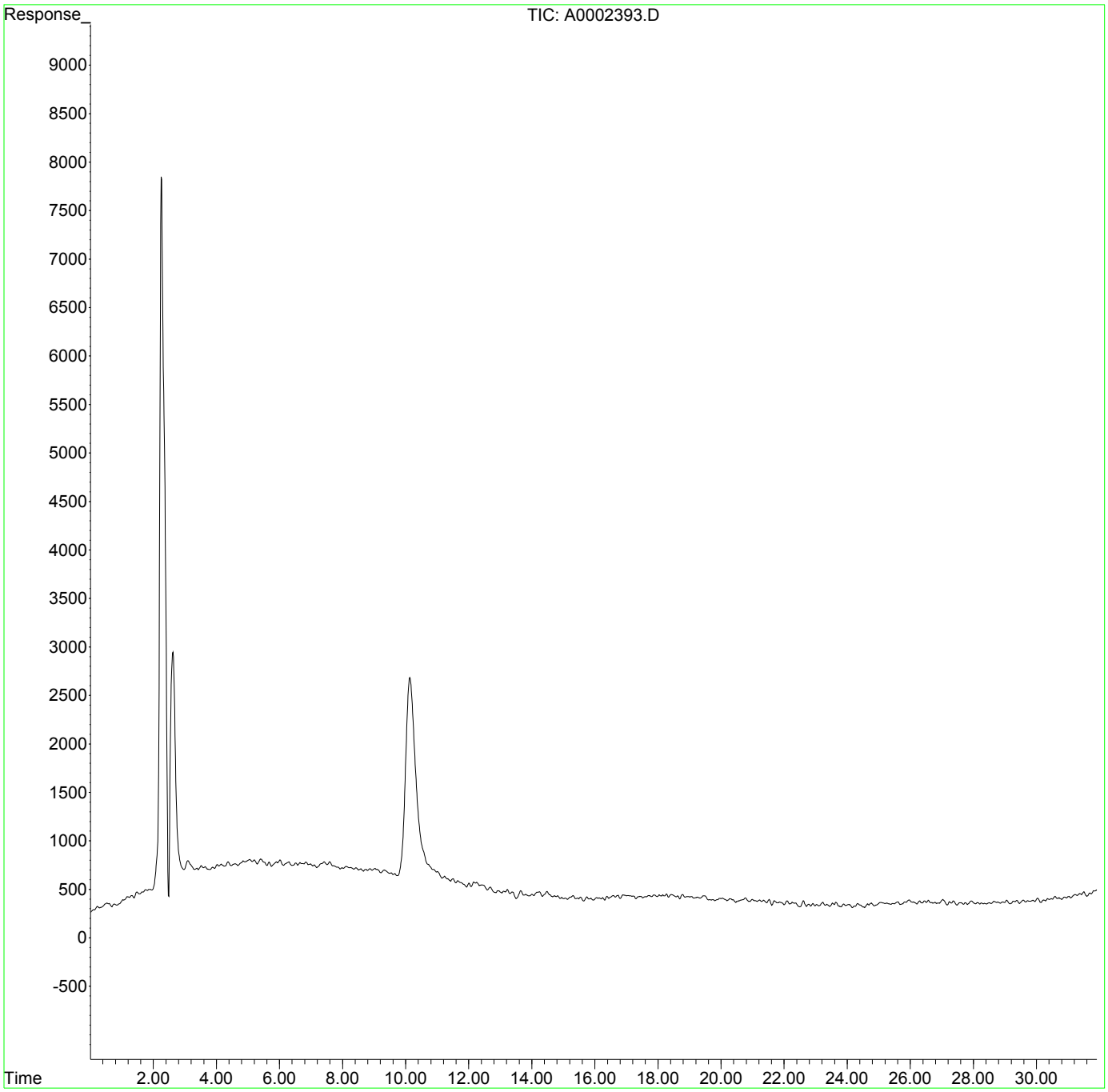
00944035

1st BA 10/08/18
2nd BA 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002393.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 11:04:39
Operator : b.allgeier
Sample : met blk
Misc :
ALS Vial : 2 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:11 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



1st BA 10/05/18
2nd MCP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002378.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 18:26:33
Operator : b.allgeier
Sample : lcs
Misc :
ALS Vial : 12 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:27:59 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc Units
Target Compounds				
1) t	Formic acid	3.133	1888113	19.598 ppm
2) T	Pyruvic acid	3.630	1345992	2.972 ppm
3) T	Lactic Acid	4.055	1088740	20.250 ppm
4) T	Acetic Acid	4.409	1224265	20.691 ppm
5) T	Propionic Acid	9.241	1120055	18.796 ppm
6) T	Butyric Acid	25.078	1146501	18.228 ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

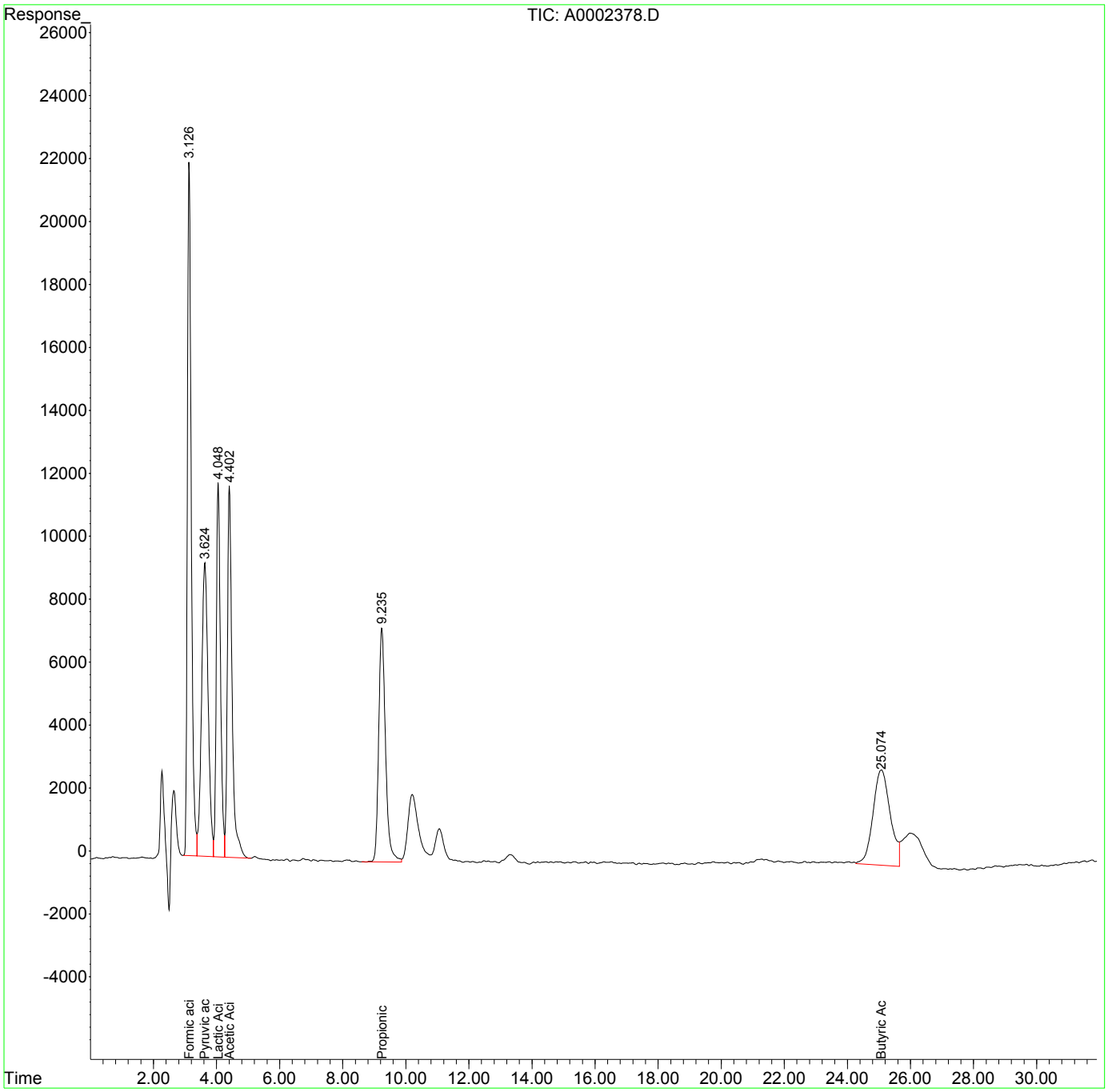
00944037

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002378.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 18:26:33
Operator : b.allgeier
Sample : lcs
Misc :
ALS Vial : 12 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:27:59 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



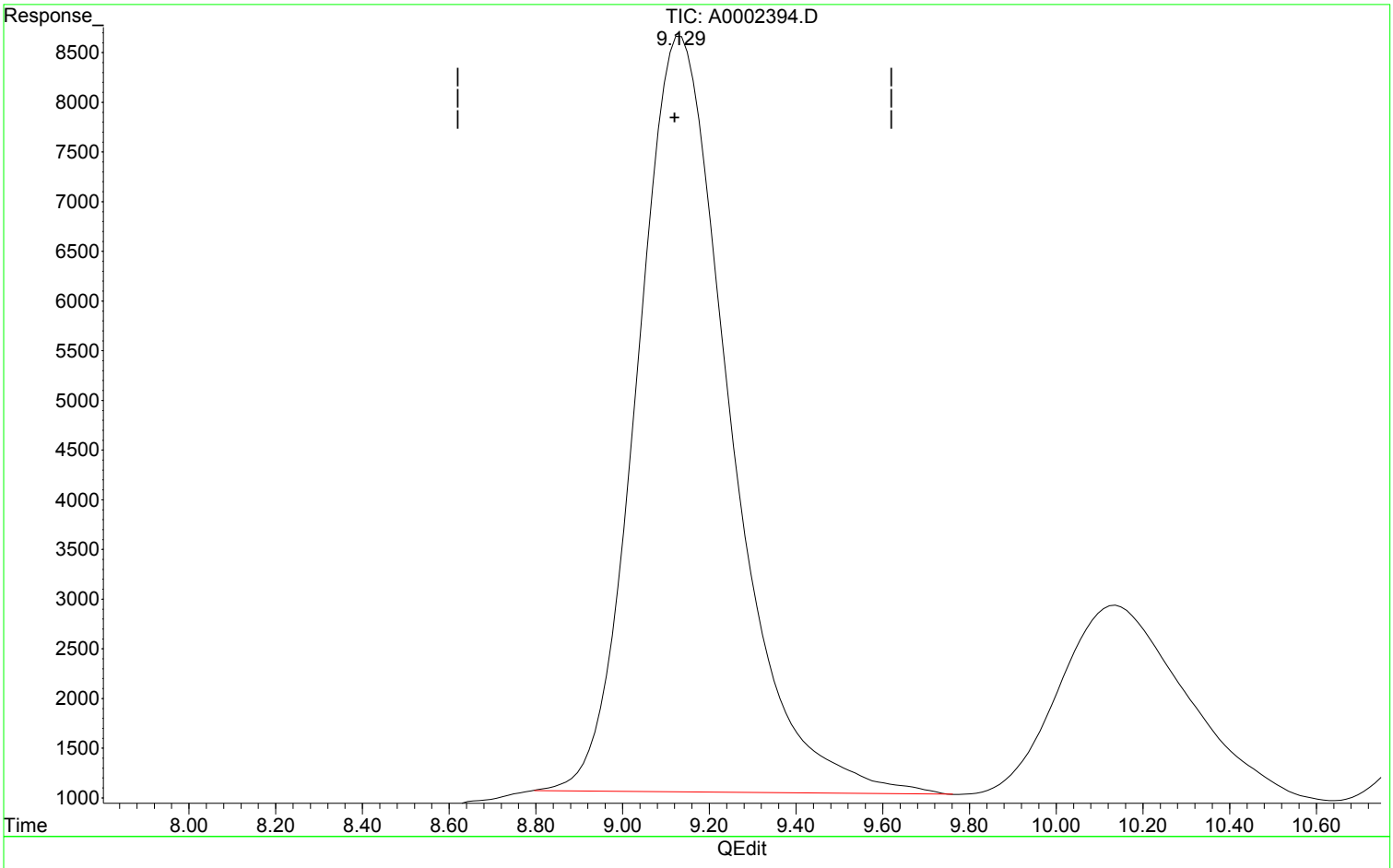
Quantitation Report (Qedit)

1st BA 10/08/18
2nd BA 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002394.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 11:39:38
Operator : b.allgeier
Sample : lcs
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:13 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.129min 19.053 ppm m

response 1135408

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

1st BA 10/08/18
2nd BA 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002394.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 11:39:38
Operator : b.allgeier
Sample : lcs
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:13 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.110	1910564	19.831	ppm	
2) T	Pyruvic acid	3.603	1352094	2.985	ppm	
3) T	Lactic Acid	4.020	1090336	20.280	ppm	
4) T	Acetic Acid	4.369	1227239	20.741	ppm	
5) T	Propionic Acid	9.129	1135408	19.053	ppm	m
6) T	Butyric Acid	24.710	1155592	18.373	ppm	

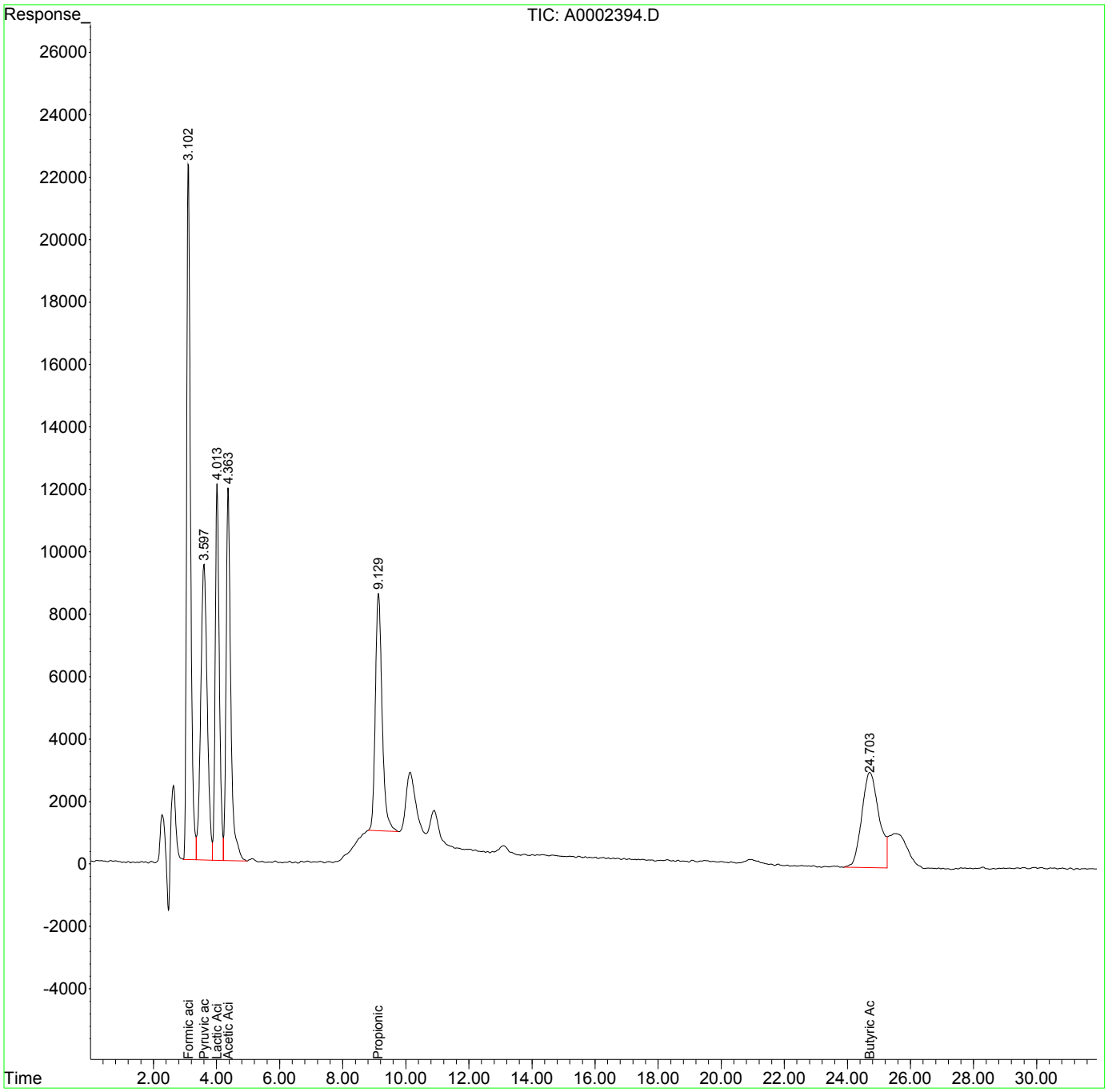
(f)=RT Delta > 1/2 Window (m)=manual int.

1st BA 10/08/18
2nd BA 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002394.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 11:39:38
Operator : b.allgeier
Sample : lcs
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:13 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



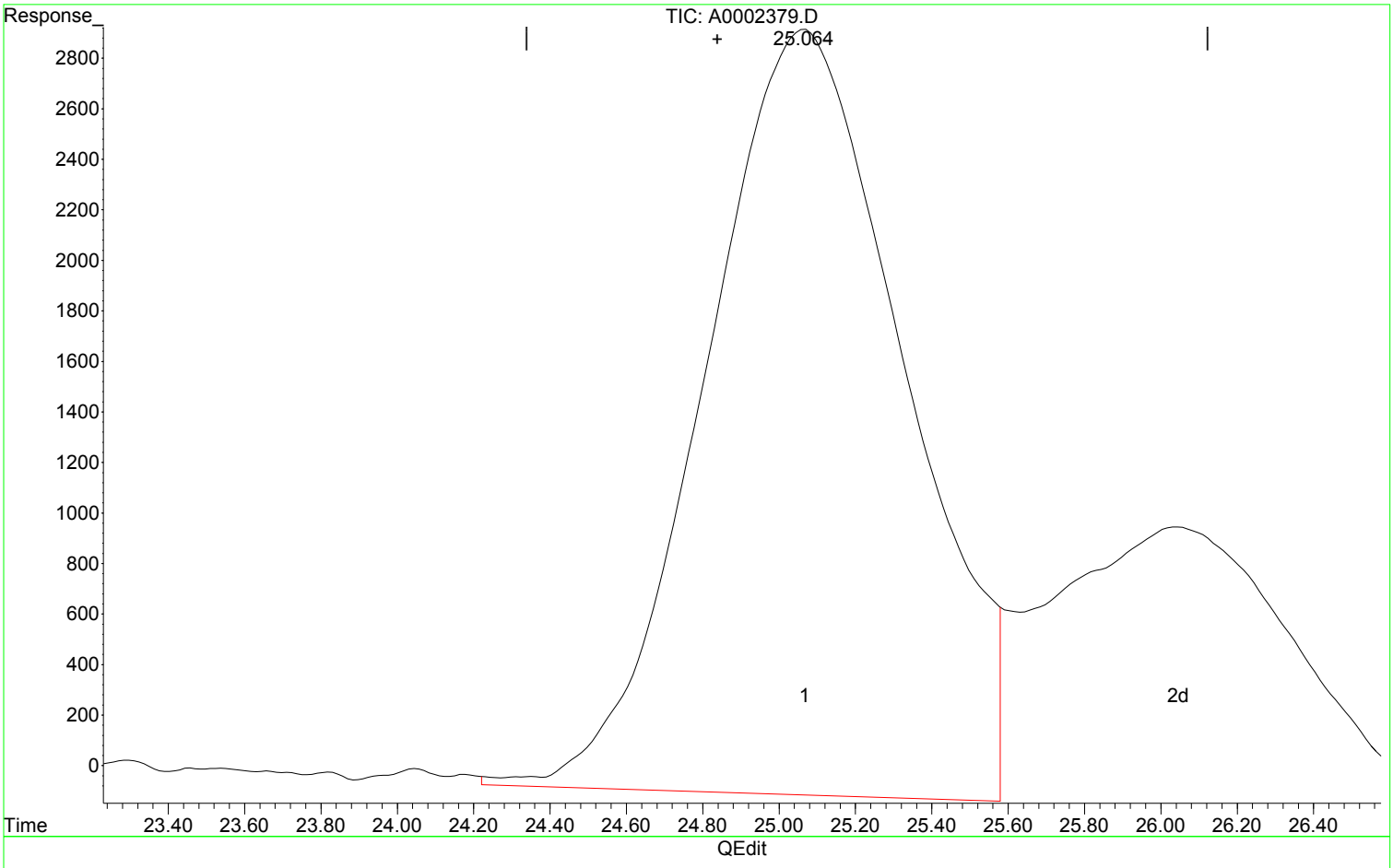
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002379.D
Signal(s) : dad1A.ch
Acq On : 29-Dec-2000, 23:47:53
Operator : b.allgeier
Sample : lcsd
Misc :
ALS Vial : 13 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:28:01 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

25.064min 17.514 ppm m

response 1101604

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

Quantitation Report (QT Reviewed)

1st BA 10/05/18
2nd MLP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002379.D
Signal(s) : dad1A.ch
Acq On : ~~29-Dec-2000, 23:47:53~~ 04-Oct-2018, 19:00:00
Operator : b.allgeier
Sample : lcsd
Misc :
ALS Vial : 13 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:01 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.133	1909074	19.815	ppm	
2) T	Pyruvic acid	3.629	1357464	2.997	ppm	
3) T	Lactic Acid	4.056	1100466	20.468	ppm	
4) T	Acetic Acid	4.411	1236167	20.892	ppm	
5) T	Propionic Acid	9.244	1128333	18.934	ppm	
6) T	Butyric Acid	25.064	1101604	17.514	ppm	m

(f)=RT Delta > 1/2 Window (m)=manual int.

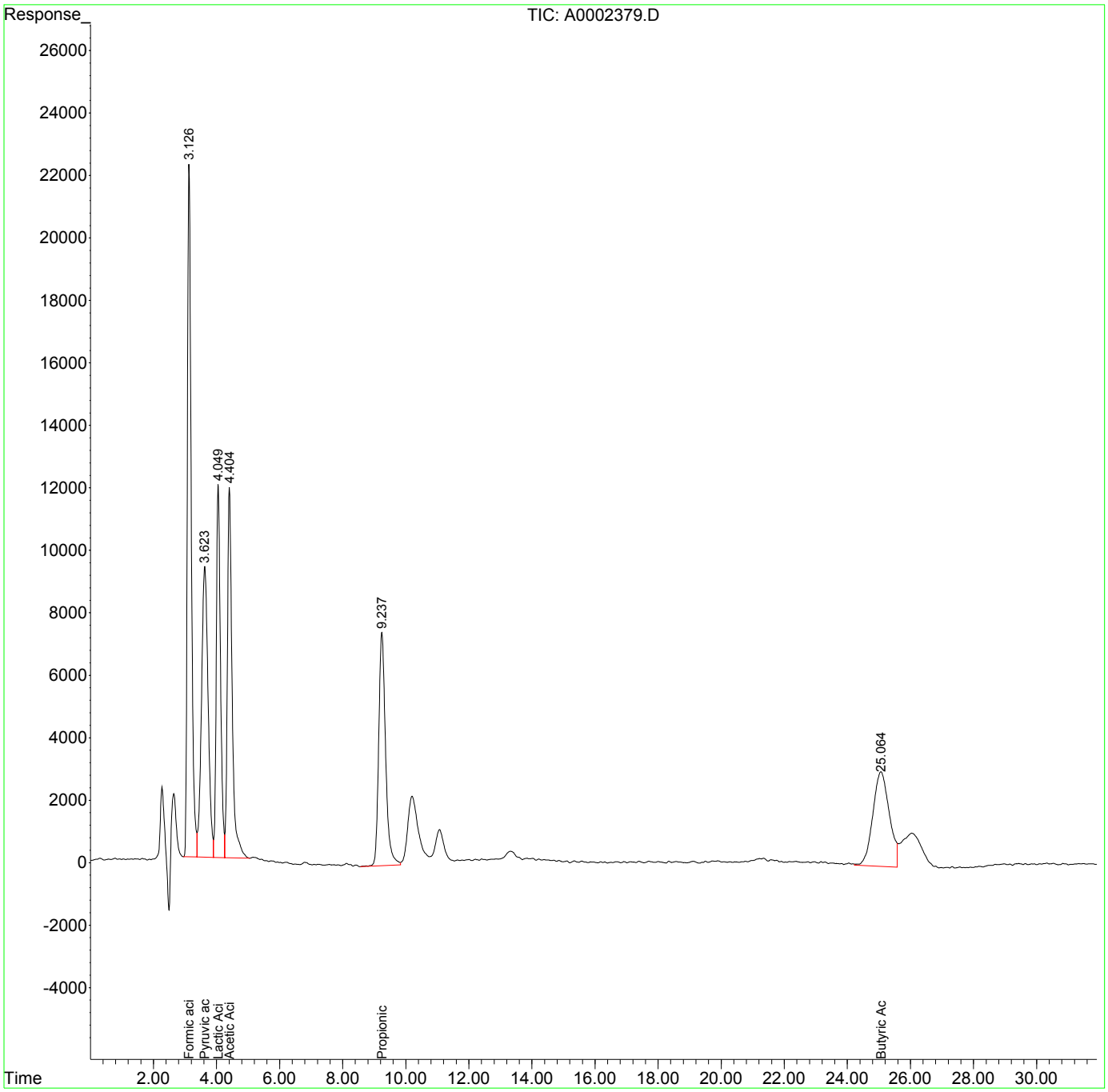
Quantitation Report (QT Reviewed)

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002379.D
Signal(s) : dad1A.ch
Acq On : 29-Dec-2000, 23:47:53
Operator : b.allgeier
Sample : lcsd
Misc :
ALS Vial : 13 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:01 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002395.D
Signal(s) : dad1A.ch
Acq On : ~~29-Dec-2000, 23:18:07~~ 05-Oct-2018, 12:02:00
Operator : b.allgeier
Sample : lcsd
Misc :
ALS Vial : 4 Sample Multiplier: 1

1st BA 10/08/18
2nd BA 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 15:30:15 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc Units
Target Compounds				
1) t	Formic acid	3.109	1891515	19.633 ppm
2) T	Pyruvic acid	3.602	1344844	2.969 ppm
3) T	Lactic Acid	4.019	1087299	20.223 ppm
4) T	Acetic Acid	4.368	1231094	20.806 ppm
5) T	Propionic Acid	9.130	1108903	18.608 ppm
6) T	Butyric Acid	24.712	1120597	17.816 ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

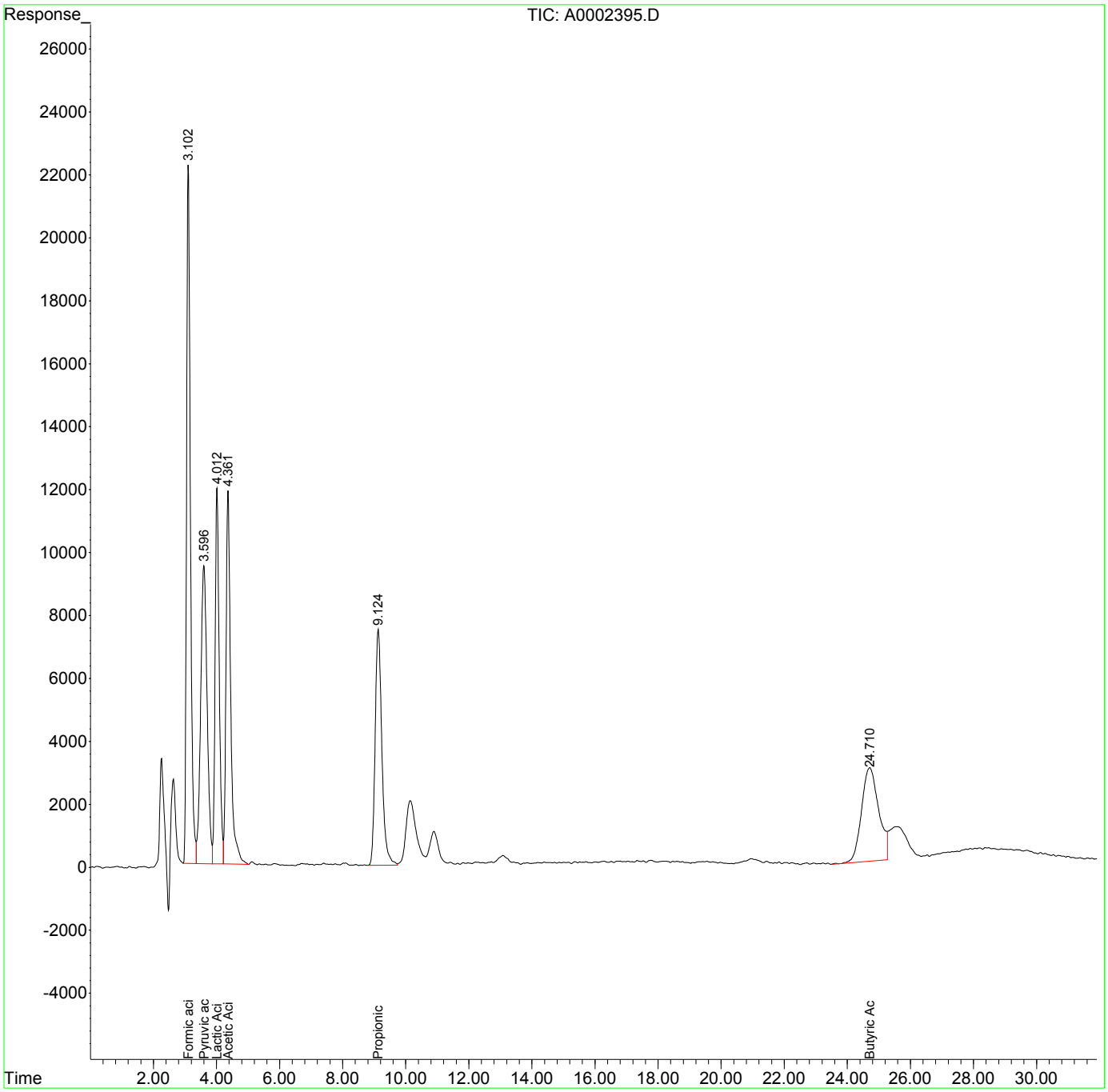
Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002395.D
Signal(s) : dad1A.ch
Acq On : 29-Dec-2000, 23:18:07
Operator : b.allgeier
Sample : lcsd
Misc :
ALS Vial : 4 Sample Multiplier: 1

1st BA 10/08/18
2nd BA 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 15:30:15 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



1st BA 10/08/18
2nd BA 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002397.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 13:24:22
Operator : b.allgeier
Sample : r1809340-001|10m
Misc :
ALS Vial : 6 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:19 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units
Target Compounds					
1) t	Formic acid	3.106	1807872	18.765	ppm
2) T	Pyruvic acid	3.598	1280859	2.828	ppm
3) T	Lactic Acid	4.015	1013087	18.843	ppm
4) T	Acetic Acid	4.360	9225886	155.923	ppm
5) T	Propionic Acid	9.100	4676222	78.471	ppm
6) T	Butyric Acid	24.411	10203381	162.223	ppm

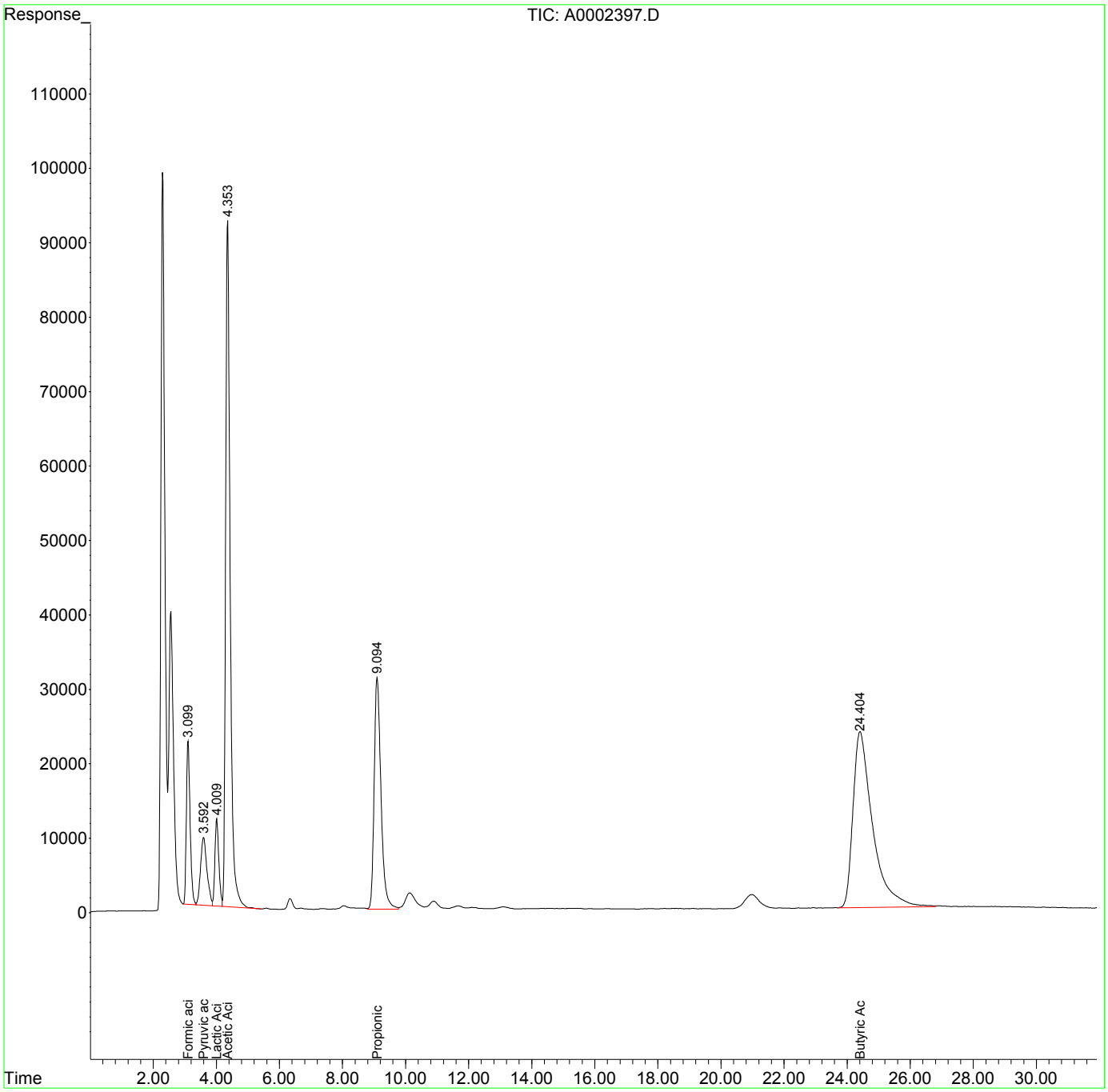
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002397.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 13:24:22
Operator : b.allgeier
Sample : r1809340-001|10m
Misc :
ALS Vial : 6 Sample Multiplier: 1

1st BA 10/08/18
2nd BA 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 15:30:19 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002398.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 13:59:20
Operator : b.allgeier
Sample : r1809340-001|10m
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/08/18
2nd BA 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 15:30:21 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units
Target Compounds					
1) t	Formic acid	3.107	1812062	18.808	ppm
2) T	Pyruvic acid	3.598	1285997	2.839	ppm
3) T	Lactic Acid	4.015	1016966	18.915	ppm
4) T	Acetic Acid	4.359	9204673	155.565	ppm
5) T	Propionic Acid	9.096	4656949	78.148	ppm
6) T	Butyric Acid	24.373	10181328	161.872	ppm

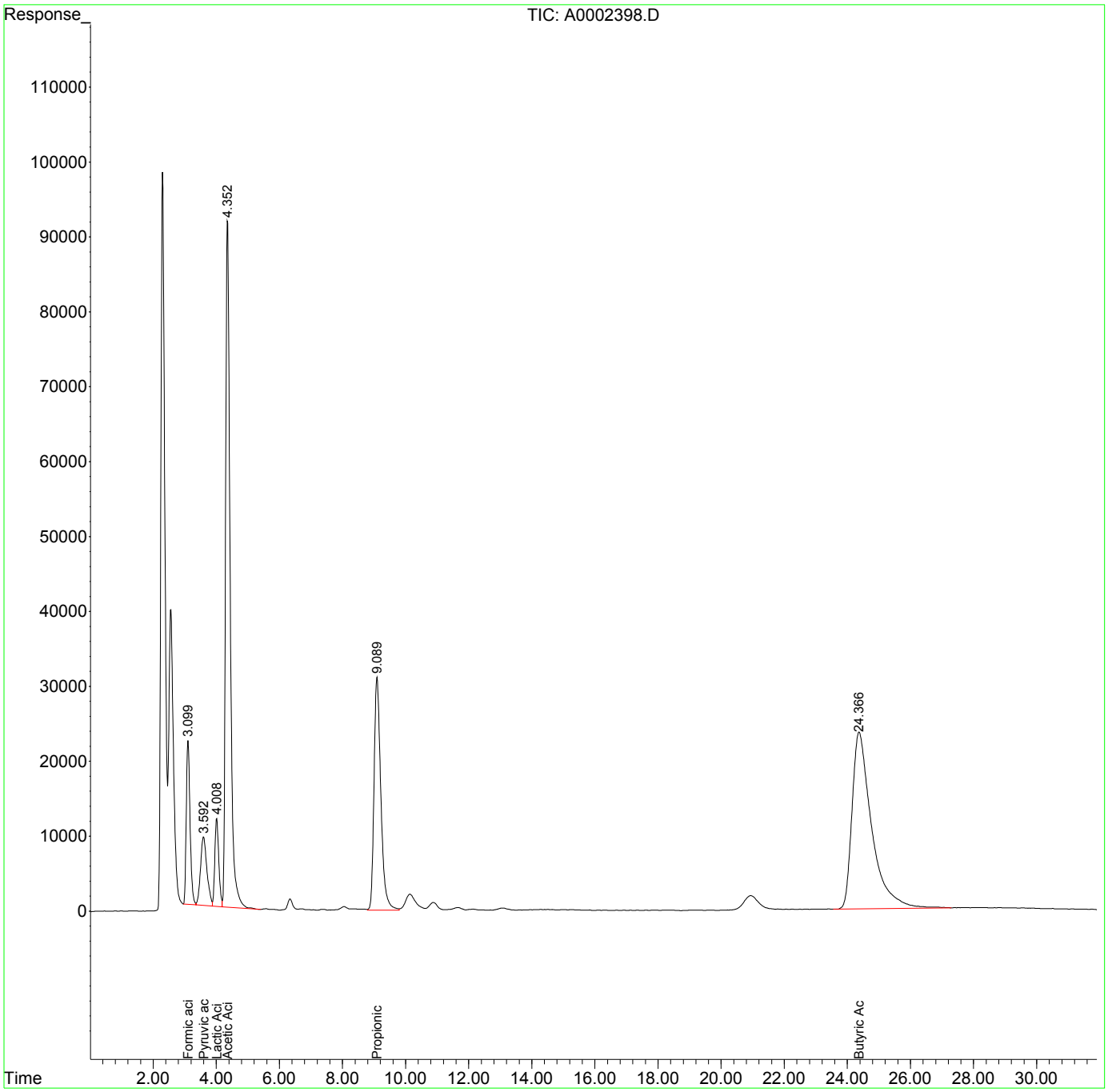
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002398.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 13:59:20
Operator : b.allgeier
Sample : r1809340-001|10m
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/08/18
2nd BA 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 15:30:21 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



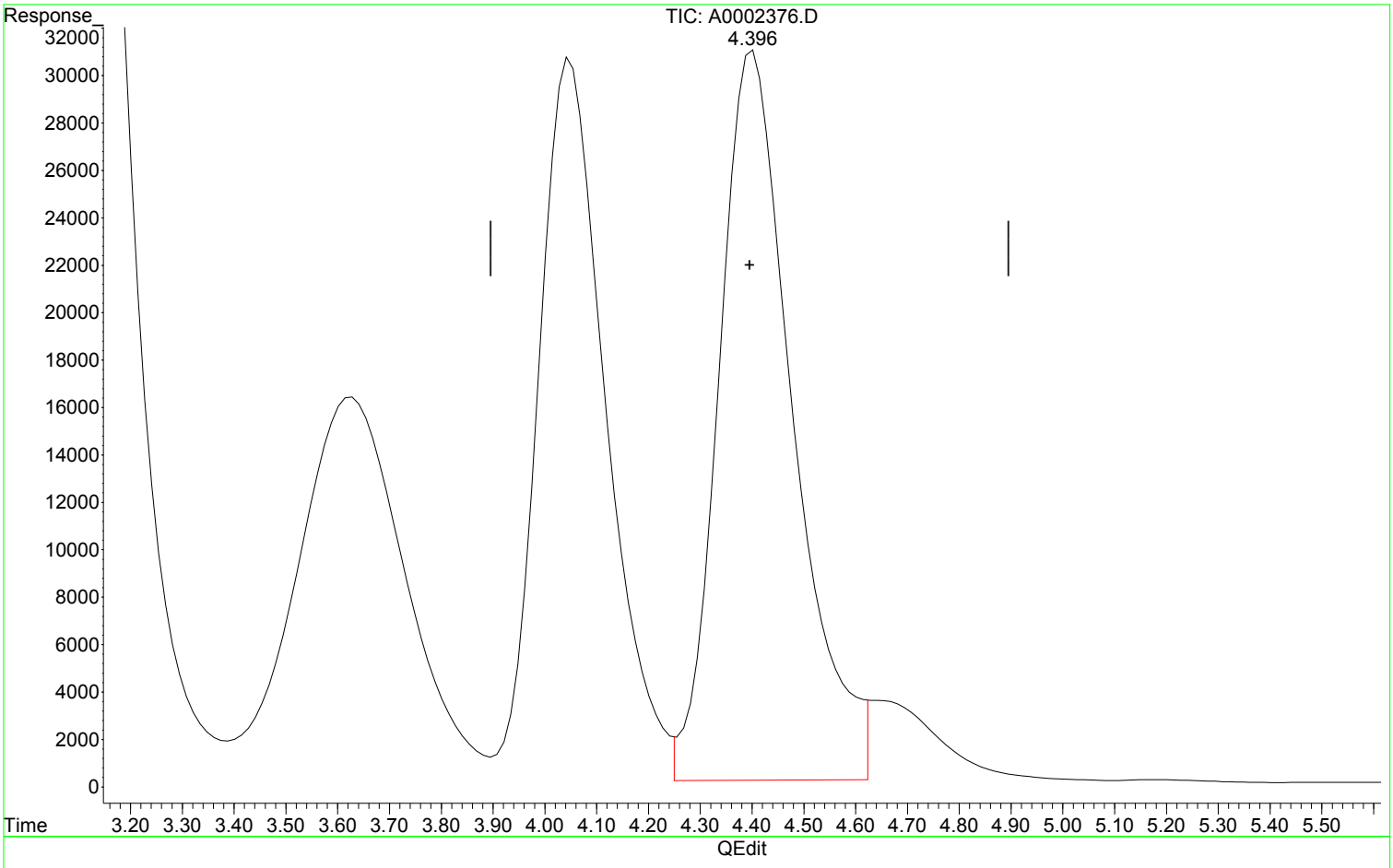
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002376.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:16:44
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:26:22 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.396min 51.650 ppm m

response 3056109

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

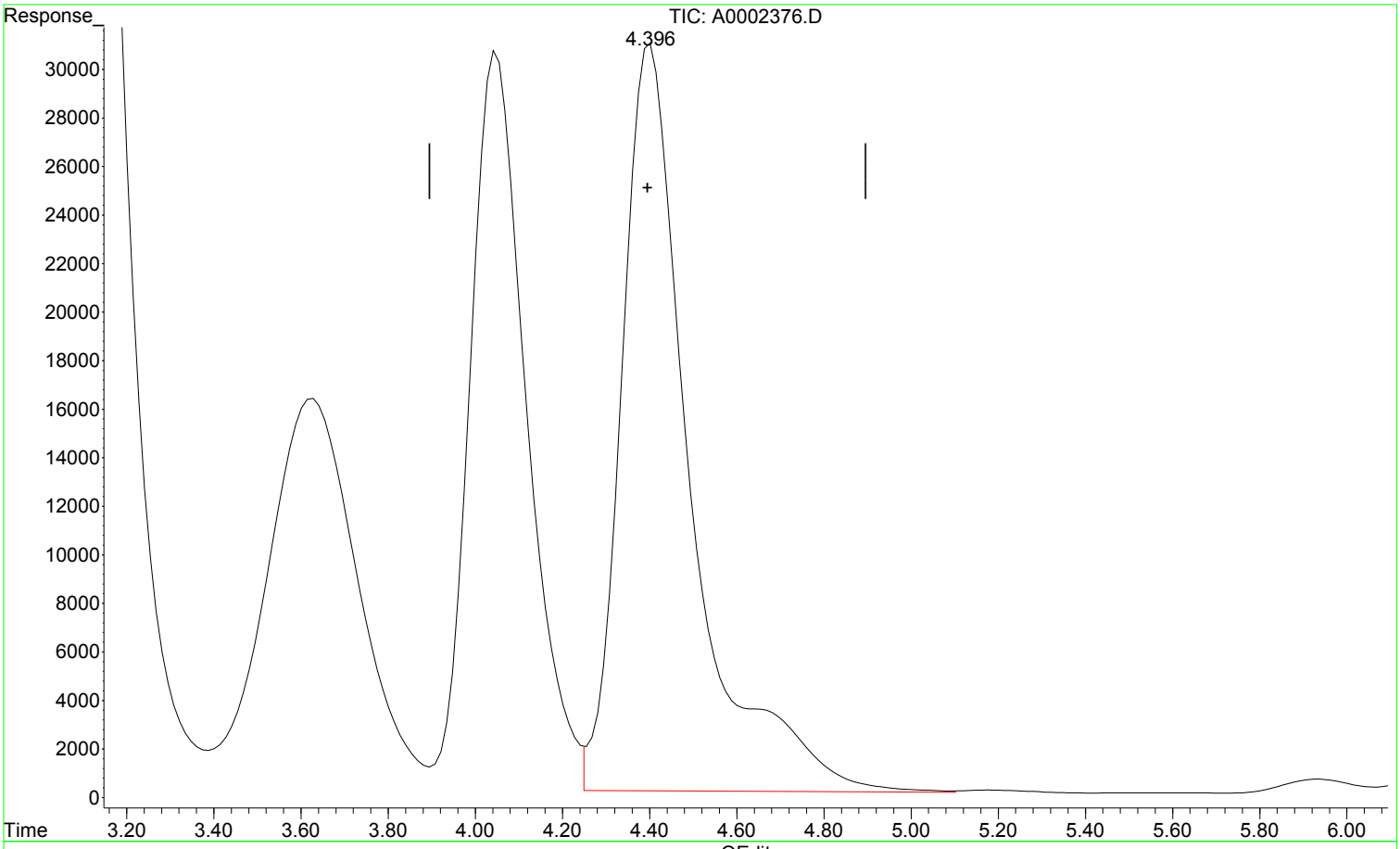
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002376.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:16:44
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:26:22 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.404min 57.452 ppm

response 3399396

Manual Integration:

Before

10/05/18

(+) = Expected Retention Time

Evaluate Continuing Calibration Report

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002376.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:16:44
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:26:22 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1 t	Formic acid	96.343	97.119 E3	-0.8	101	0.00
2 T	Pyruvic acid	452.935	463.290 E3	-2.3	101	0.00
3 T	Lactic Acid	53.765	55.006 E3	-2.3	101	0.00
4 T	Acetic Acid	59.169	61.122 E3	-3.3	101	0.00
5 T	Propionic Acid	59.592	58.787 E3	1.4	100	0.02
6 T	Butyric Acid	62.897	57.717 E3	8.2	98	0.10

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002376.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:16:44
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:26:22 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.131	4855945	50.403	ppm	
2) T	Pyruvic acid	3.628	2316452	5.114	ppm	
3) T	Lactic Acid	4.051	2750282	51.154	ppm	
4) T	Acetic Acid	4.396	3056109	51.650	ppm	m
5) T	Propionic Acid	9.209	2939344	49.325	ppm	
6) T	Butyric Acid	24.941	2885862	45.882	ppm	

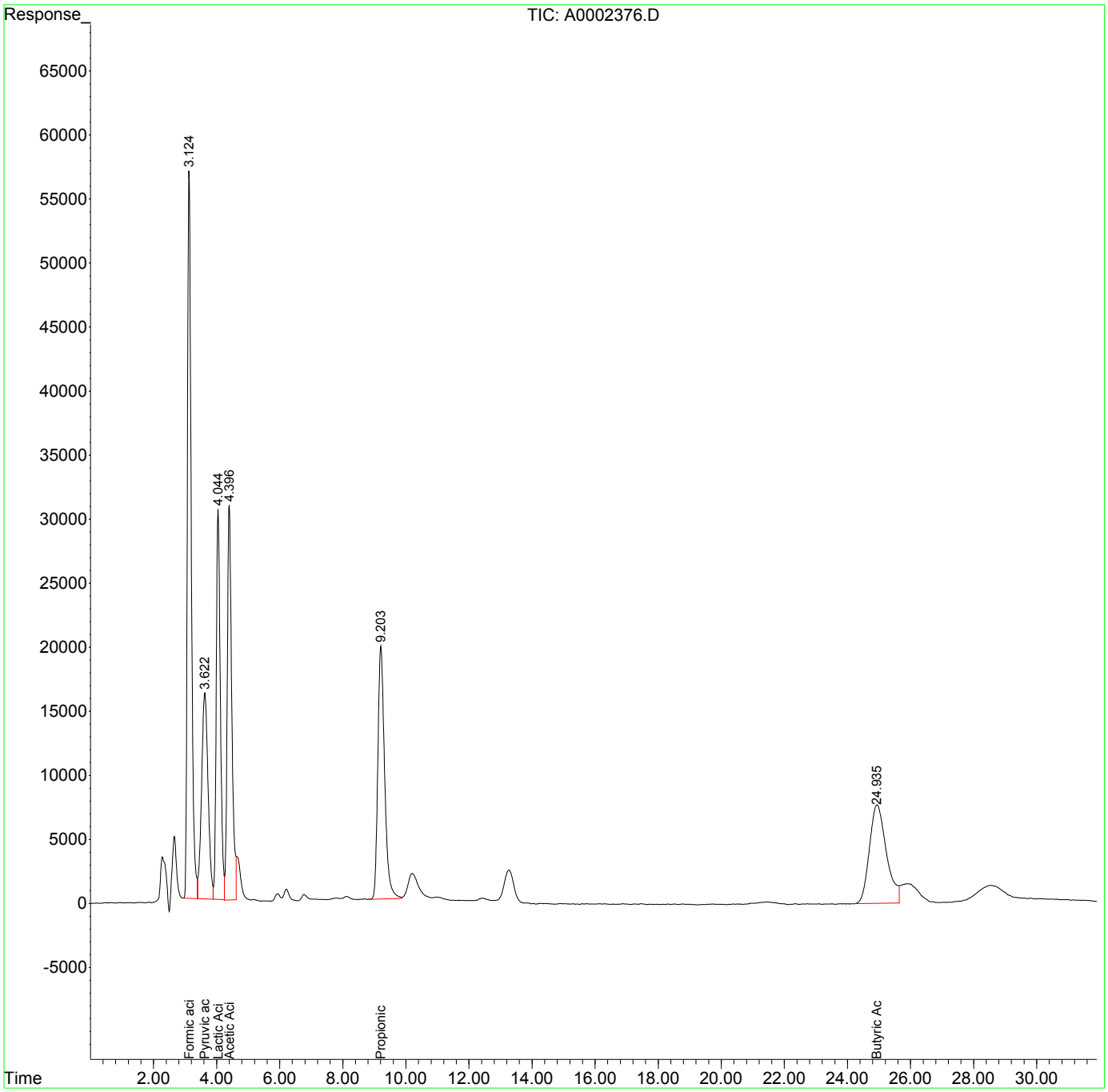
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002376.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:16:44
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:26:22 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



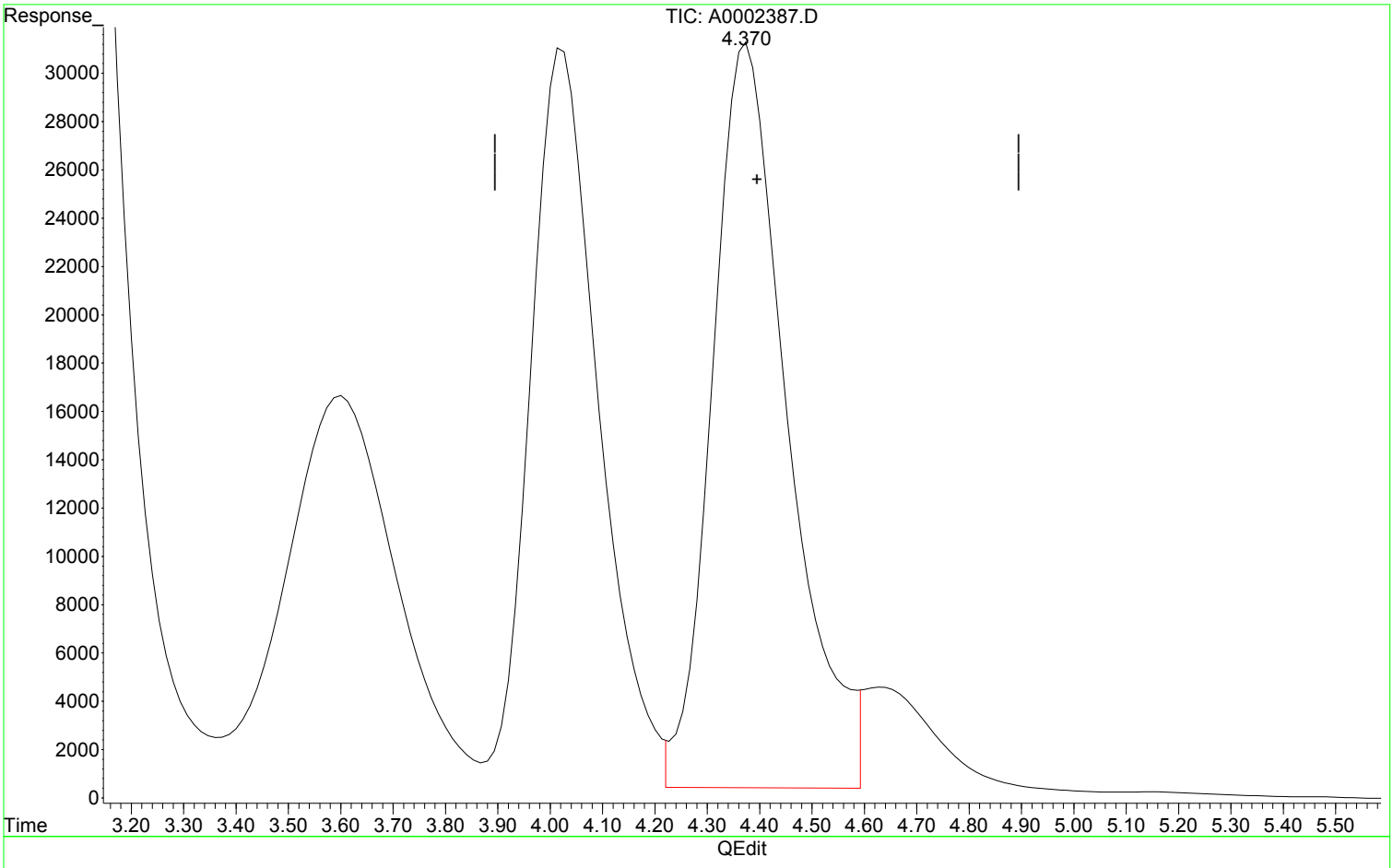
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002387.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 23:40:52
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MLP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:28:17 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.370min 52.246 ppm m

response 3091378

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

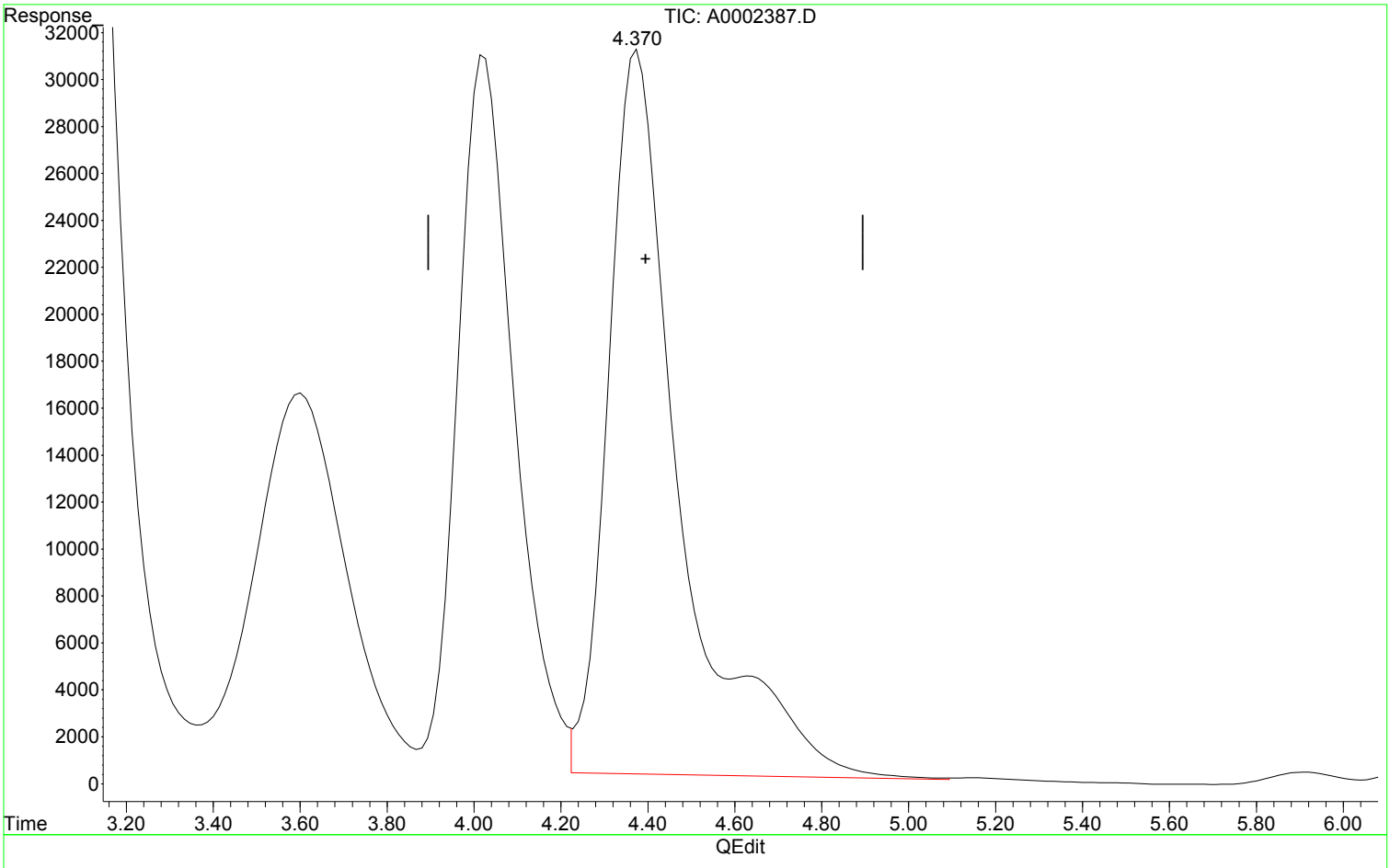
Quantitation Report (Qedit)

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002387.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 23:40:52
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:17 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.378min 59.424 ppm

response 3516056

Manual Integration:

Before

10/05/18

(+) = Expected Retention Time

Evaluate Continuing Calibration Report

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002387.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 23:40:52
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:17 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1 t	Formic acid	96.343	96.897 E3	-0.6	101	-0.02
2 T	Pyruvic acid	452.935	460.392 E3	-1.6	100	-0.03
3 T	Lactic Acid	53.765	55.156 E3	-2.6	102	-0.02
4 T	Acetic Acid	59.169	61.828 E3	-4.5	102	-0.03
5 T	Propionic Acid	59.592	58.777 E3	1.4	100	-0.03
6 T	Butyric Acid	62.897	58.758 E3	6.6	100	-0.03

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002387.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 23:40:52
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:28:17 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.111	4844848	50.287	ppm	
2) T	Pyruvic acid	3.603	2301960	5.082	ppm	
3) T	Lactic Acid	4.026	2757824	51.294	ppm	
4) T	Acetic Acid	4.370	3091378	52.246	ppm	m
5) T	Propionic Acid	9.162	2938838	49.316	ppm	
6) T	Butyric Acid	24.810	2937908	46.710	ppm	

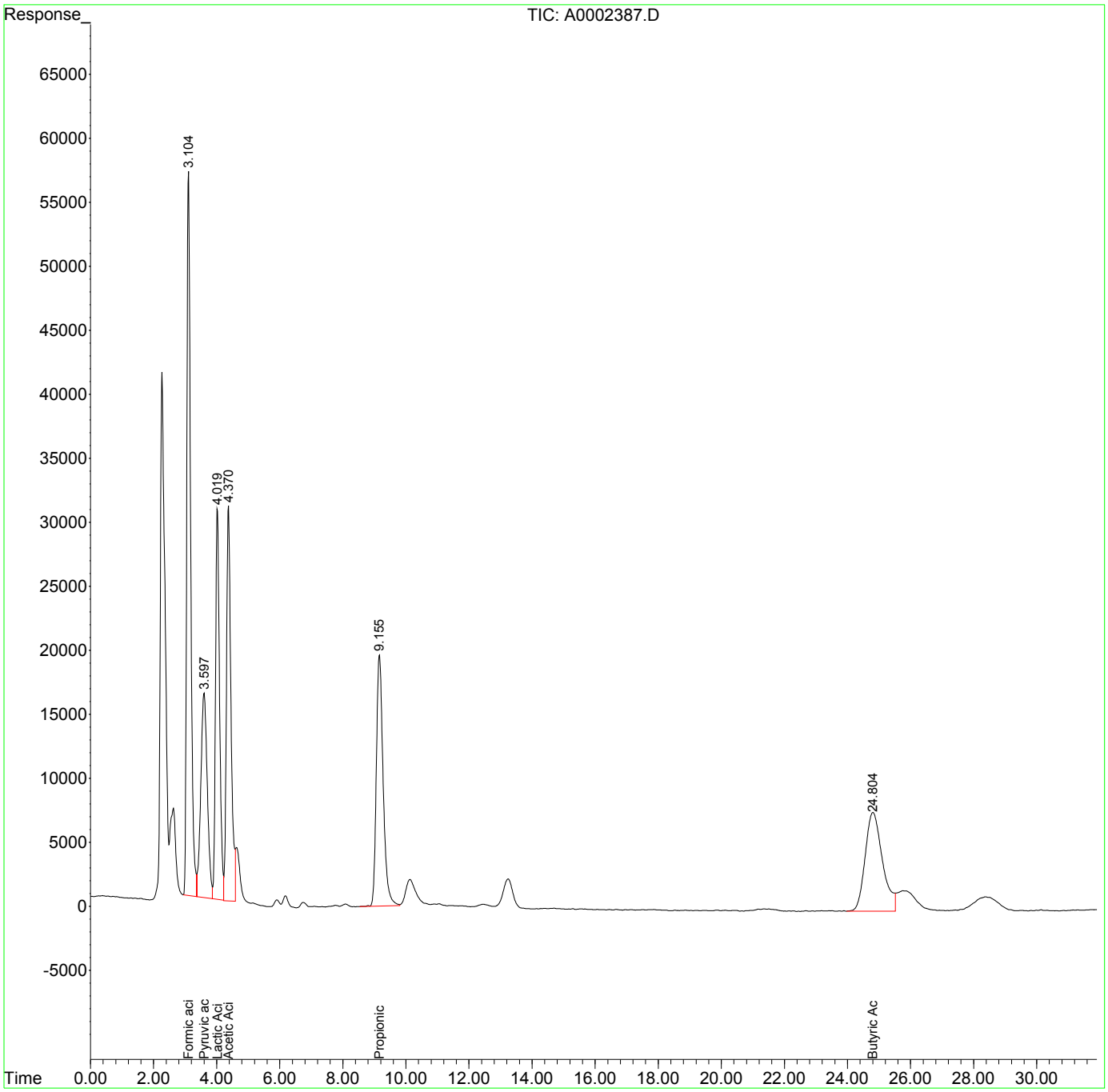
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002387.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 23:40:52
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:28:17 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



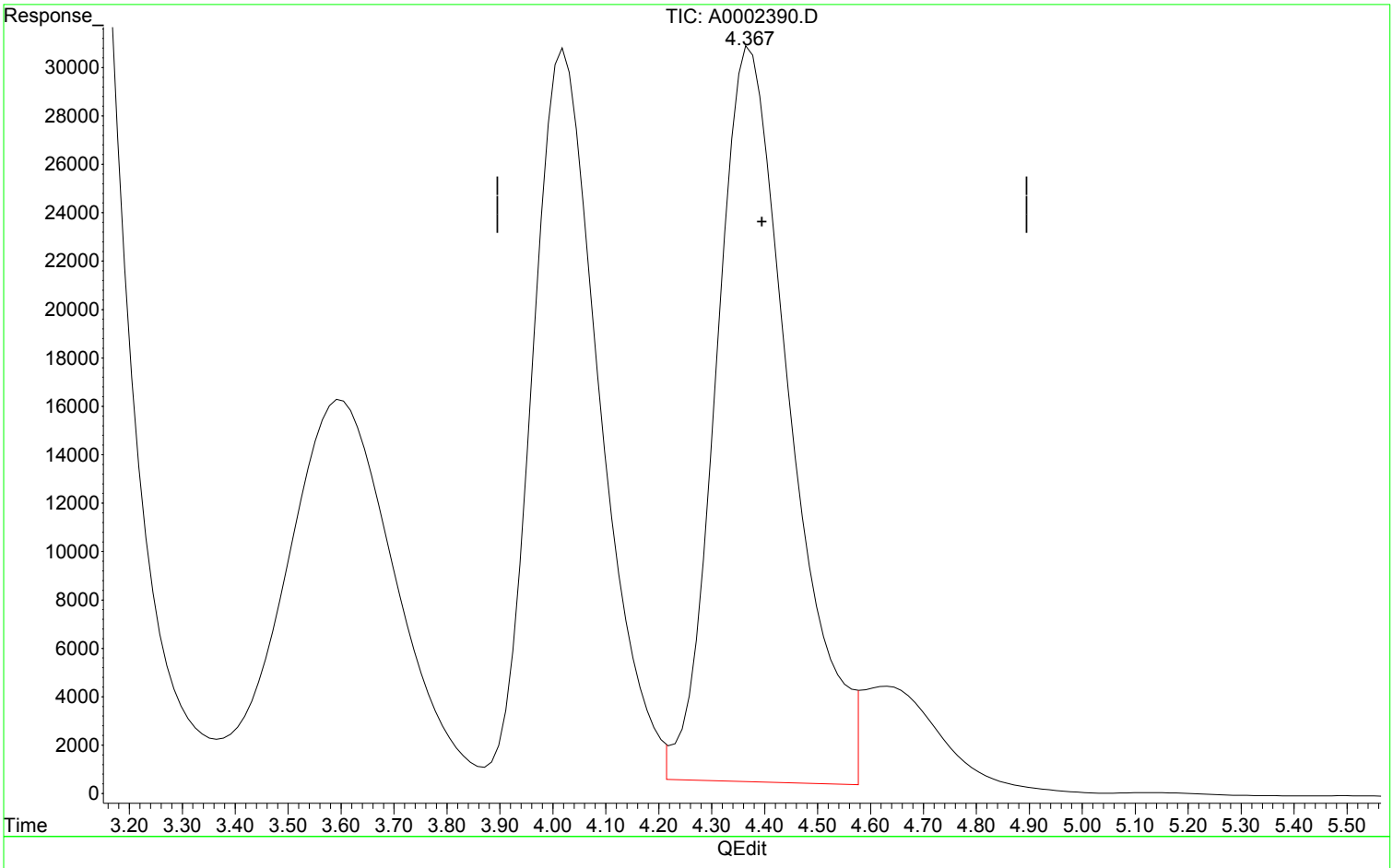
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.367min 49.784 ppm m

response 2945690

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

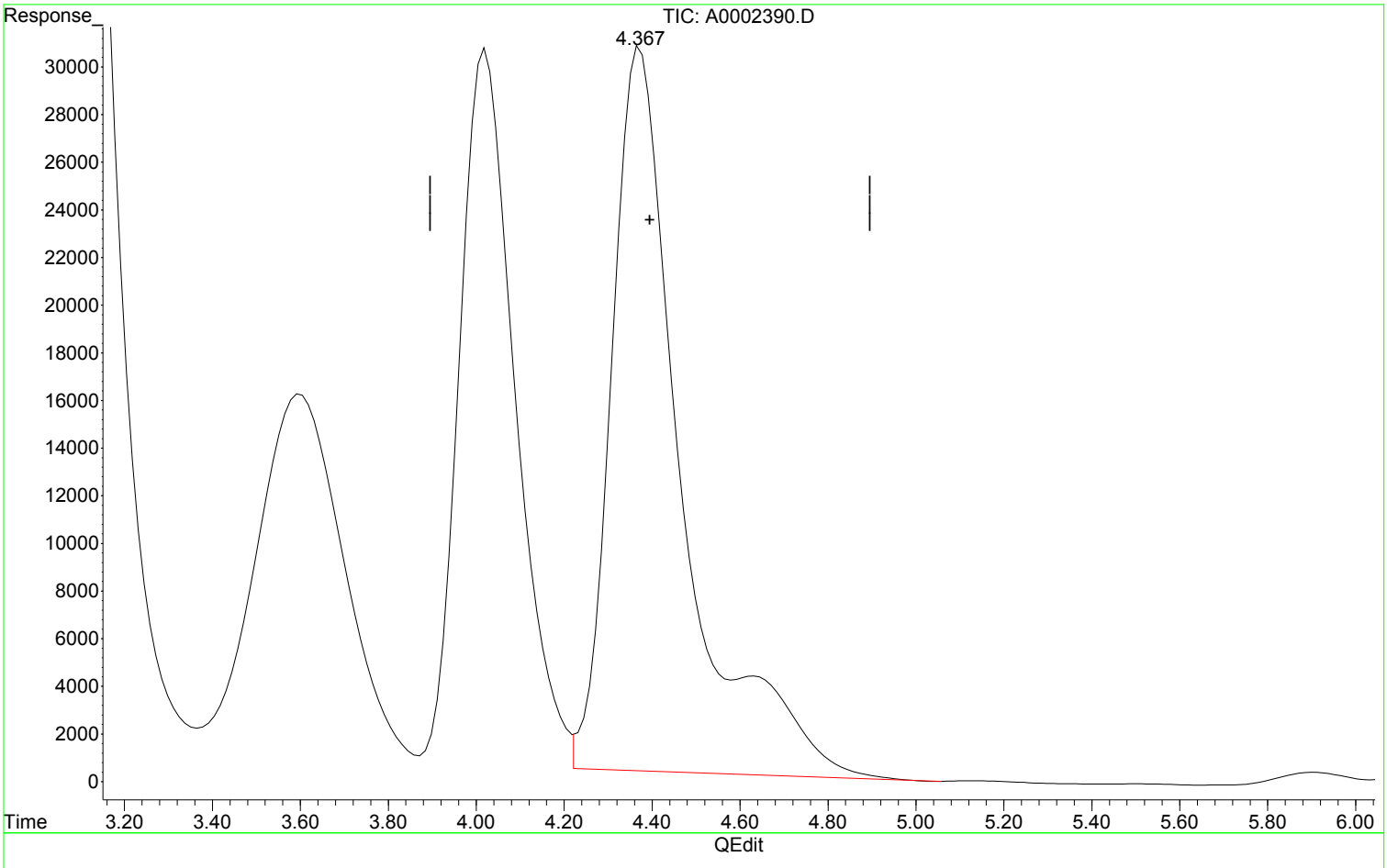
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.375min 57.500 ppm

response 3402228

Manual Integration:

Before

10/05/18

(+) = Expected Retention Time

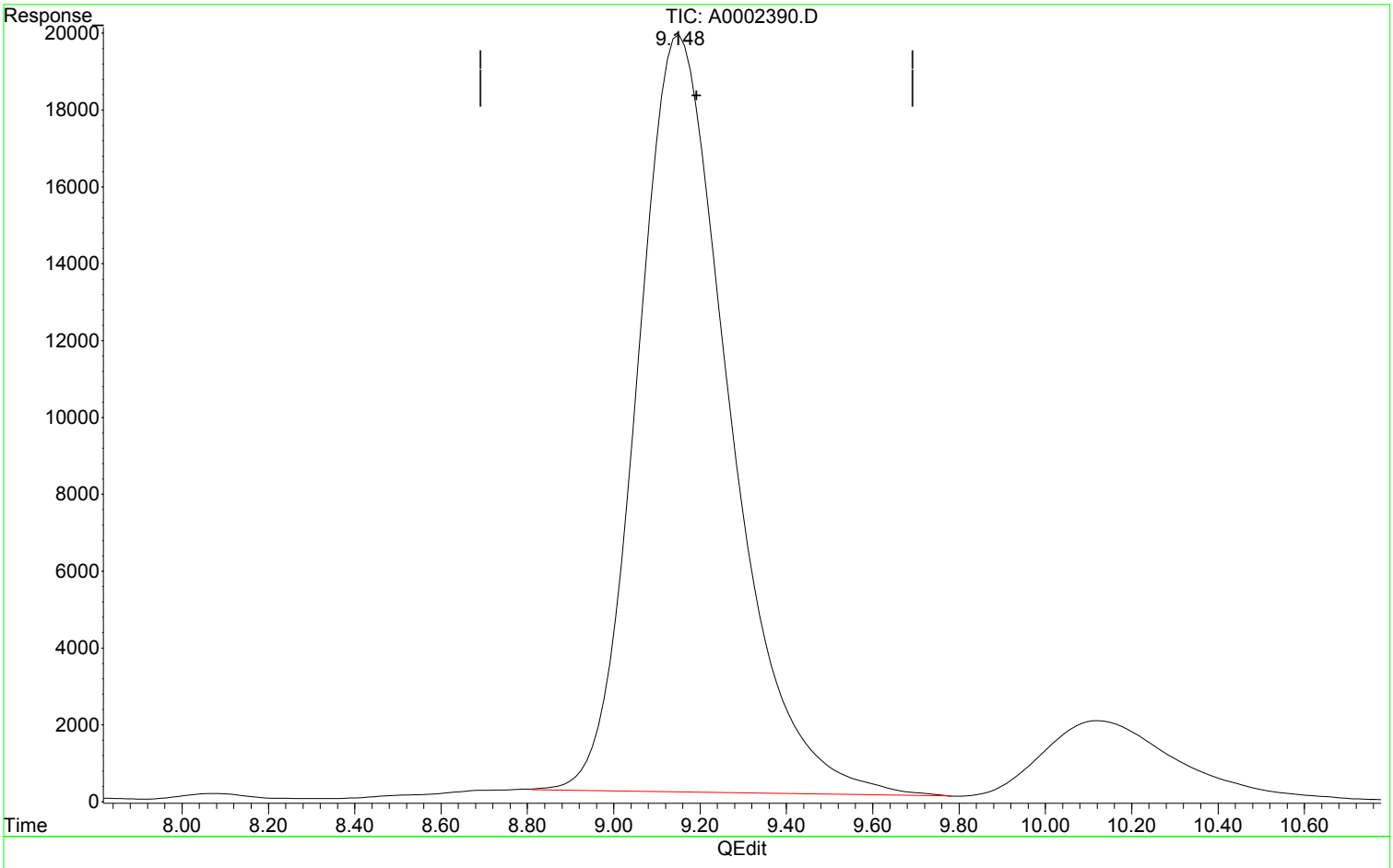
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.148min 49.189 ppm m

response 2931268

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

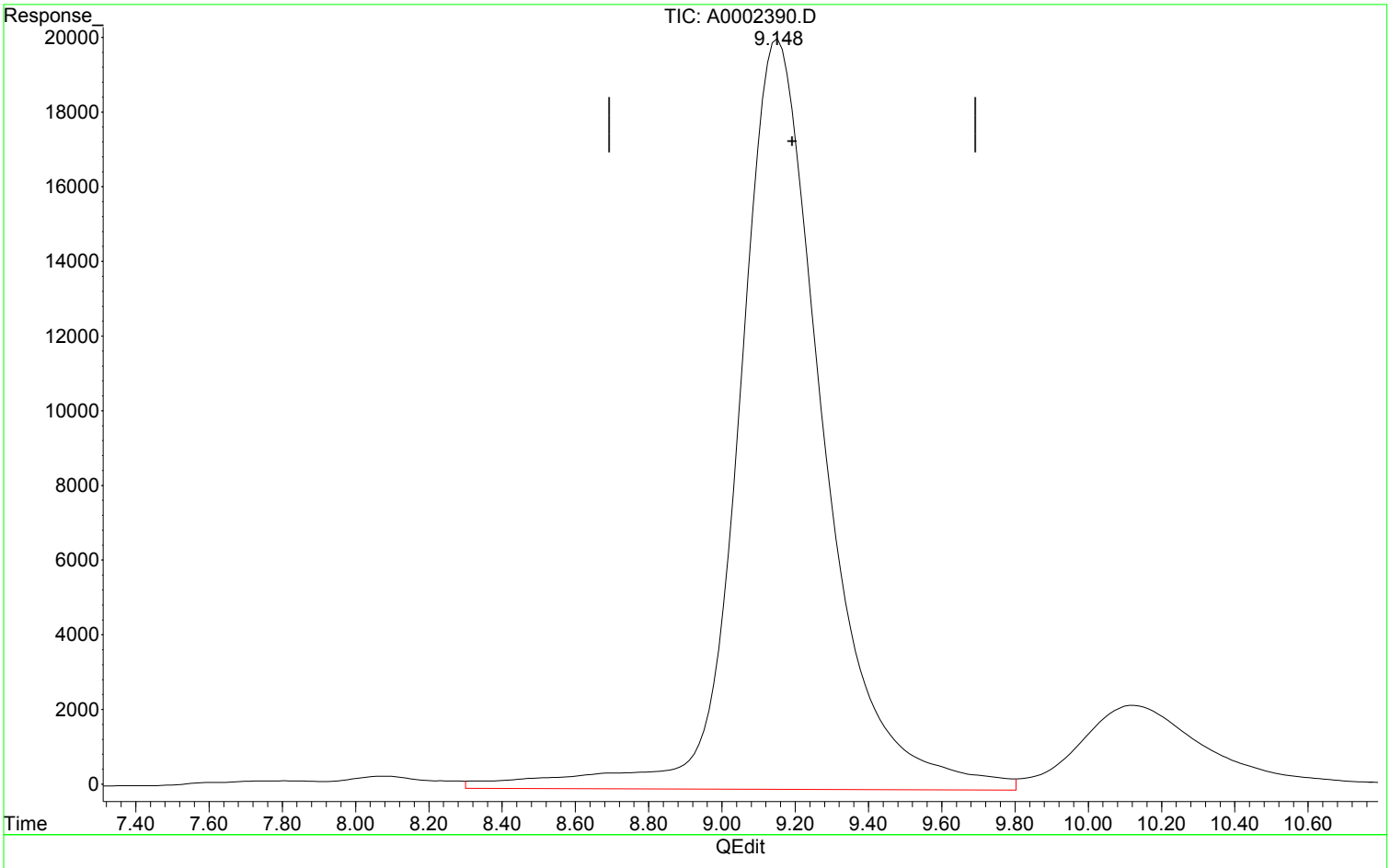
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.154min 54.569 ppm

response 3251832

Manual Integration:

Before

10/05/18

(+) = Expected Retention Time

Evaluate Continuing Calibration Report

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1 t	Formic acid	96.343	95.630 E3	0.7	99	-0.02
2 T	Pyruvic acid	452.935	422.410 E3	6.7	92	-0.03
3 T	Lactic Acid	53.765	53.004 E3	1.4	98	-0.03
4 T	Acetic Acid	59.169	58.914 E3	0.4	97	-0.03
5 T	Propionic Acid	59.592	58.625 E3	1.6	99	-0.04
6 T	Butyric Acid	62.897	57.833 E3	8.1	99	-0.05

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Quantitation Report (QT Reviewed)

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.109	4781519	49.630	ppm	
2) T	Pyruvic acid	3.601	2112050	4.663	ppm	
3) T	Lactic Acid	4.024	2650211	49.293	ppm	
4) T	Acetic Acid	4.367	2945690	49.784	ppm	m
5) T	Propionic Acid	9.148	2931268	49.189	ppm	m
6) T	Butyric Acid	24.791	2891658	45.974	ppm	

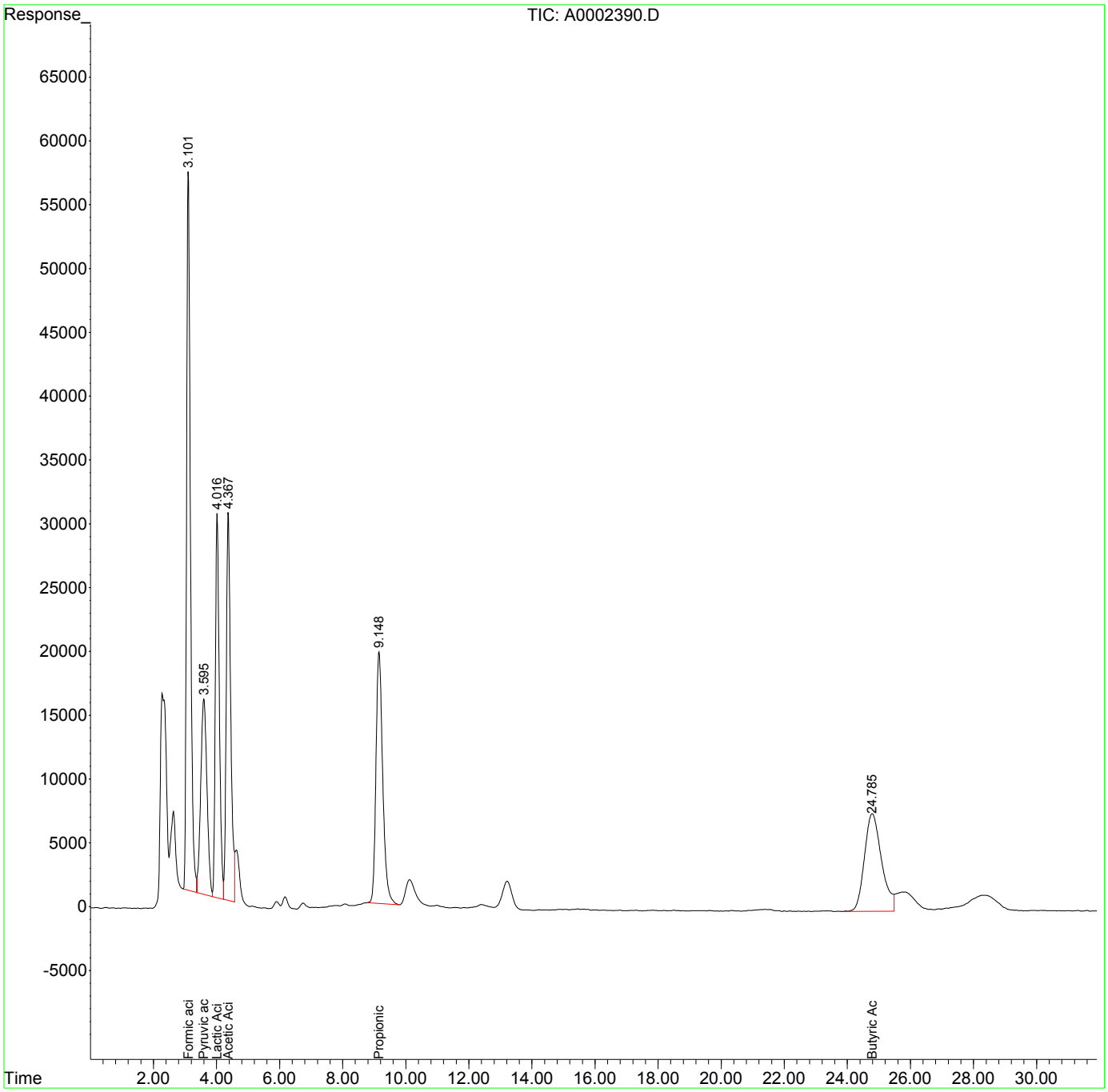
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd [illegible] 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



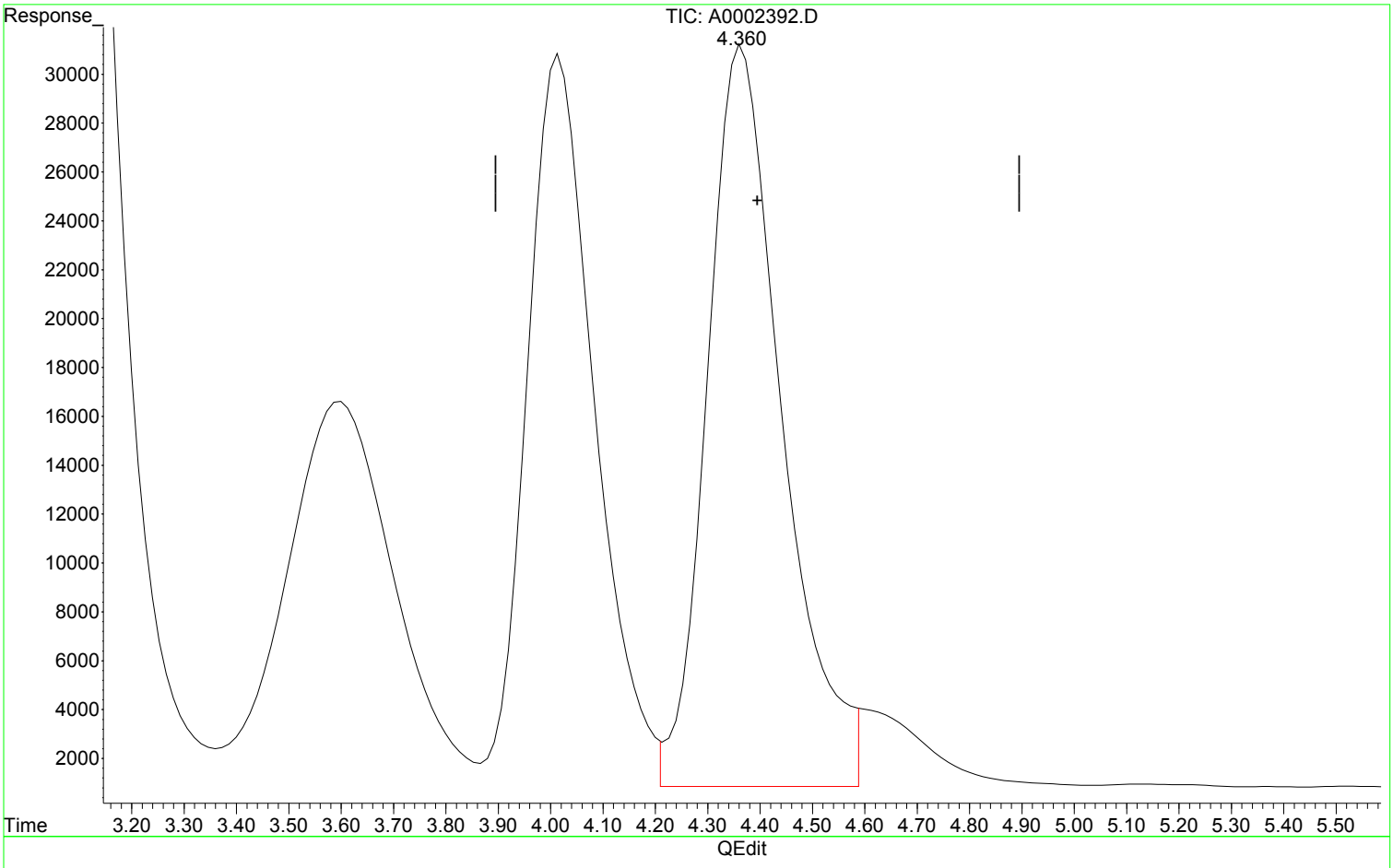
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002392.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 10:29:40
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

1st BA 10/08/18
2nd BA 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 15:14:43 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.360min 51.179 ppm m

response 3028258

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

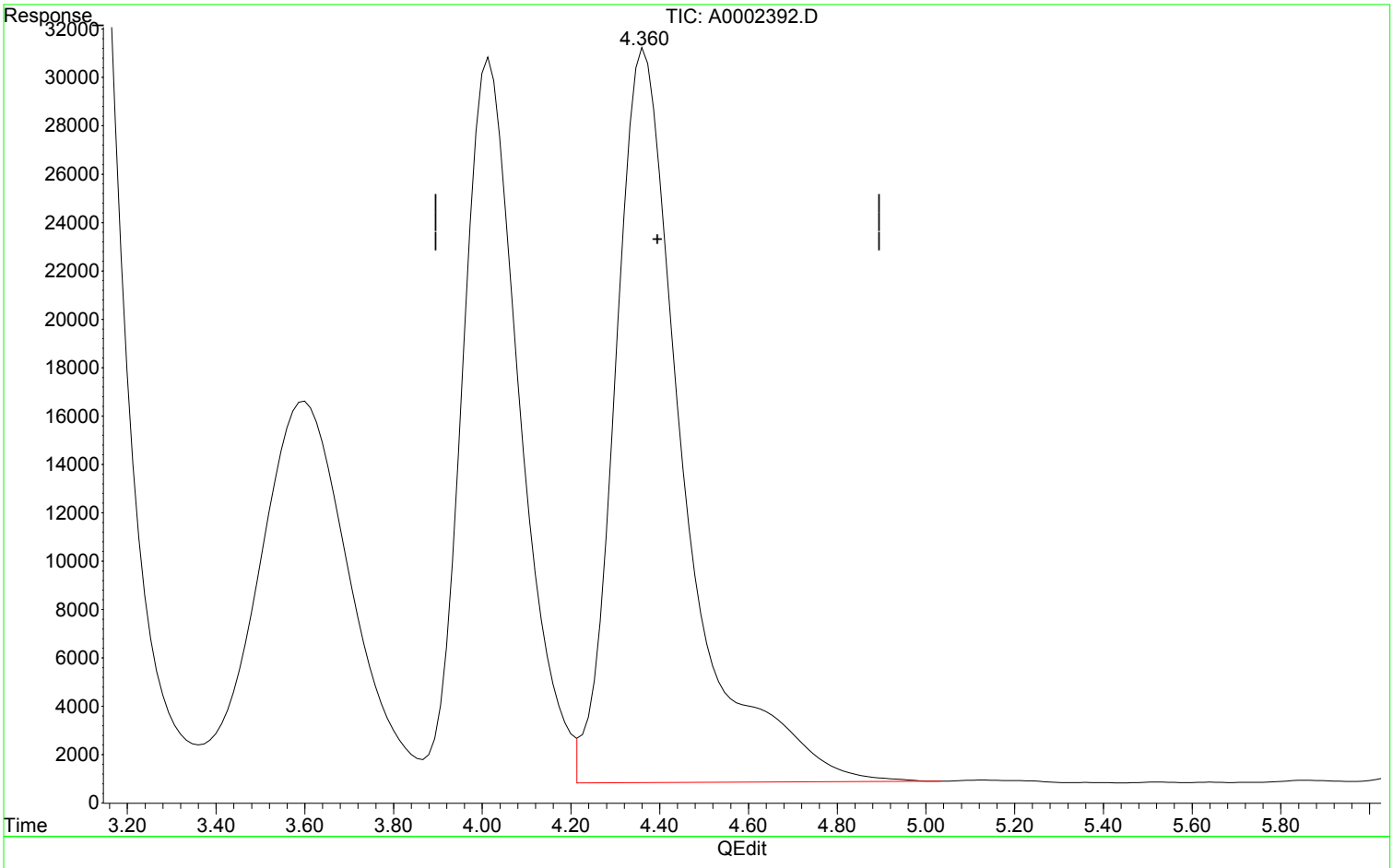
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002392.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 10:29:40
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

1st BA 10/08/18
2nd BA 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 15:14:43 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.367min 55.649 ppm

response 3292693

Manual Integration:

Before

10/05/18

(+) = Expected Retention Time

Evaluate Continuing Calibration Report

1st BA 10/08/18
2nd BA 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002392.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 10:29:40
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:14:43 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1 t	Formic acid	96.343	95.645 E3	0.7	99	0.00
2 T	Pyruvic acid	452.935	453.885 E3	-0.2	99	0.00
3 T	Lactic Acid	53.765	54.021 E3	-0.5	100	0.00
4 T	Acetic Acid	59.169	60.565 E3	-2.4	100	0.00
5 T	Propionic Acid	59.592	58.178 E3	2.4	99	0.00
6 T	Butyric Acid	62.897	58.755 E3	6.6	100	0.00

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002392.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 10:29:40
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

1st BA 10/08/18
2nd BA 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 15:14:43 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.108	4782273	49.638	ppm	
2) T	Pyruvic acid	3.600	2269427	5.010	ppm	
3) T	Lactic Acid	4.018	2701047	50.238	ppm	
4) T	Acetic Acid	4.360	3028258	51.179	ppm	m
5) T	Propionic Acid	9.121	2908885	48.814	ppm	
6) T	Butyric Acid	24.655	2937738	46.707	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

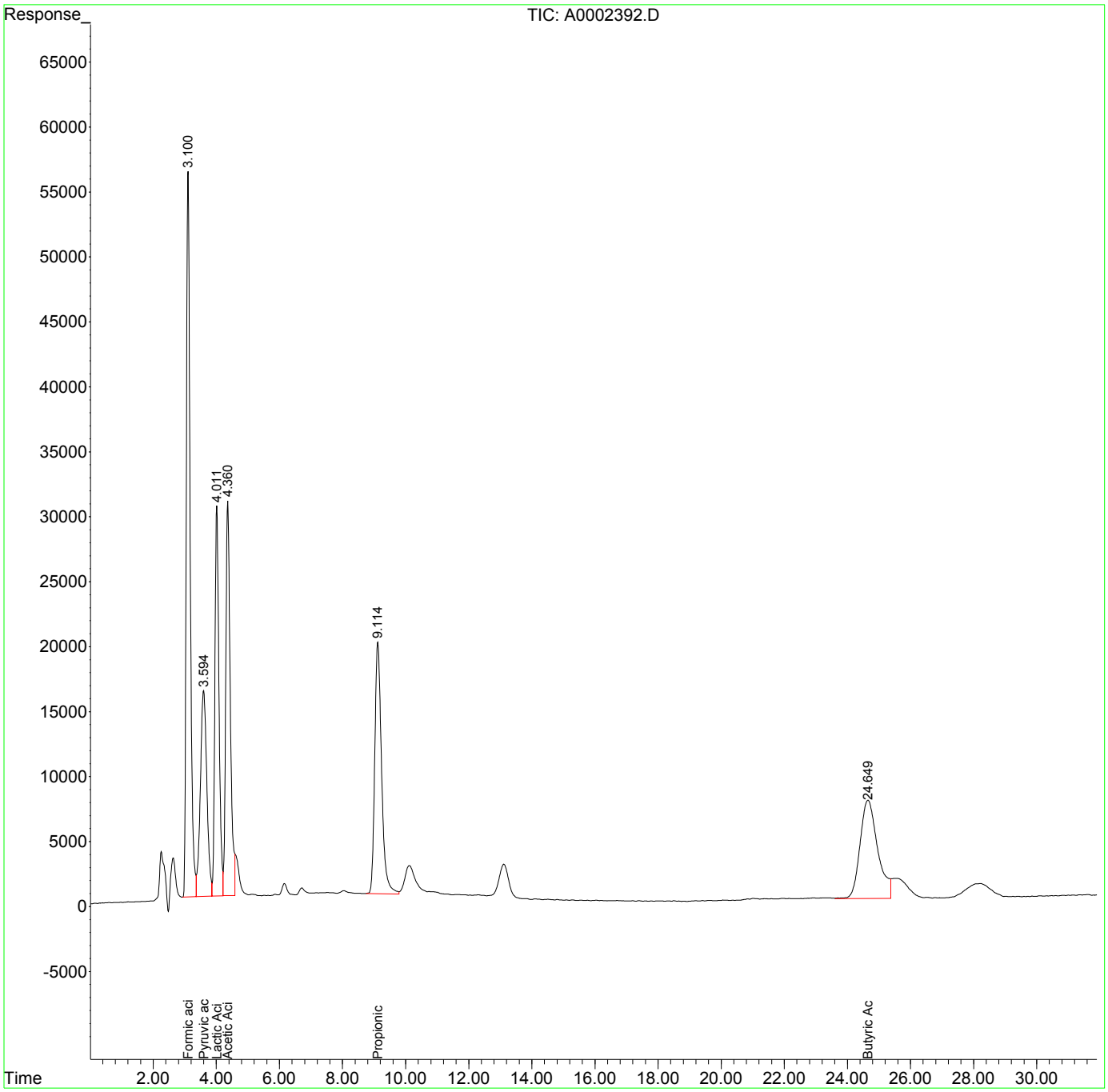
Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002392.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 10:29:40
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

1st BA 10/08/18
2nd BA 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 15:14:43 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



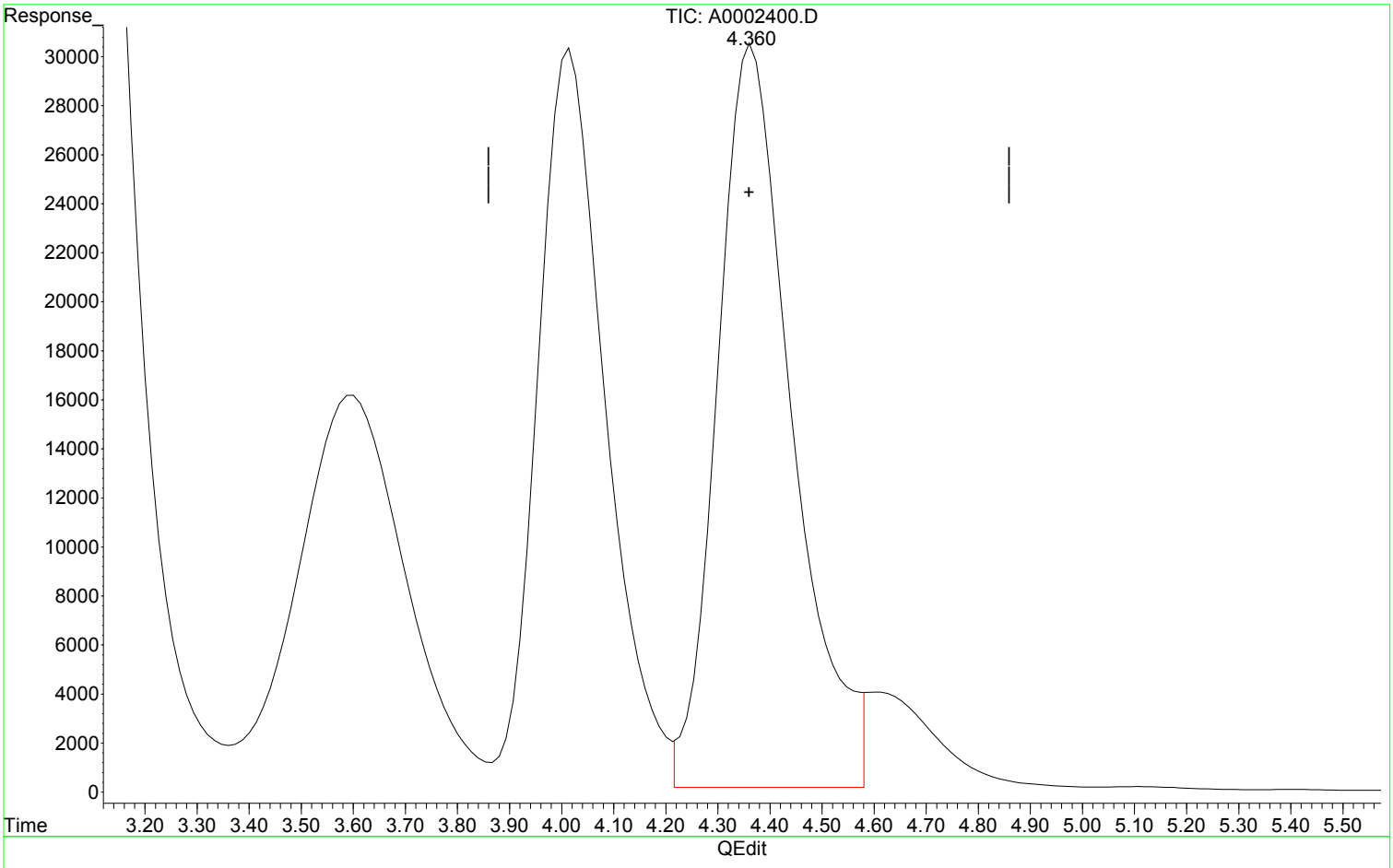
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002400.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 15:09:20
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

1st BA 10/08/18
2nd BA 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 16:07:05 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.360min 50.833 ppm m

response 3007786

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

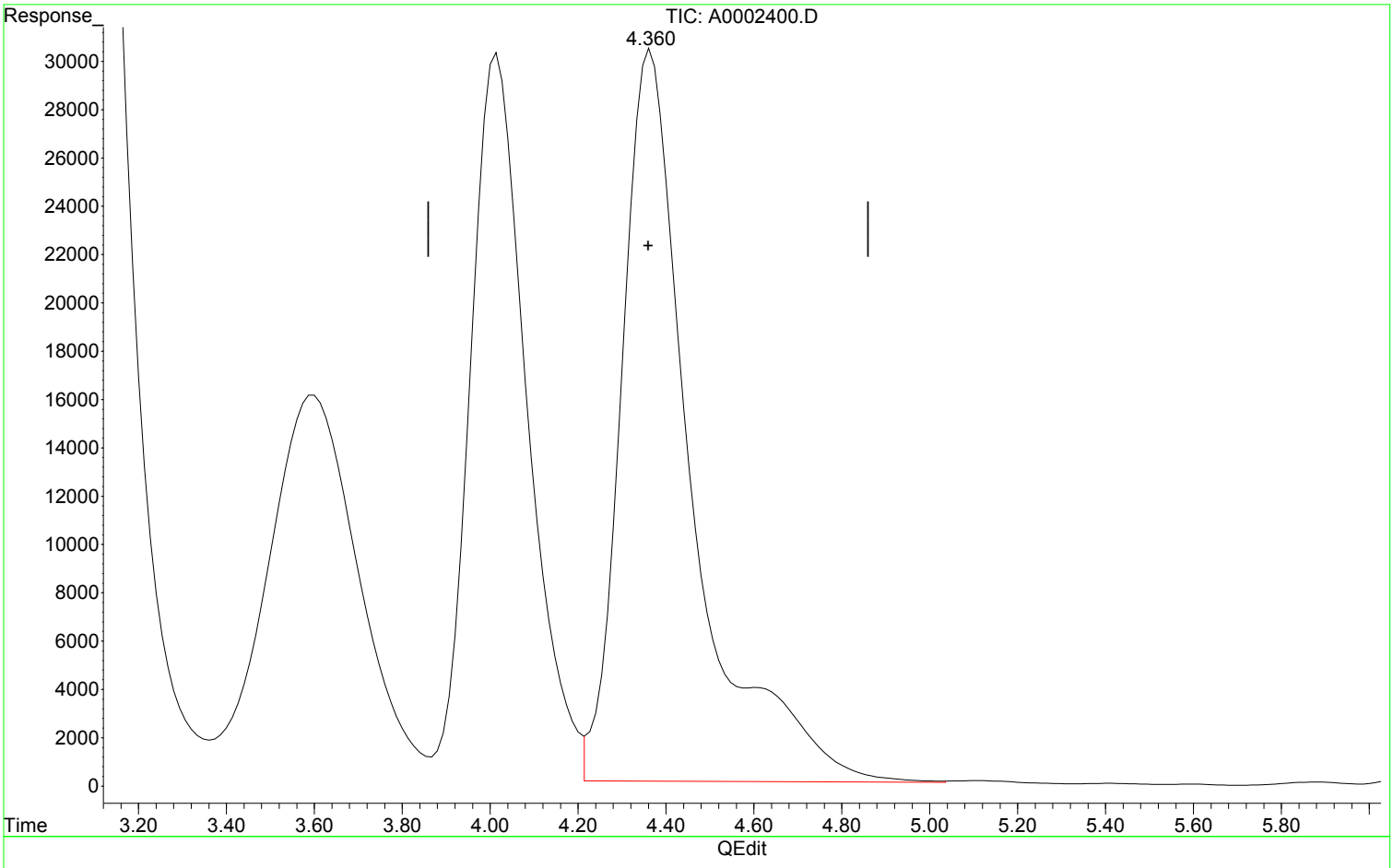
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002400.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 15:09:20
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

1st BA 10/08/18
2nd BA 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 16:07:05 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.367min 57.265 ppm

response 3388325

Manual Integration:

Before

10/05/18

(+) = Expected Retention Time

Evaluate Continuing Calibration Report

1st BA 10/08/18
2nd BA 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002400.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 15:09:20
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 16:07:05 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1 t	Formic acid	96.343	95.077 E3	1.3	99	0.00
2 T	Pyruvic acid	452.935	456.790 E3	-0.9	100	0.00
3 T	Lactic Acid	53.765	54.332 E3	-1.1	100	0.00
4 T	Acetic Acid	59.169	60.156 E3	-1.7	99	0.00
5 T	Propionic Acid	59.592	57.295 E3	3.9	97	0.00
6 T	Butyric Acid	62.897	58.521 E3	7.0	100	0.03

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002400.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 15:09:20
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

1st BA 10/08/18
2nd BA 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 16:07:05 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.107	4753865	49.343	ppm	
2) T	Pyruvic acid	3.599	2283950	5.043	ppm	
3) T	Lactic Acid	4.018	2716598	50.527	ppm	
4) T	Acetic Acid	4.360	3007786	50.833	ppm	m
5) T	Propionic Acid	9.123	2864749	48.073	ppm	
6) T	Butyric Acid	24.681	2926070	46.521	ppm	

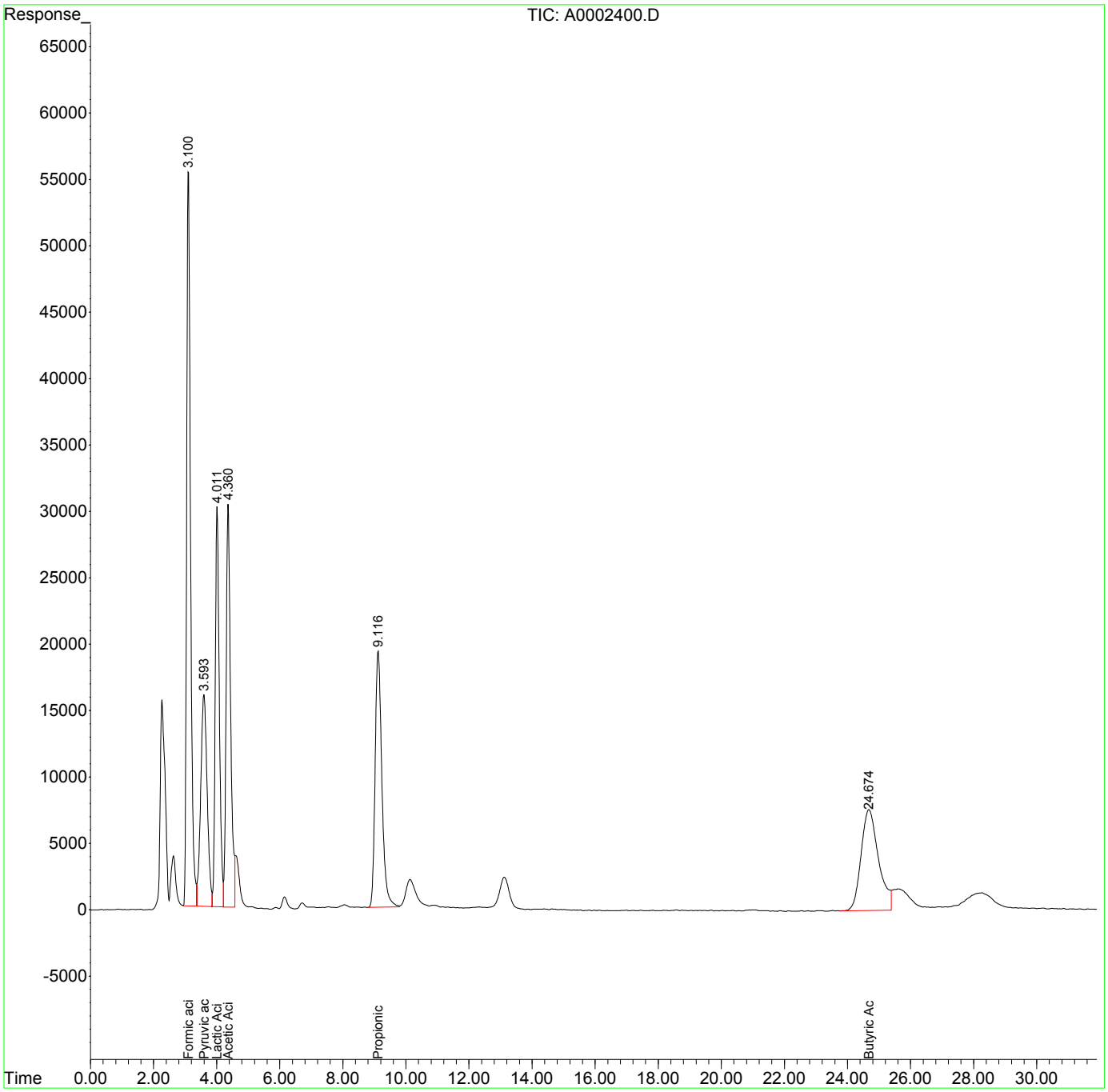
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002400.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 15:09:20
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

1st BA 10/08/18
2nd BA 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 16:07:05 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002375.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : icv
Misc :
ALS Vial : 10 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:21:24 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc Units
Target Compounds				
1) t	Formic acid	3.131	1896636	19.686 ppm
2) T	Pyruvic acid	3.628	1357394	2.997 ppm
3) T	Lactic Acid	4.052	1086883	20.215 ppm
4) T	Acetic Acid	4.405	1218452	20.593 ppm
5) T	Propionic Acid	9.222	1146657	19.242 ppm
6) T	Butyric Acid	25.002	1138865	18.107 ppm

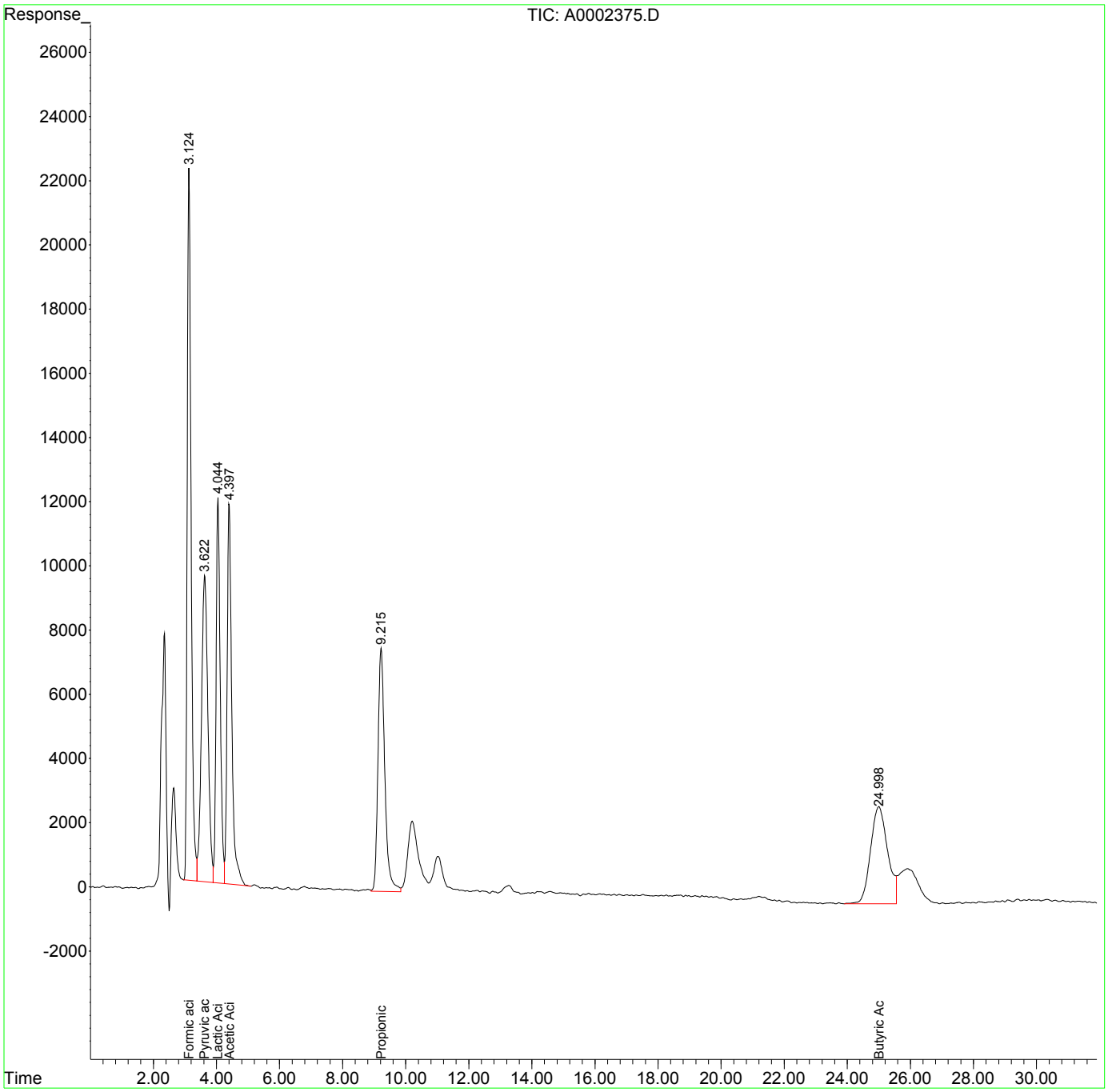
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002375.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : icv
Misc :
ALS Vial : 10 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 05 08:21:24 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



Evaluate Continuing Calibration Report

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002375.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : icv
Misc :
ALS Vial : 10 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:21:24 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1 t	Formic acid	96.343	94.832 E3	1.6	100	0.00
2 T	Pyruvic acid	452.935	678.697 E3	-49.8#	160#	0.00
3 T	Lactic Acid	53.765	54.344 E3	-1.1	108	0.00
4 T	Acetic Acid	59.169	60.923 E3	-3.0	111	0.00
5 T	Propionic Acid	59.592	57.333 E3	3.8	101	0.03
6 T	Butyric Acid	62.897	56.943 E3	9.5	94	0.16

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002374.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : 20.0-200.0ppm
Misc :
ALS Vial : 9 Sample Multiplier: 1

1st BA 10/05/18
2nd MLP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:41:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:11:30 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.129	18870917	195.296	ppm	
2) T	Pyruvic acid	3.625	9170882	20.284	ppm	
3) T	Lactic Acid	4.045	10741636	199.759	ppm	
4) T	Acetic Acid	4.387	11865318	200.607	ppm	m
5) T	Propionic Acid	9.141	11451173	191.091	ppm	
6) T	Butyric Acid	24.580	12106071	191.444	ppm	m

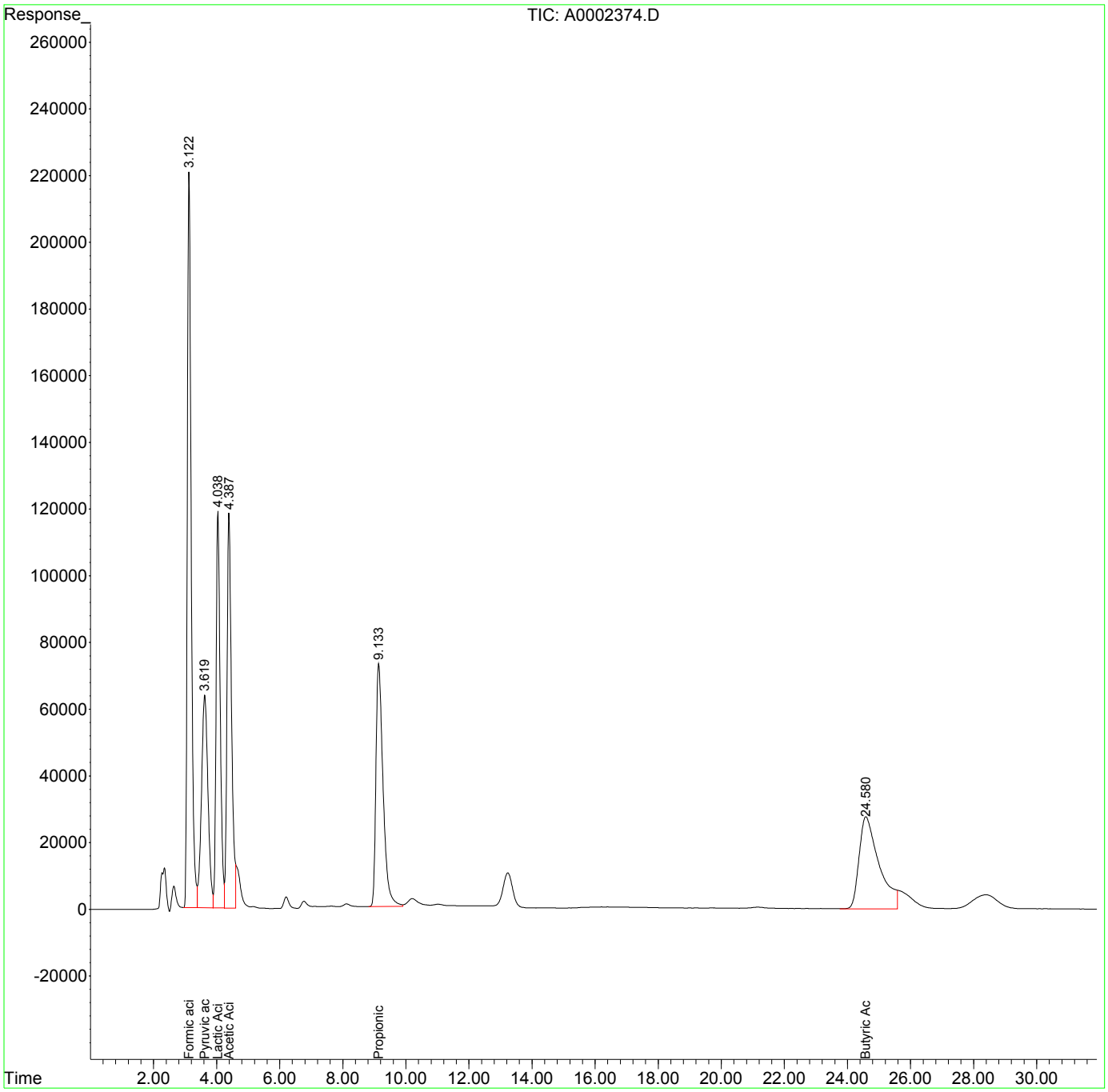
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002374.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : 20.0-200.0ppm
Misc :
ALS Vial : 9 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:41:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:11:30 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



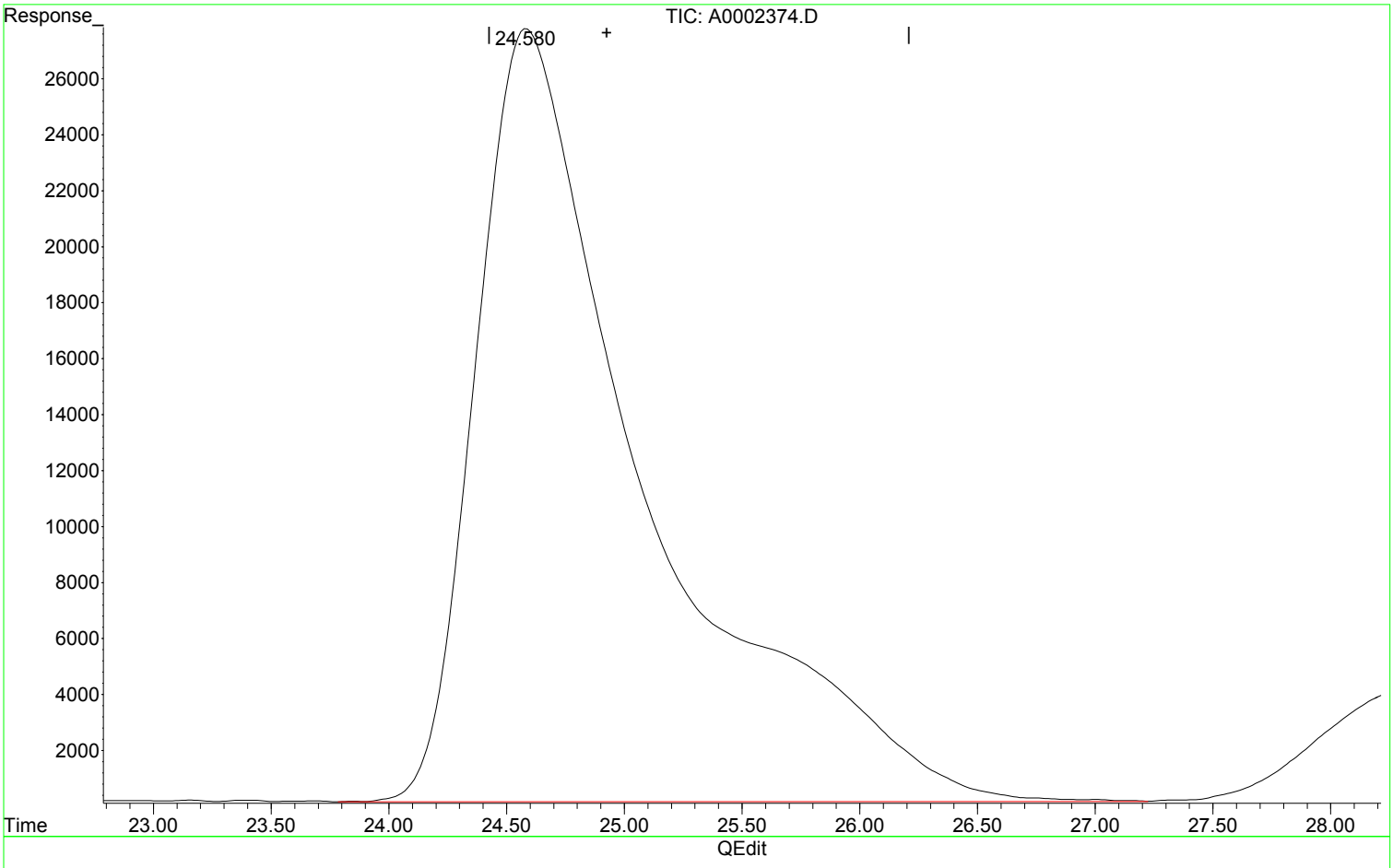
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002374.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : 20.0-200.0ppm
Misc :
ALS Vial : 9 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:41:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:11:30 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.587min 217.586 ppm

response 13759140

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

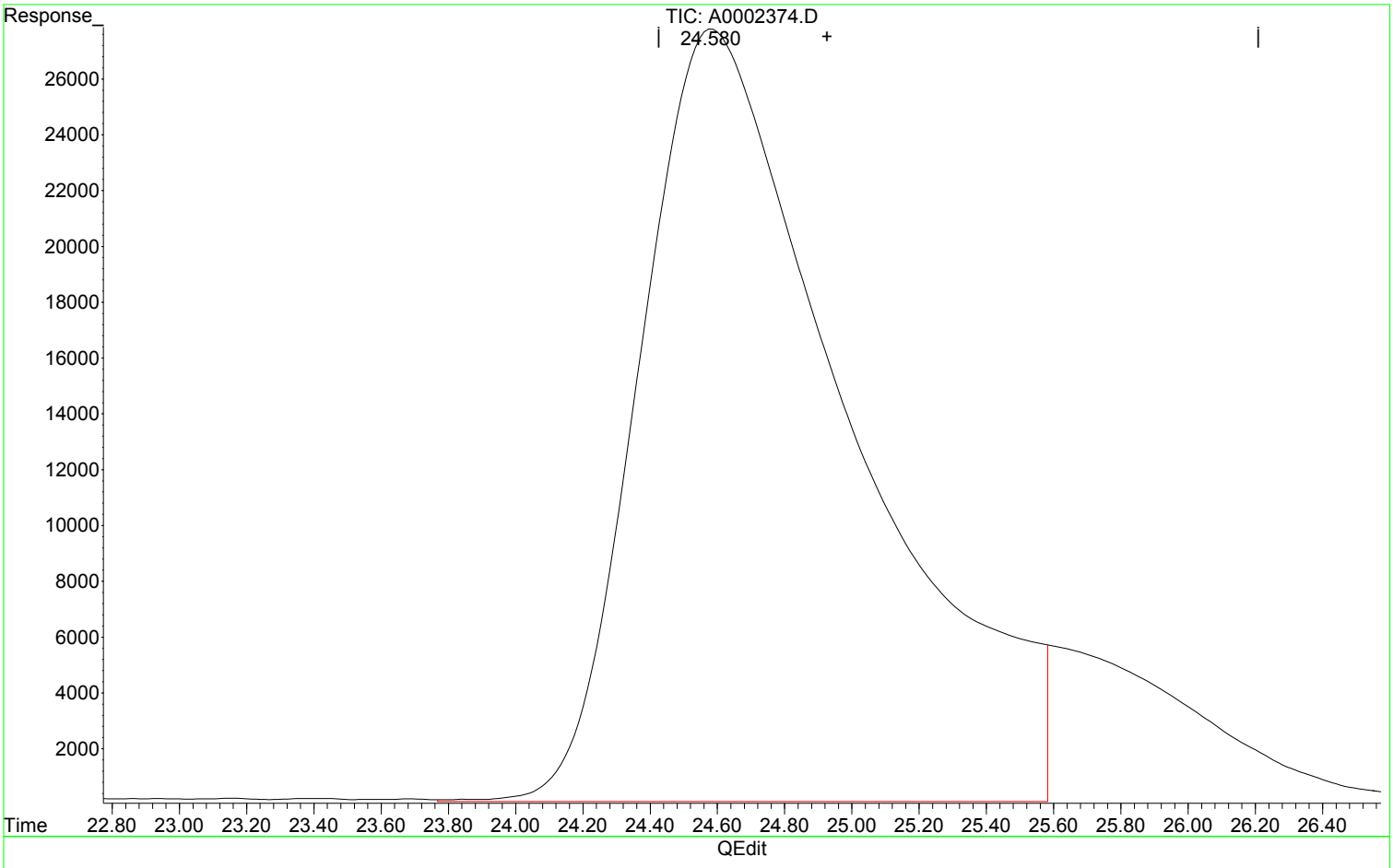
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002374.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : 20.0-200.0ppm
Misc :
ALS Vial : 9 Sample Multiplier: 1

1st BA 10/05/18
2nd [illegible] 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:41:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:11:30 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.580min 191.444 ppm m

response 12106071

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

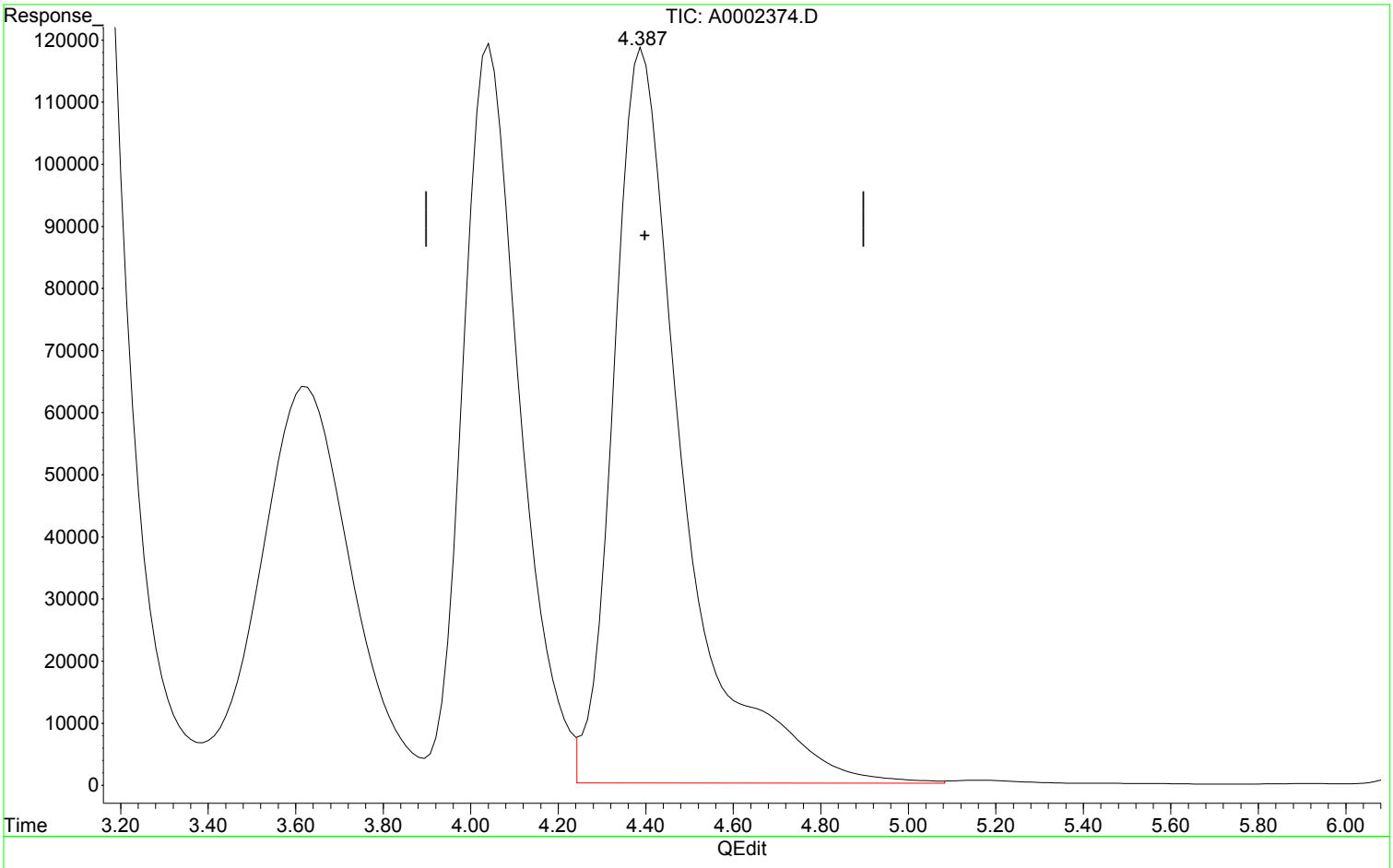
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002374.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : 20.0-200.0ppm
Misc :
ALS Vial : 9 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:41:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:11:30 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.394min 222.004 ppm

response 13130885

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

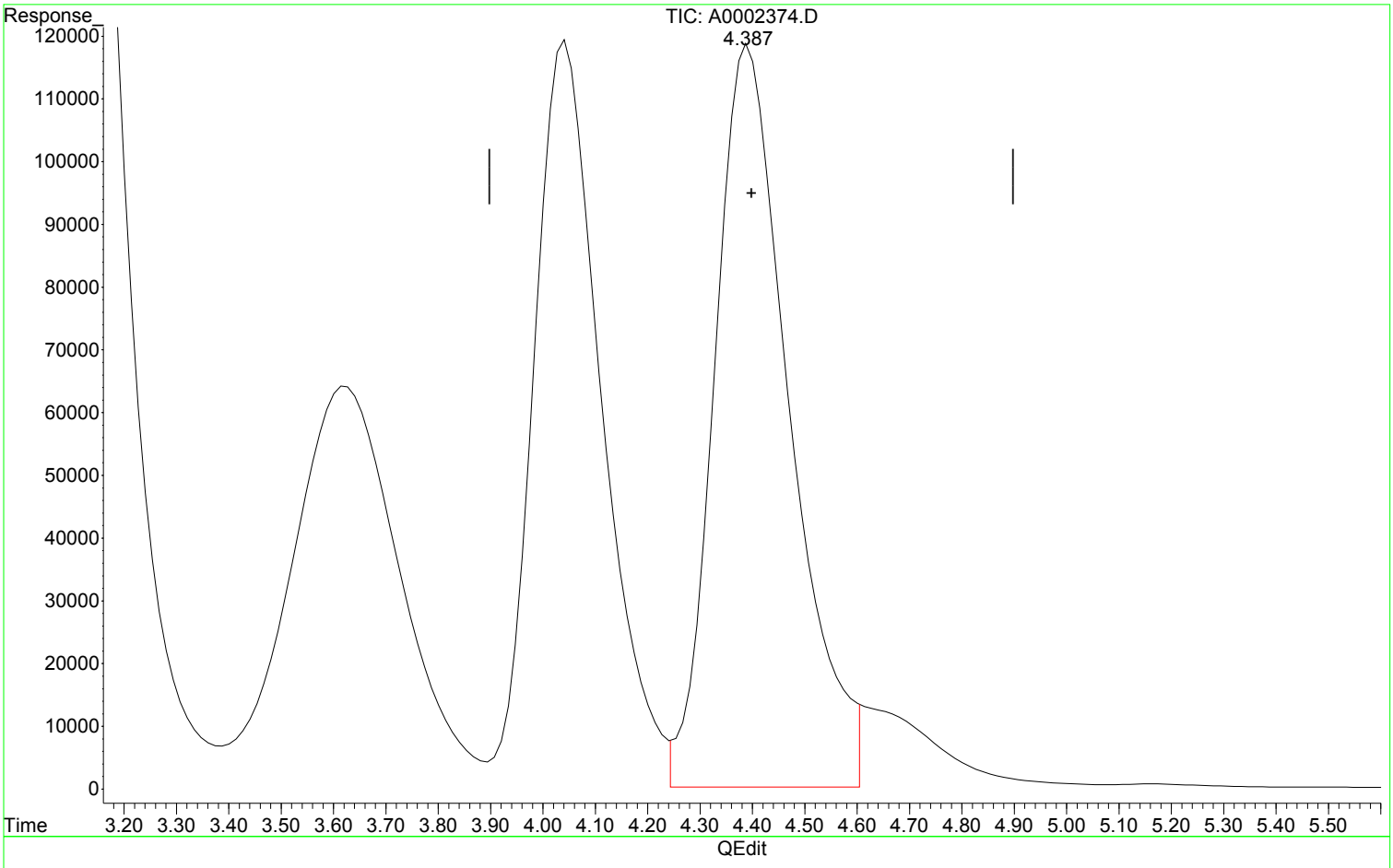
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002374.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : 20.0-200.0ppm
Misc :
ALS Vial : 9 Sample Multiplier: 1

1st BA 10/05/18
2nd MLP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:41:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:11:30 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.387min 200.607 ppm m

response 11865318

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002373.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 15:31:47
Operator : b.allgeier
Sample : 10.0-100.0ppm
Misc :
ALS Vial : 8 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:10:46 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.132	9131569	96.958	ppm	
2) T	Pyruvic acid	3.629	4430352	9.849	ppm	
3) T	Lactic Acid	4.052	5216101	98.587	ppm	
4) T	Acetic Acid	4.397	5725459	96.715	ppm	m
5) T	Propionic Acid	9.203	5508012	93.403	ppm	
6) T	Butyric Acid	24.847	5510917	91.221	ppm	m

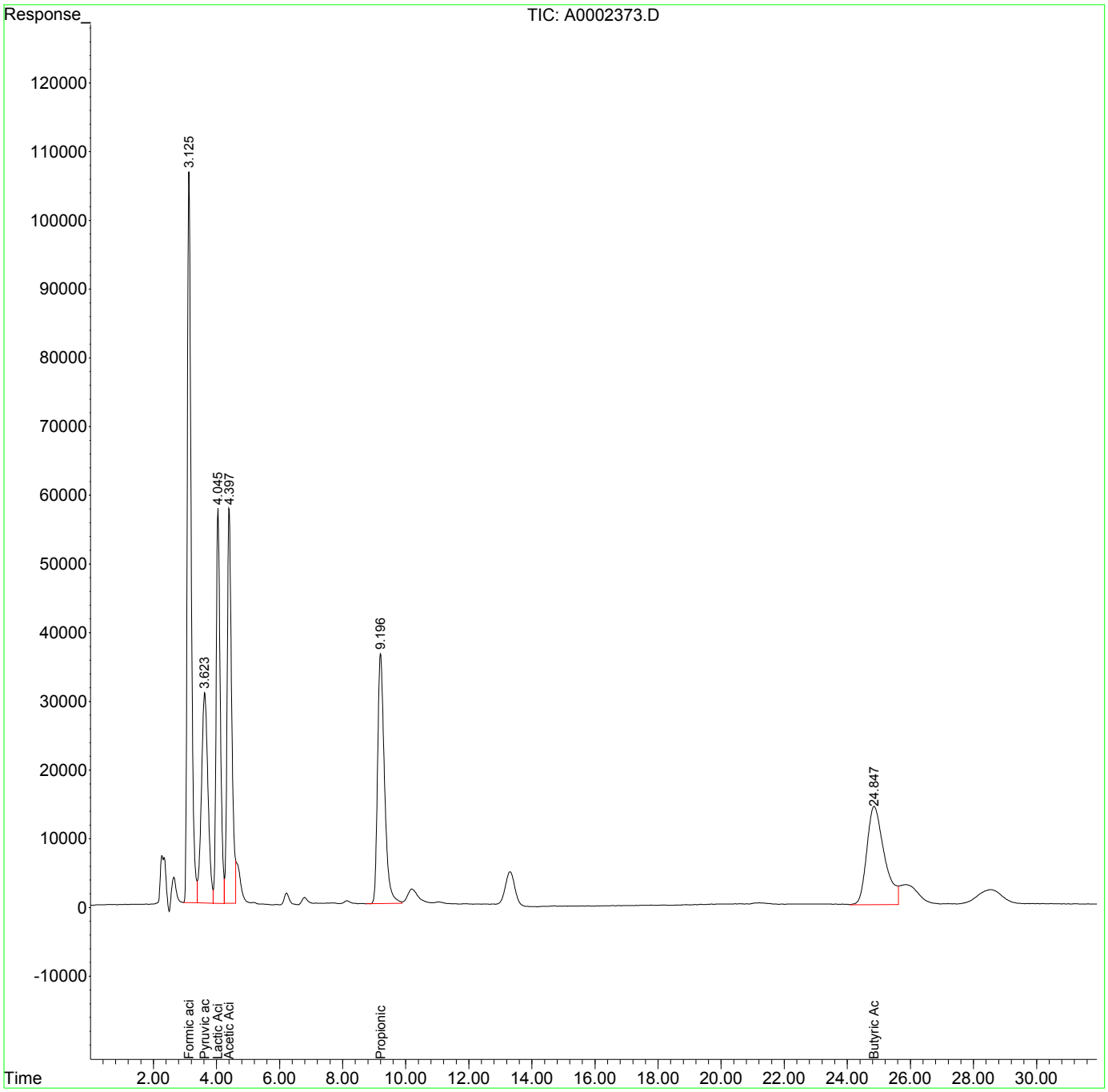
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002373.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 15:31:47
Operator : b.allgeier
Sample : 10.0-100.0ppm
Misc :
ALS Vial : 8 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:10:46 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



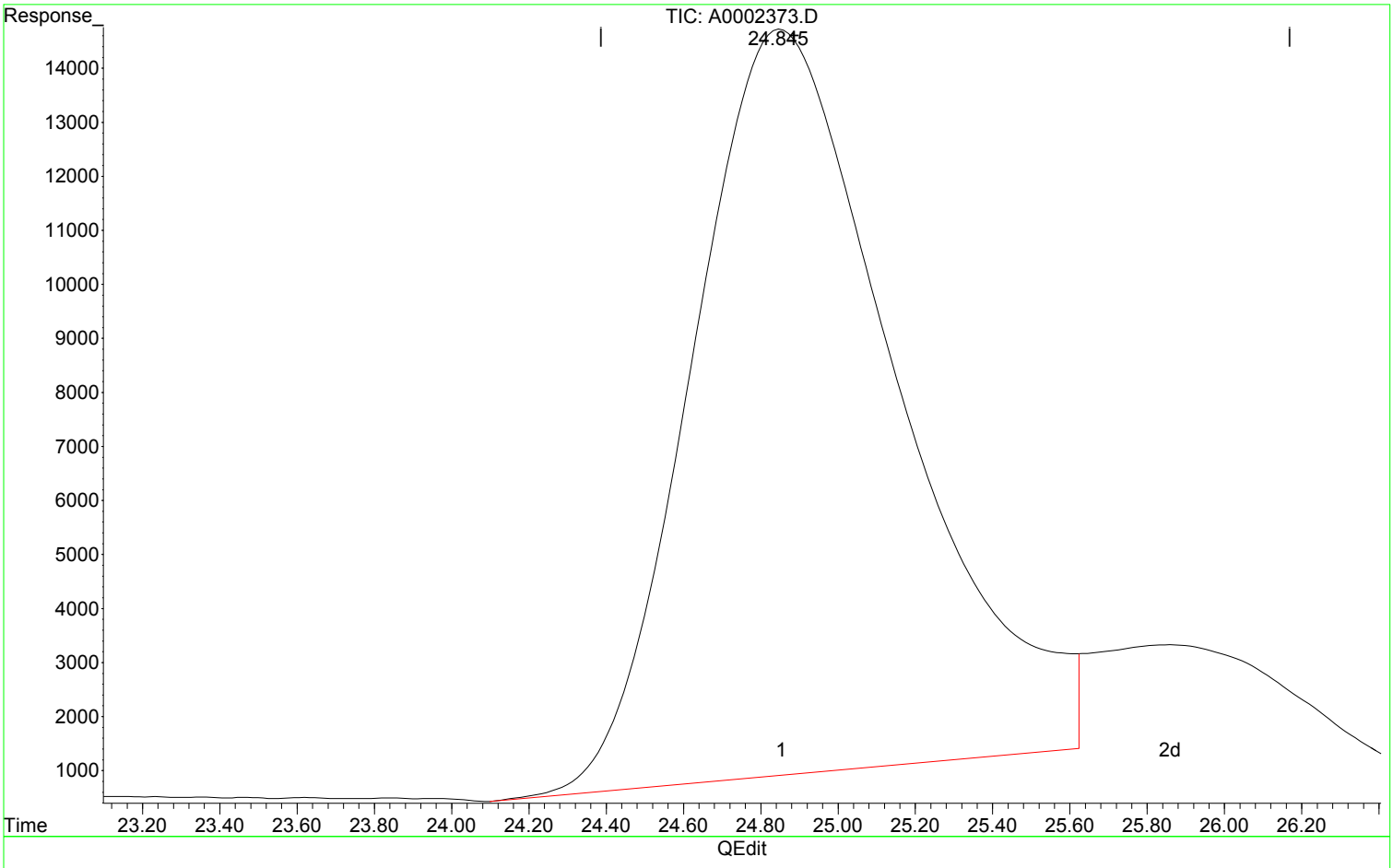
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002373.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 15:31:47
Operator : b.allgeier
Sample : 10.0-100.0ppm
Misc :
ALS Vial : 8 Sample Multiplier: 1

1st BA 10/05/18
2nd [illegible] 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:10:46 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.853min 84.188 ppm

response 5086048

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

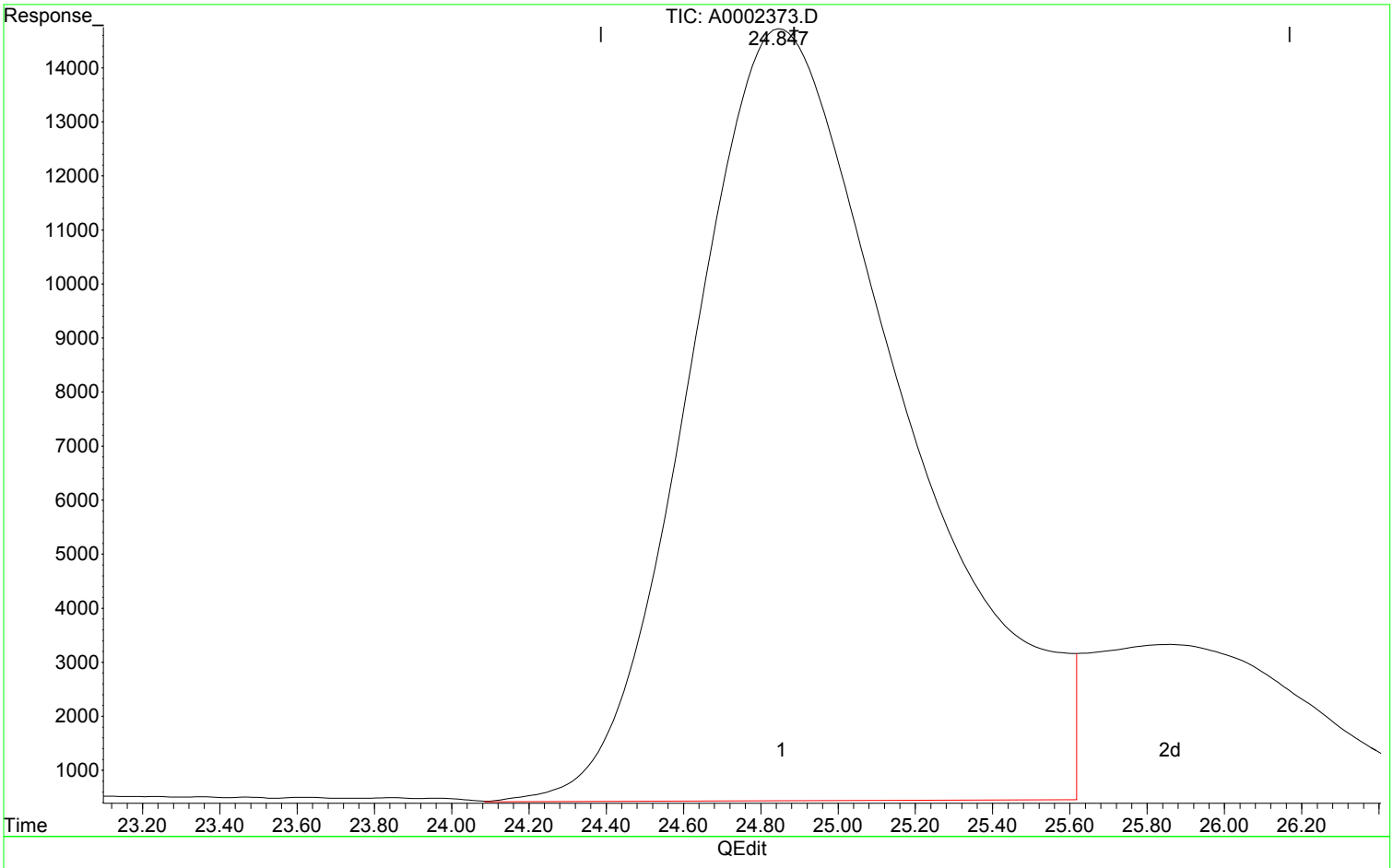
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002373.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 15:31:47
Operator : b.allgeier
Sample : 10.0-100.0ppm
Misc :
ALS Vial : 8 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:10:46 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.847min 91.221 ppm m

response 5510917

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

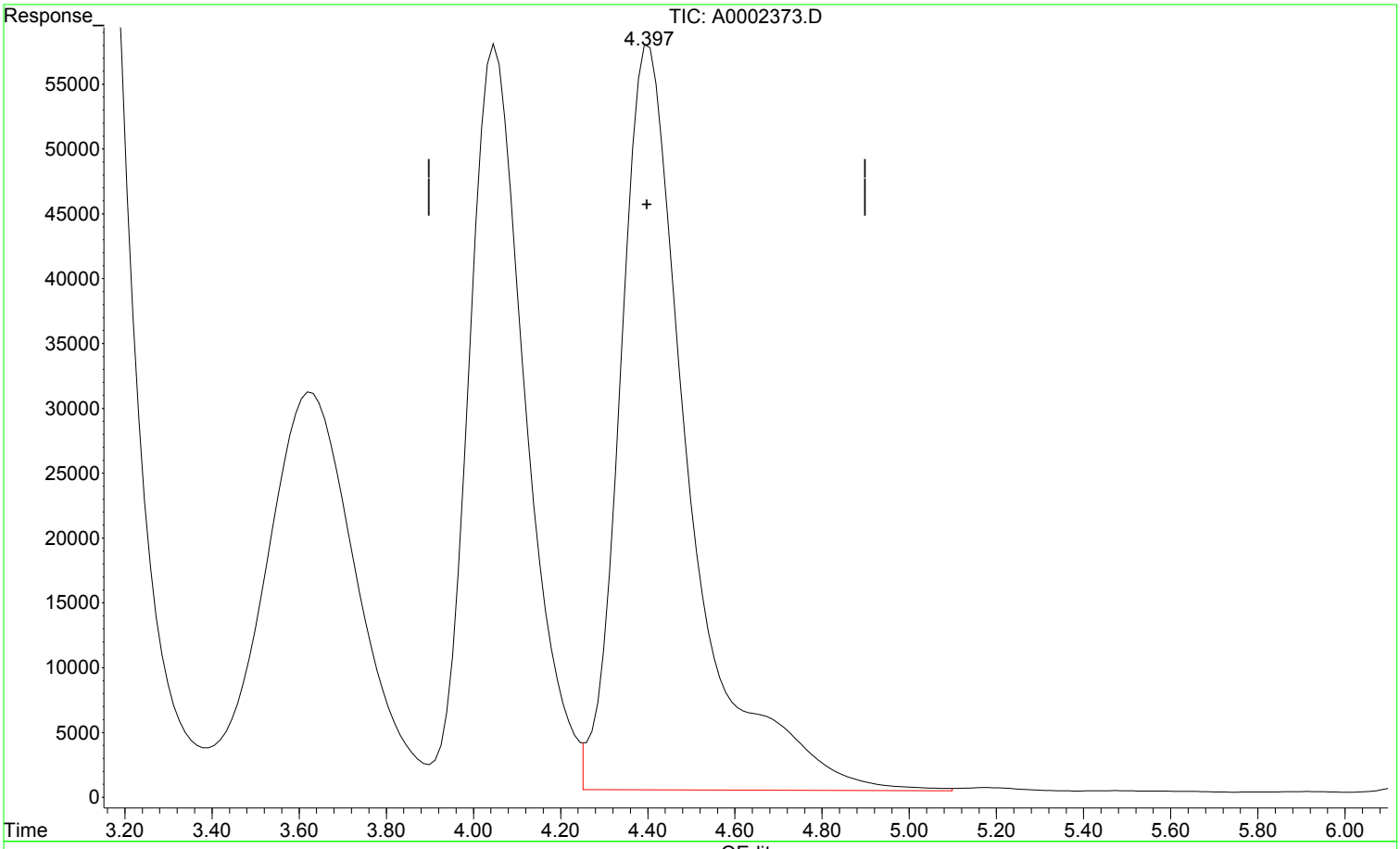
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002373.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 15:31:47
Operator : b.allgeier
Sample : 10.0-100.0ppm
Misc :
ALS Vial : 8 Sample Multiplier: 1

1st BA 10/05/18
2nd [illegible] 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:10:46 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.405min 107.446 ppm

response 6360712

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

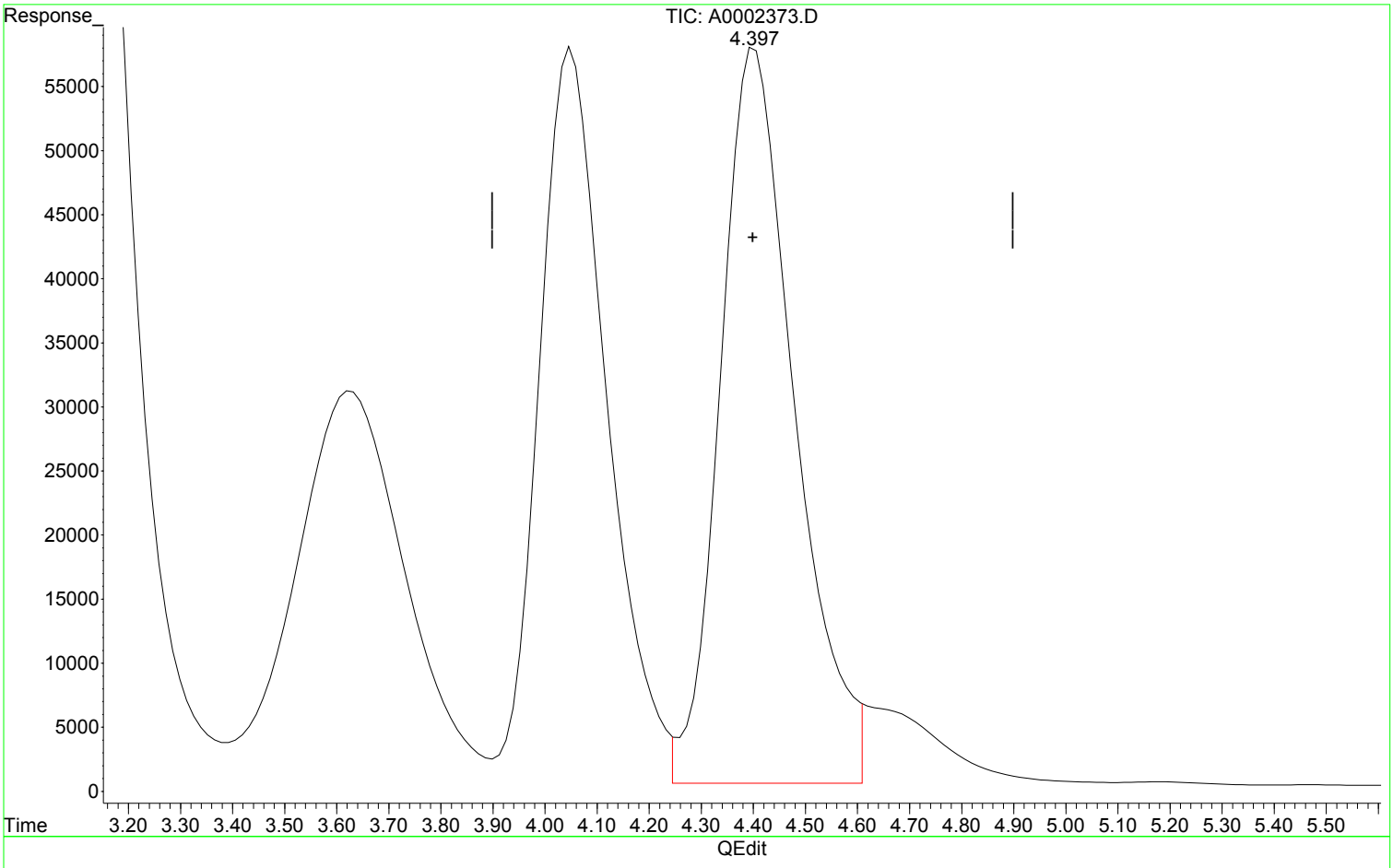
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002373.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 15:31:47
Operator : b.allgeier
Sample : 10.0-100.0ppm
Misc :
ALS Vial : 8 Sample Multiplier: 1

1st BA 10/05/18
2nd [illegible] 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:10:46 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.397min 96.715 ppm m

response 5725459

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002372.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:56:43
Operator : b.allgeier
Sample : 5.0-50.0ppm
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:10:03 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc Units	
Target Compounds					
1) t	Formic acid	3.133	4817586	51.153 ppm	
2) T	Pyruvic acid	3.630	2294161	5.100 ppm	
3) T	Lactic Acid	4.053	2711599	51.251 ppm	
4) T	Acetic Acid	4.398	3026497	51.124 ppm	m
5) T	Propionic Acid	9.212	2949938	50.024 ppm	
6) T	Butyric Acid	24.928	2932273	48.537 ppm	

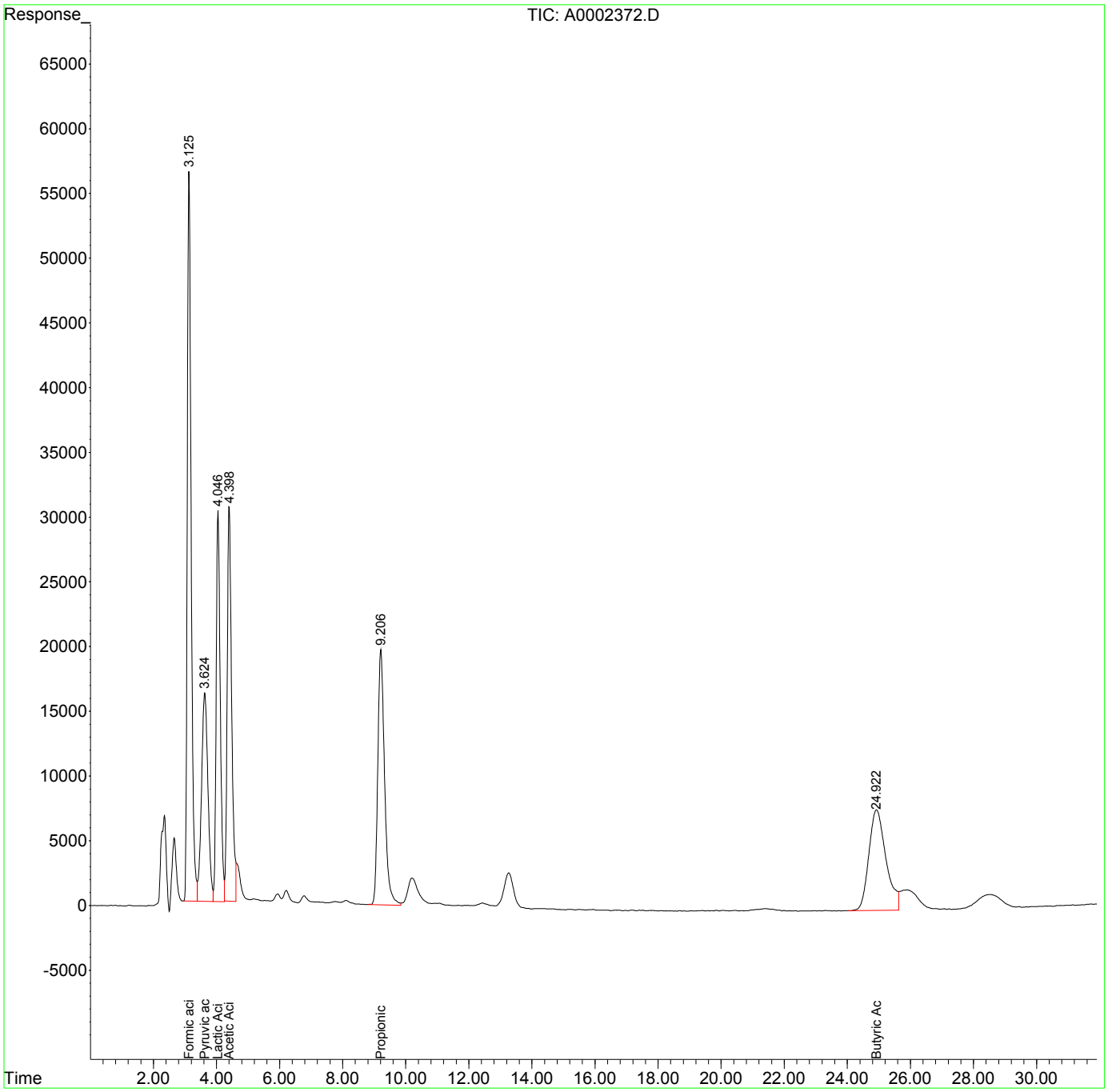
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002372.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:56:43
Operator : b.allgeier
Sample : 5.0-50.0ppm
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd [illegible] 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:10:03 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



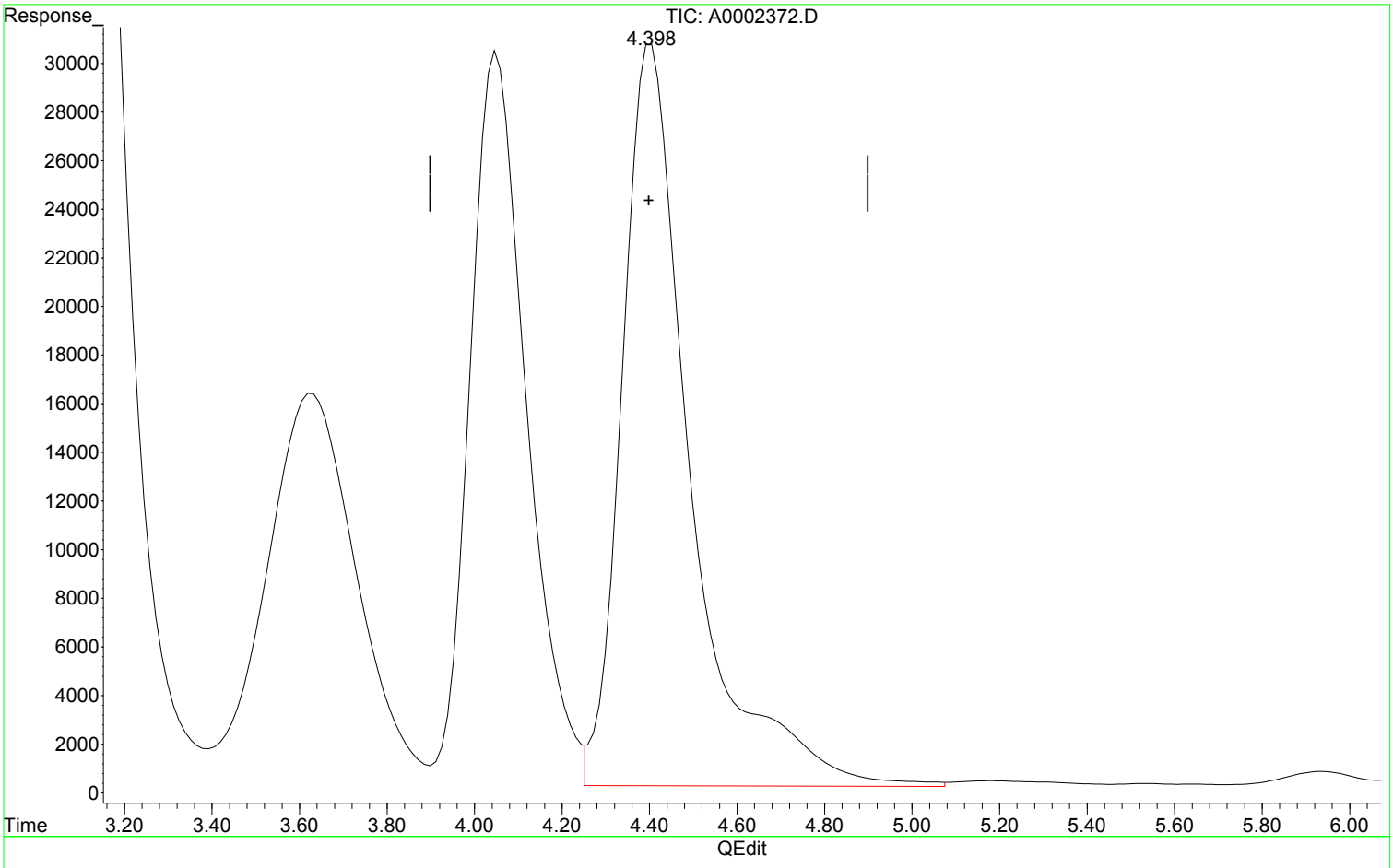
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002372.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:56:43
Operator : b.allgeier
Sample : 5.0-50.0ppm
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MLP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:10:03 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.406min 56.131 ppm

response 3322912

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

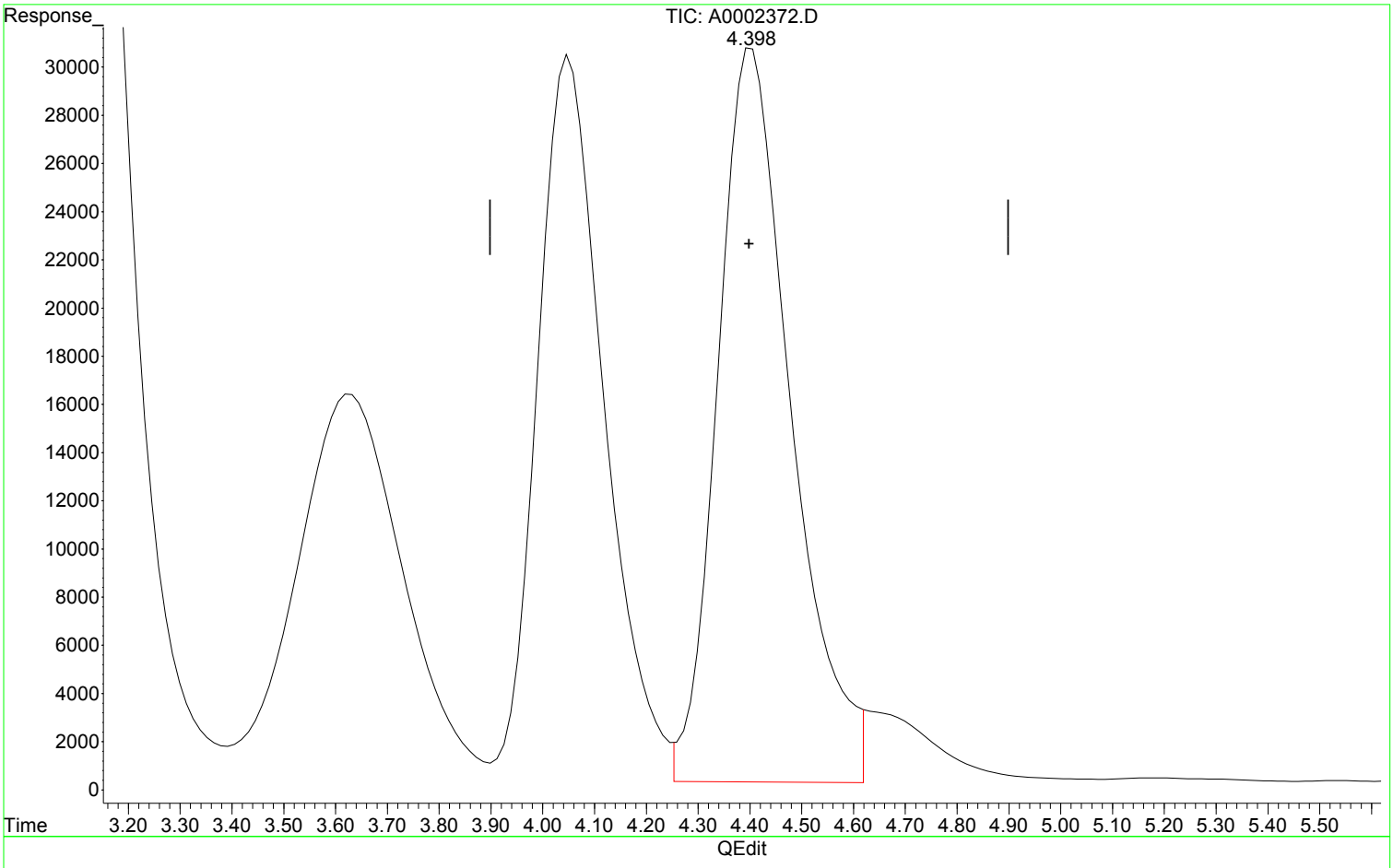
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002372.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:56:43
Operator : b.allgeier
Sample : 5.0-50.0ppm
Misc :
ALS Vial : 7 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:10:03 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.398min 51.124 ppm m

response 3026497

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002371.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:21:46
Operator : b.allgeier
Sample : 2.0-20.0ppm
Misc :
ALS Vial : 6 Sample Multiplier: 1

1st BA 10/05/18
2nd MLP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:09:14 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.131	1890077	20.069	ppm	
2) T	Pyruvic acid	3.629	850051	1.890	ppm	
3) T	Lactic Acid	4.051	1003444	18.966	ppm	
4) T	Acetic Acid	4.397	1096677	18.525	ppm	m
5) T	Propionic Acid	9.206	1140510	19.340	ppm	m
6) T	Butyric Acid	24.960	1207082	19.981	ppm	

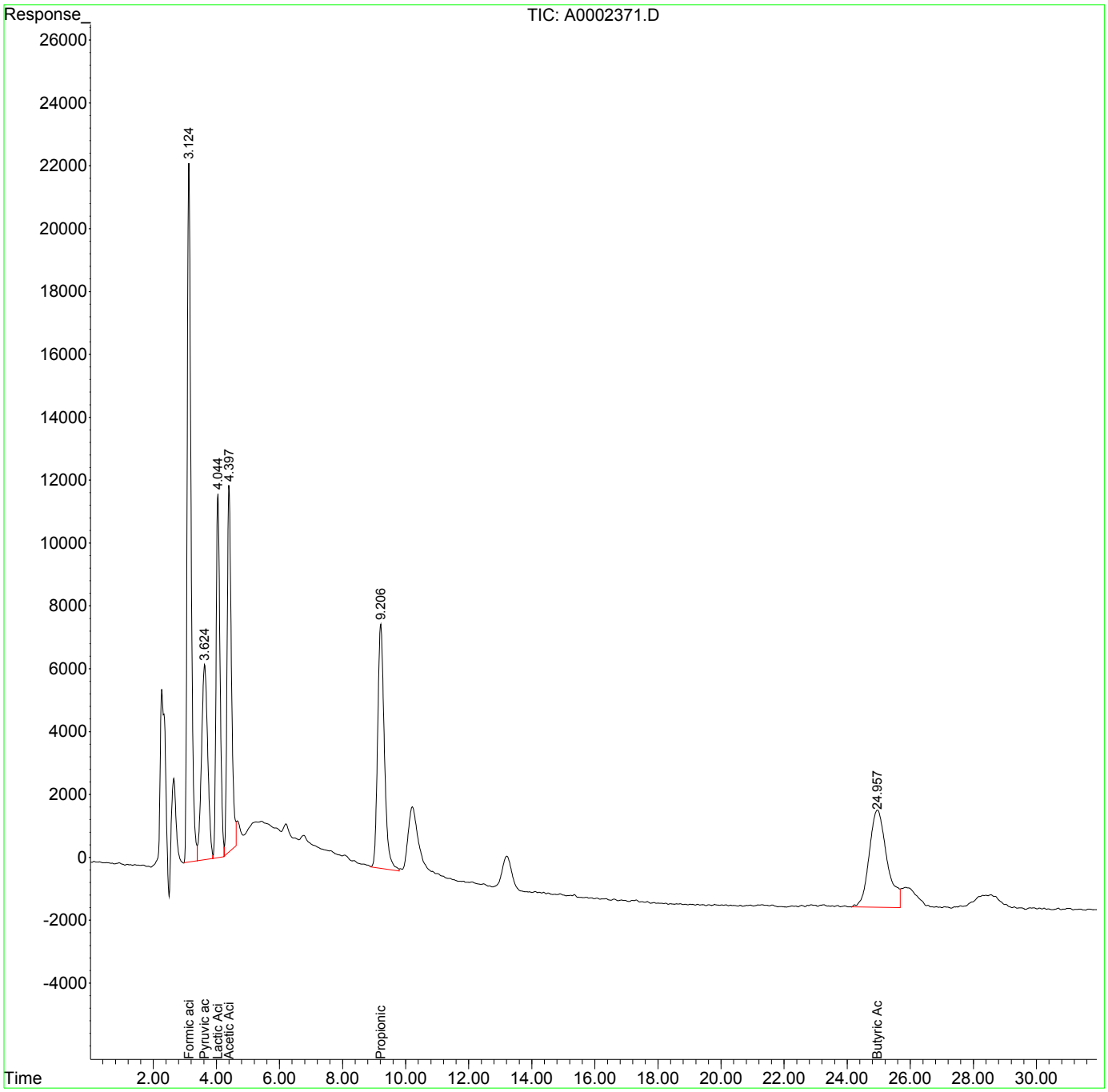
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002371.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:21:46
Operator : b.allgeier
Sample : 2.0-20.0ppm
Misc :
ALS Vial : 6 Sample Multiplier: 1

1st BA 10/05/18
2nd MLP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:09:14 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



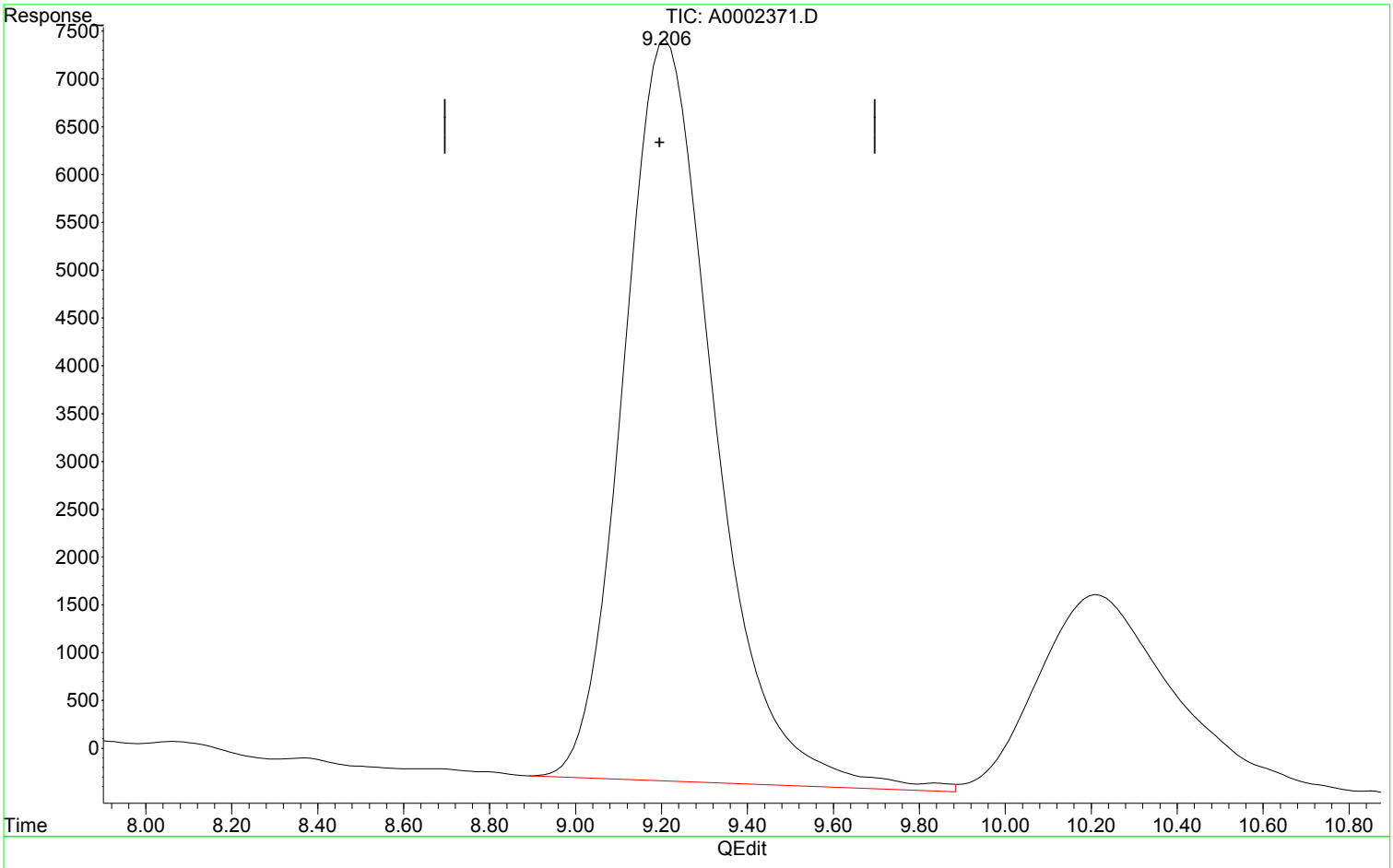
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002371.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:21:46
Operator : b.allgeier
Sample : 2.0-20.0ppm
Misc :
ALS Vial : 6 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:09:14 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.212min 19.380 ppm

response 1142822

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

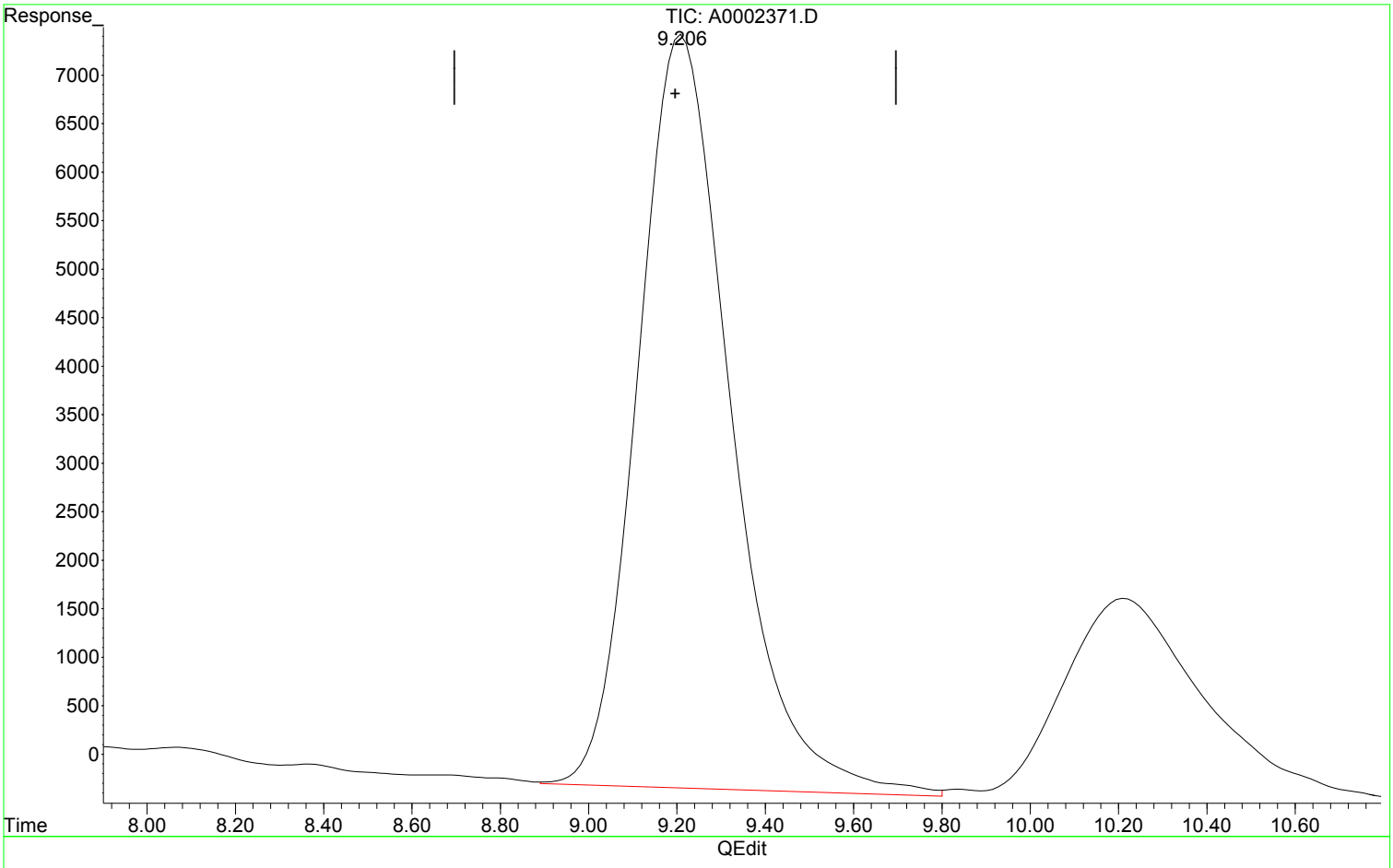
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002371.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:21:46
Operator : b.allgeier
Sample : 2.0-20.0ppm
Misc :
ALS Vial : 6 Sample Multiplier: 1

1st BA 10/05/18
2nd [illegible] 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:09:14 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.206min 19.340 ppm m

response 1140510

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

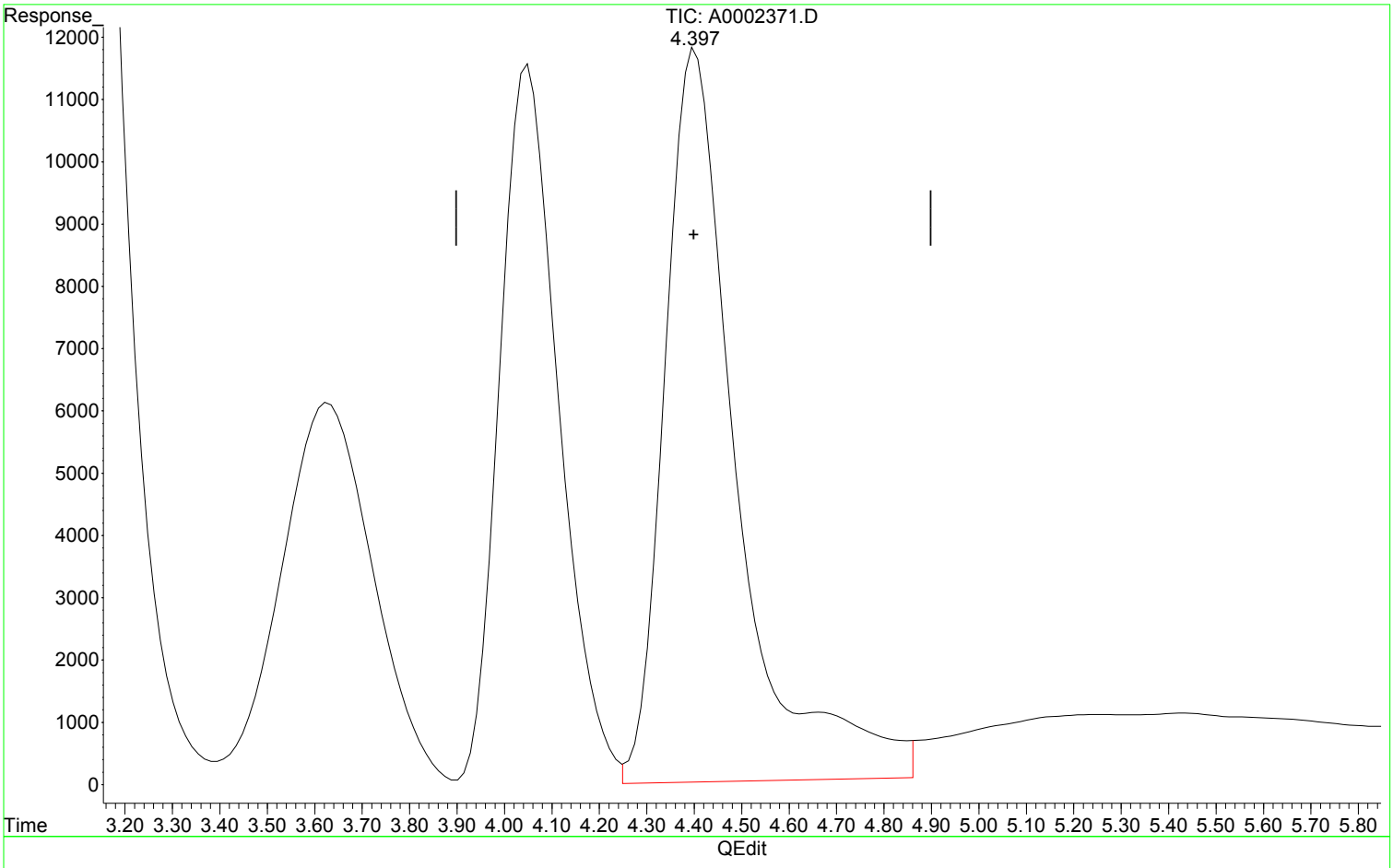
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002371.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:21:46
Operator : b.allgeier
Sample : 2.0-20.0ppm
Misc :
ALS Vial : 6 Sample Multiplier: 1

1st BA 10/05/18
2nd MLP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:09:14 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.404min 21.093 ppm

response 1248683

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

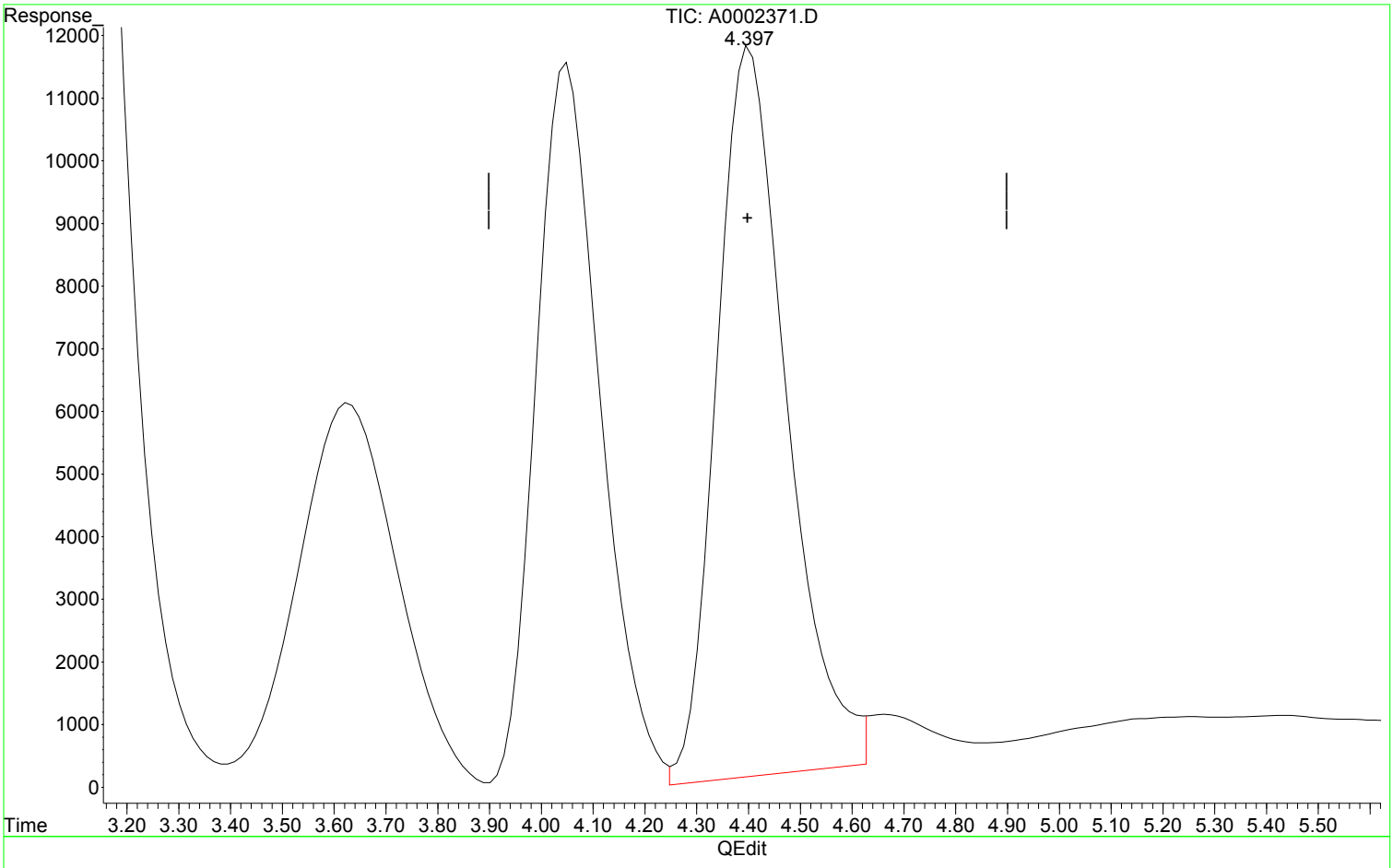
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002371.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:21:46
Operator : b.allgeier
Sample : 2.0-20.0ppm
Misc :
ALS Vial : 6 Sample Multiplier: 1

1st BA 10/05/18
2nd [illegible] 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:09:14 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.397min 18.525 ppm m

response 1096677

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002370.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:19
Operator : b.allgeier
Sample : 1.0-10.0ppm
Misc :
ALS Vial : 5 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:08:41 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.133	942238	10.005	ppm	
2) T	Pyruvic acid	3.631	448113	0.996	ppm	
3) T	Lactic Acid	4.053	528635	9.991	ppm	
4) T	Acetic Acid	4.399	585881	9.897	ppm	m
5) T	Propionic Acid	9.226	585985	9.937	ppm	
6) T	Butyric Acid	25.010	602088	9.966	ppm	

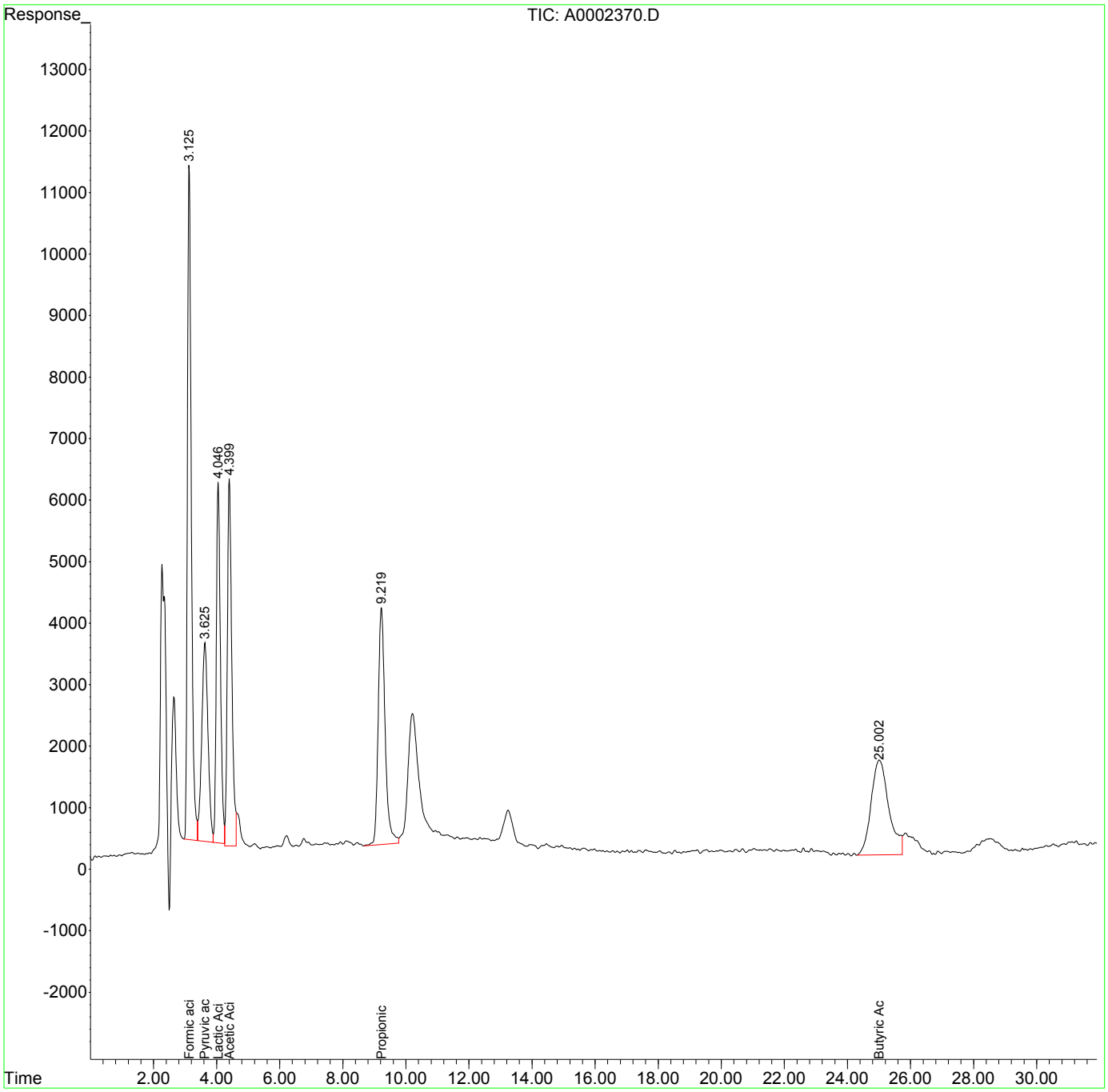
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002370.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:19
Operator : b.allgeier
Sample : 1.0-10.0ppm
Misc :
ALS Vial : 5 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:08:41 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



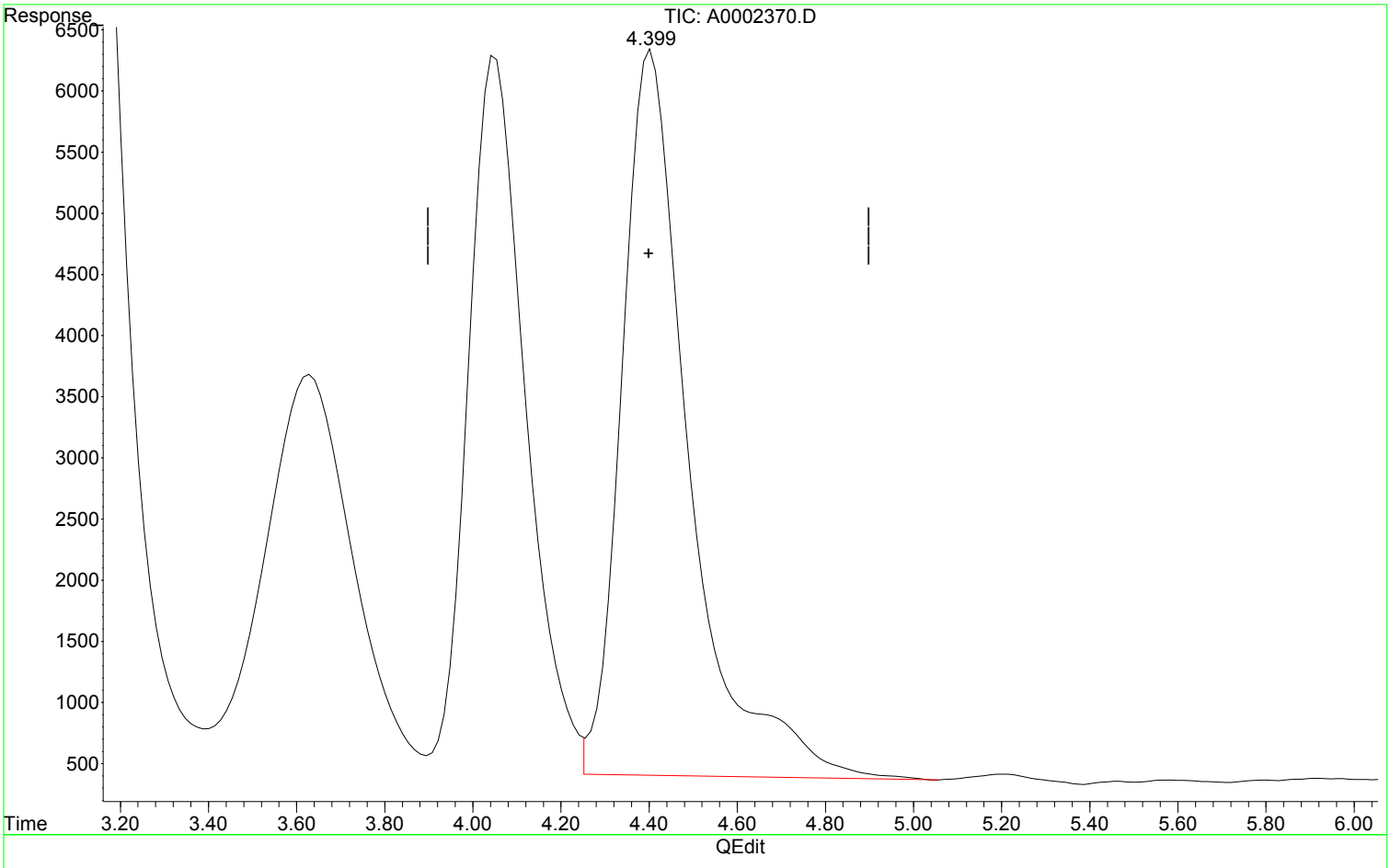
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002370.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:19
Operator : b.allgeier
Sample : 1.0-10.0ppm
Misc :
ALS Vial : 5 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:08:41 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.406min 10.646 ppm

response 630261

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

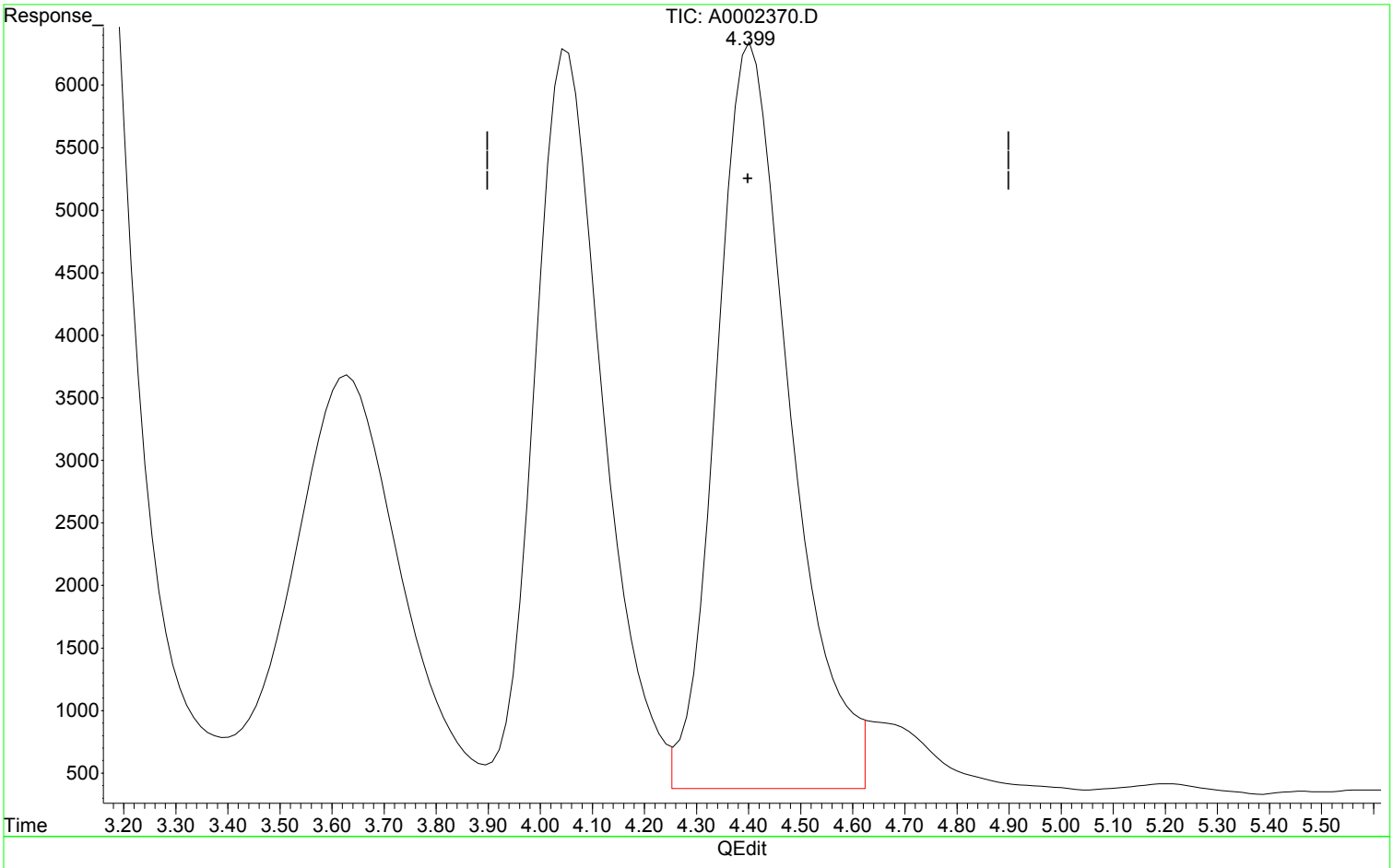
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002370.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:19
Operator : b.allgeier
Sample : 1.0-10.0ppm
Misc :
ALS Vial : 5 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:08:41 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.399min 9.897 ppm m

response 585881

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.133	497049	5.278	ppm	
2) T	Pyruvic acid	3.631	227620	0.506	ppm	
3) T	Lactic Acid	4.053	269401	5.092	ppm	
4) T	Acetic Acid	4.399	309471	5.228	ppm	m
5) T	Propionic Acid	9.220	306395	5.196	ppm	m
6) T	Butyric Acid	25.001	310758	5.144	ppm	m

(f)=RT Delta > 1/2 Window (m)=manual int.

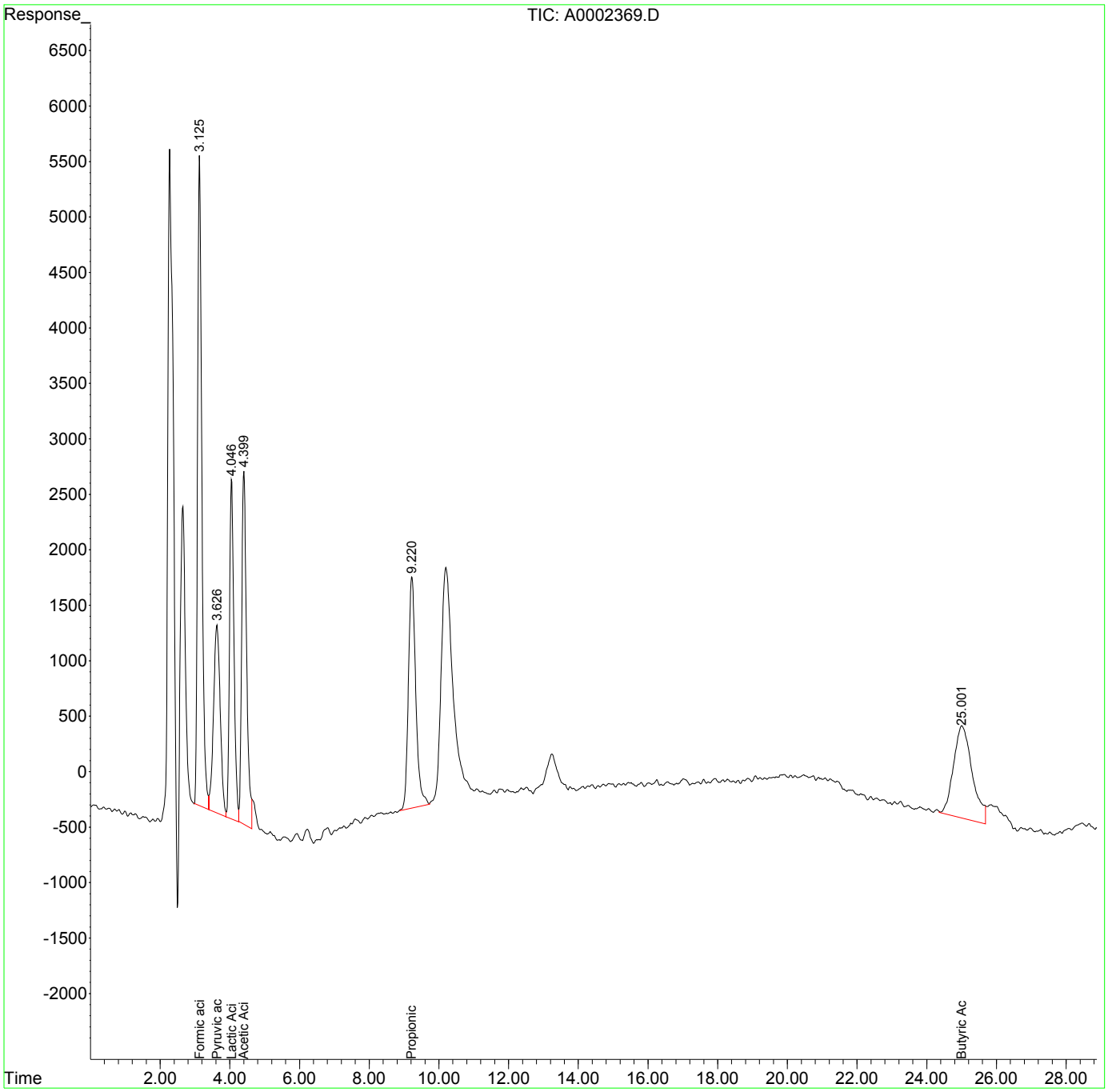
Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



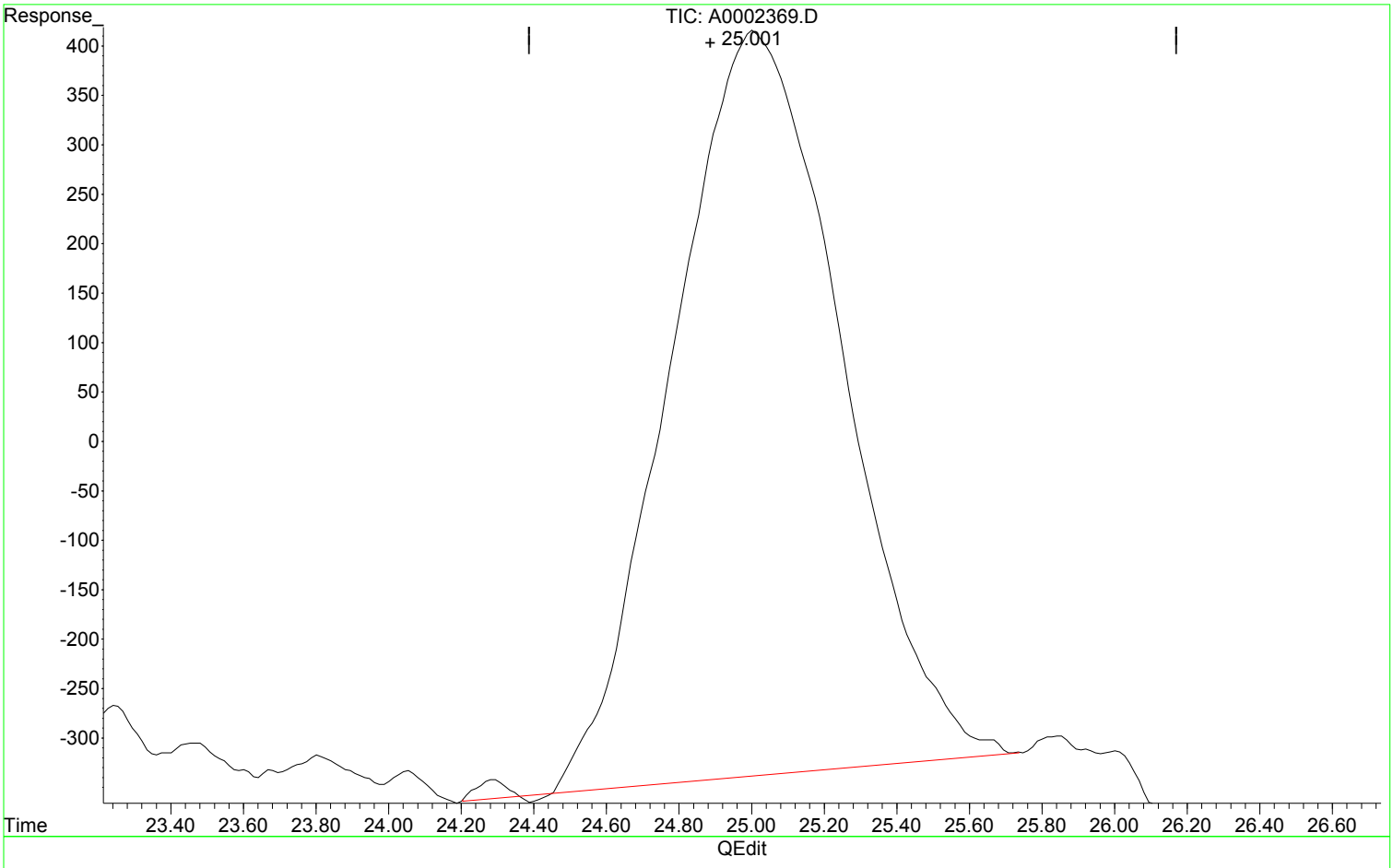
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

1st BA 10/05/18
2nd [illegible] 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

25.009min 4.071 ppm

response 245954

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

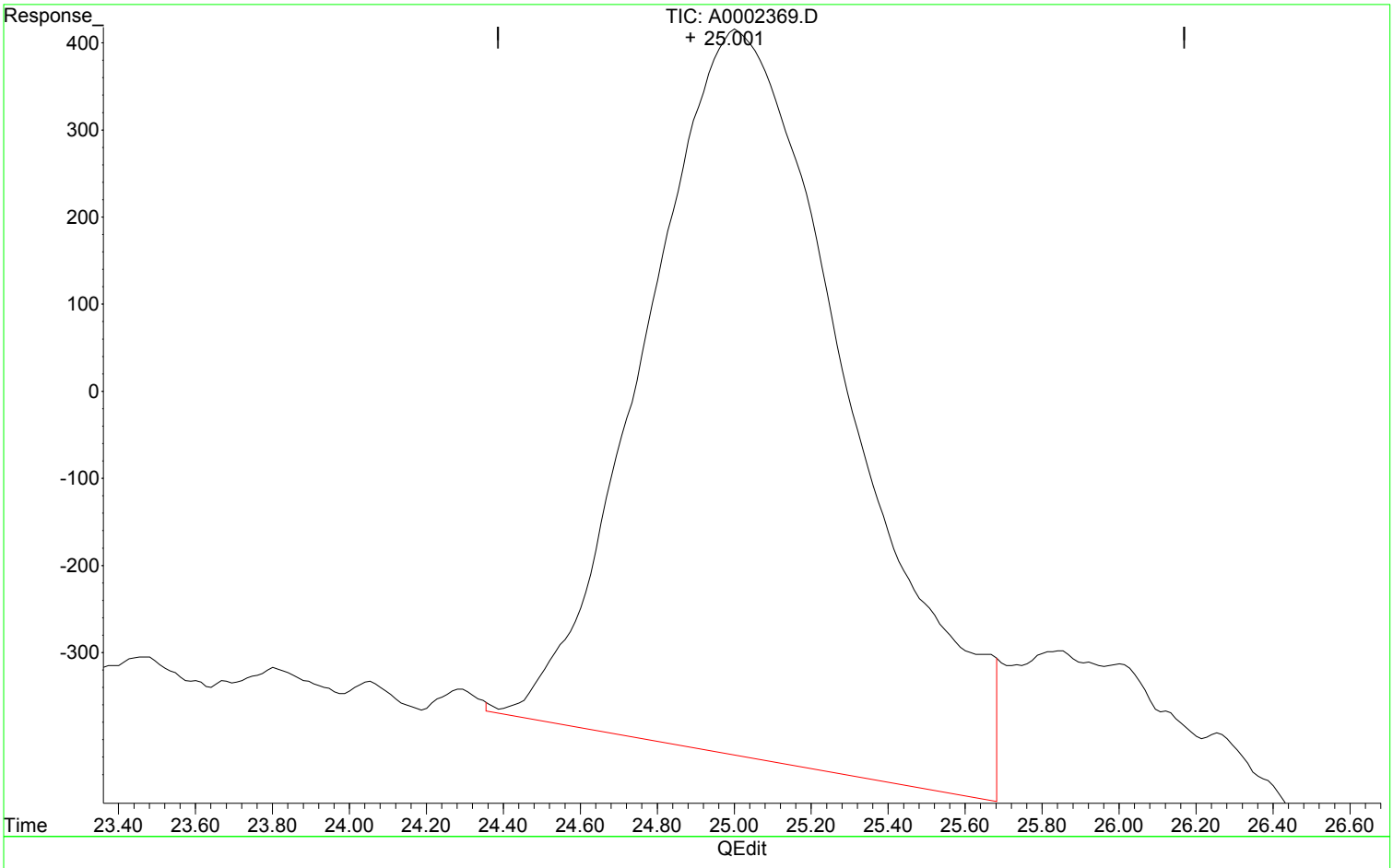
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

1st BA 10/05/18
2nd [illegible] 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

25.001min 5.144 ppm m

response 310758

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

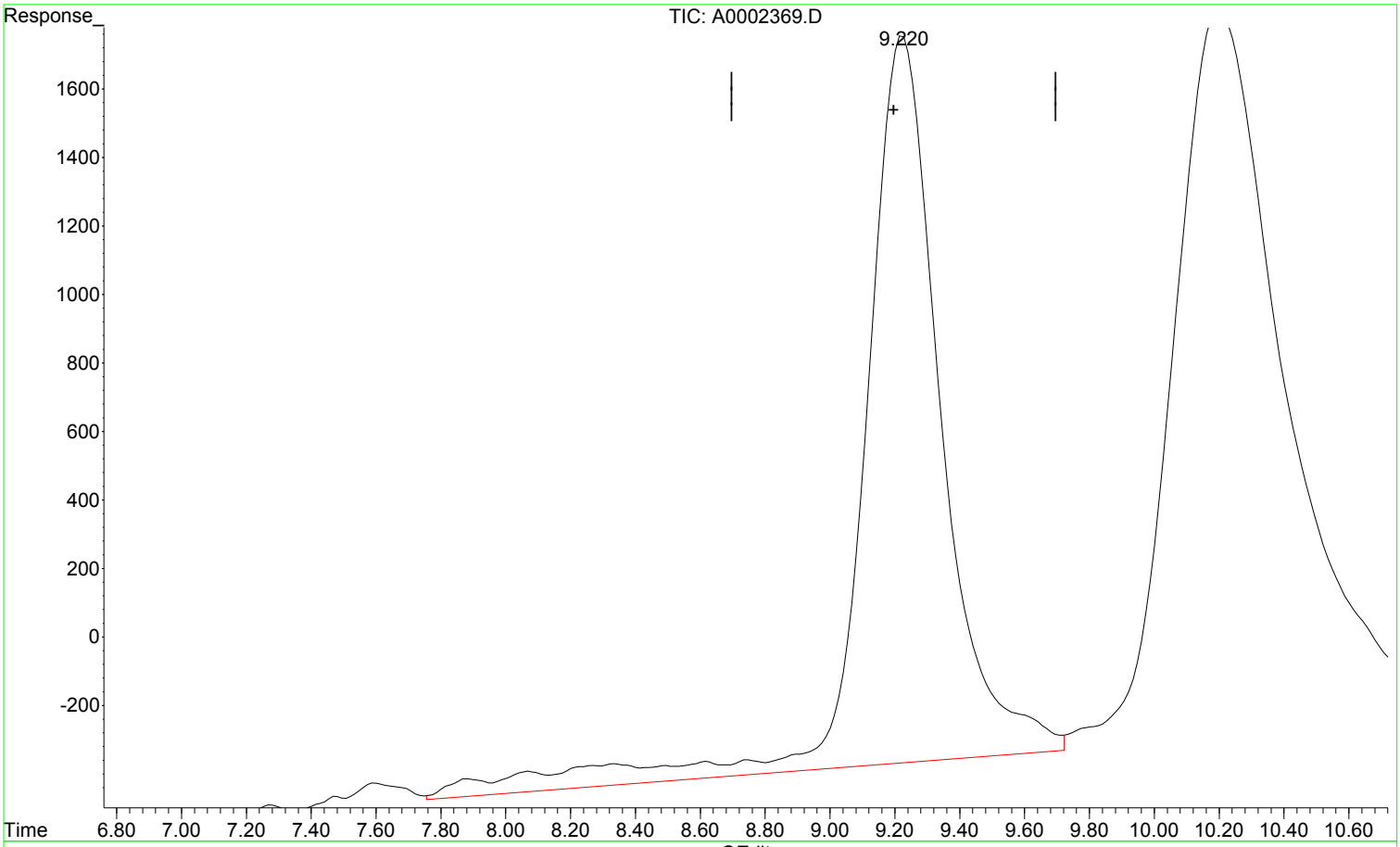
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

1st BA 10/05/18
2nd MLP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.226min 6.027 ppm

response 355419

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

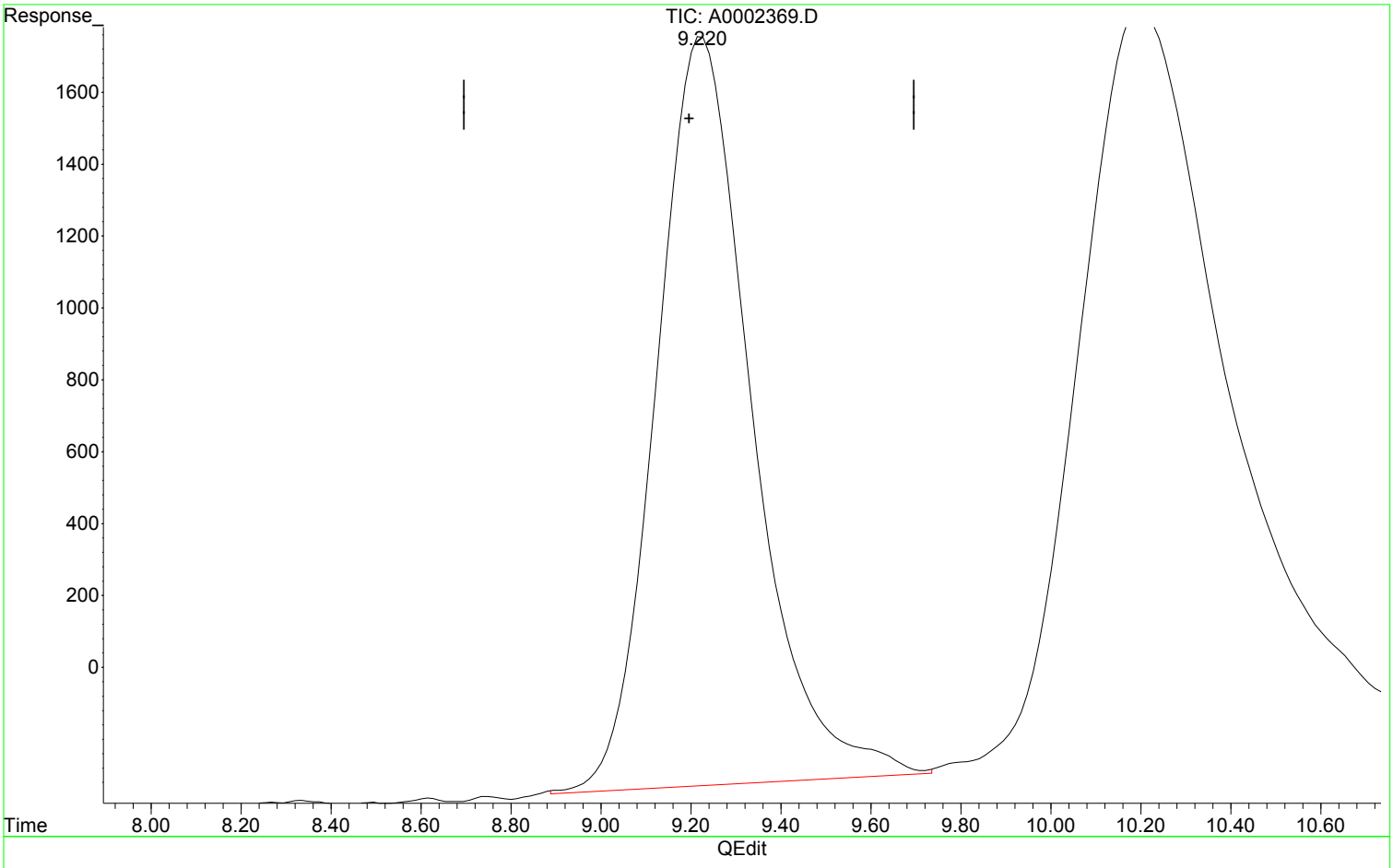
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

1st BA 10/05/18
2nd MLP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.220min 5.196 ppm m

response 306395

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

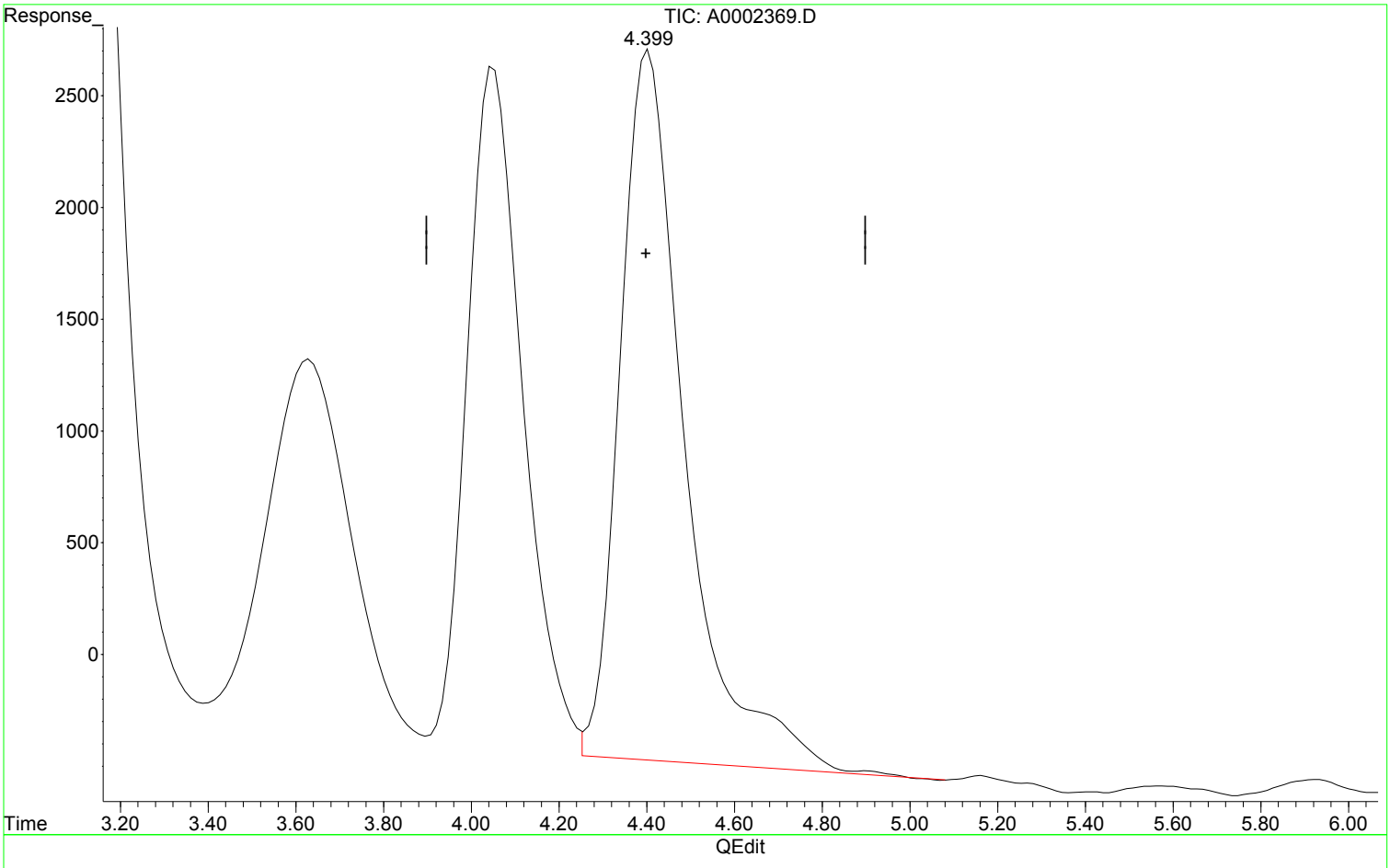
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

1st BA 10/05/18
2nd [illegible] 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.406min 5.542 ppm

response 328094

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

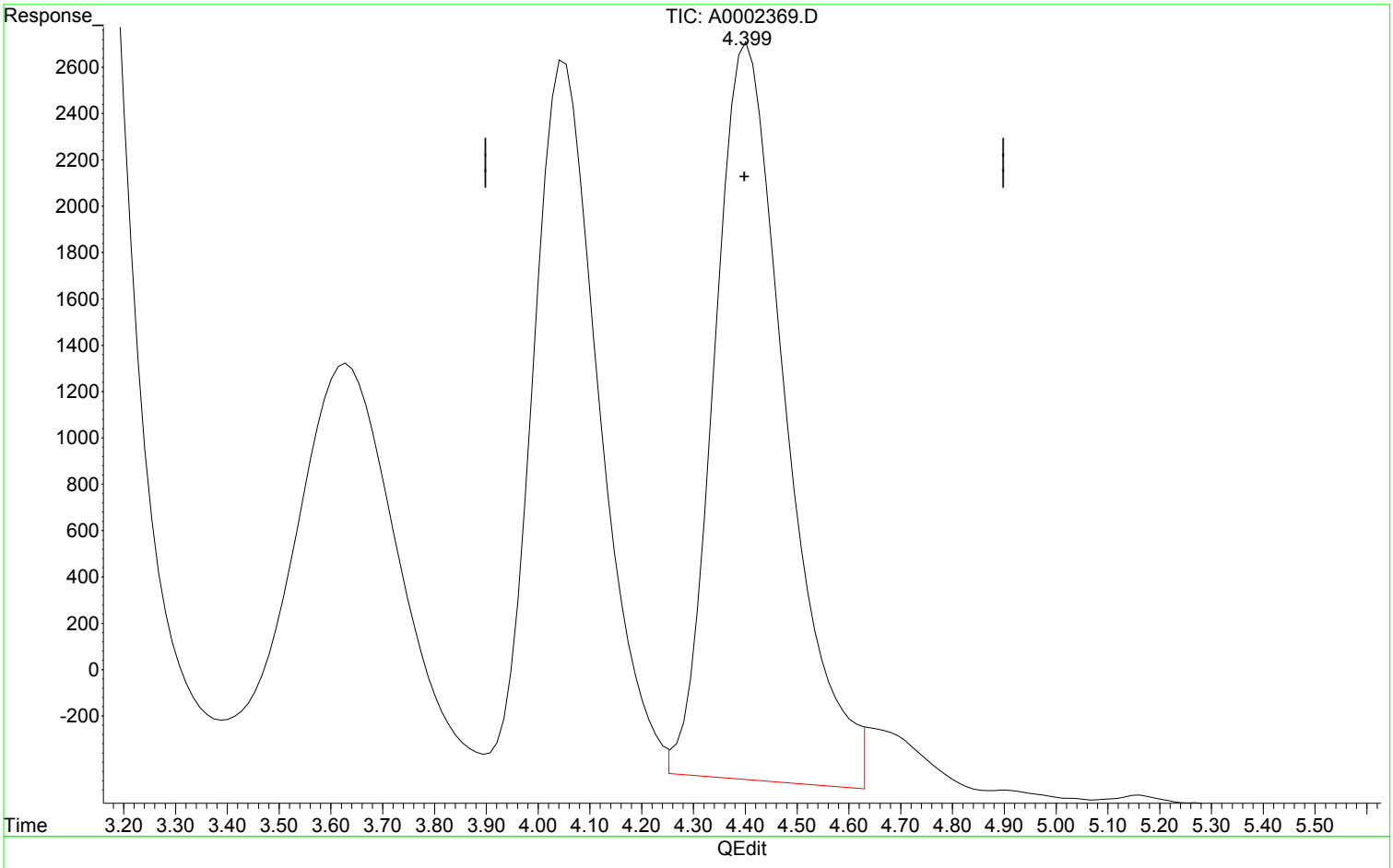
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.399min 5.228 ppm m

response 309471

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

Quantitation Report (QT Reviewed)

1st BA 10/05/18
2nd MLP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.133	197324	2.095	ppm	
2) T	Pyruvic acid	3.628	94203	0.209	ppm	
3) T	Lactic Acid	4.053	108314	2.047	ppm	
4) T	Acetic Acid	4.399	121343	2.050	ppm	m
5) T	Propionic Acid	9.219	118189	2.004	ppm	m
6) T	Butyric Acid	24.985	143852	2.381	ppm	m

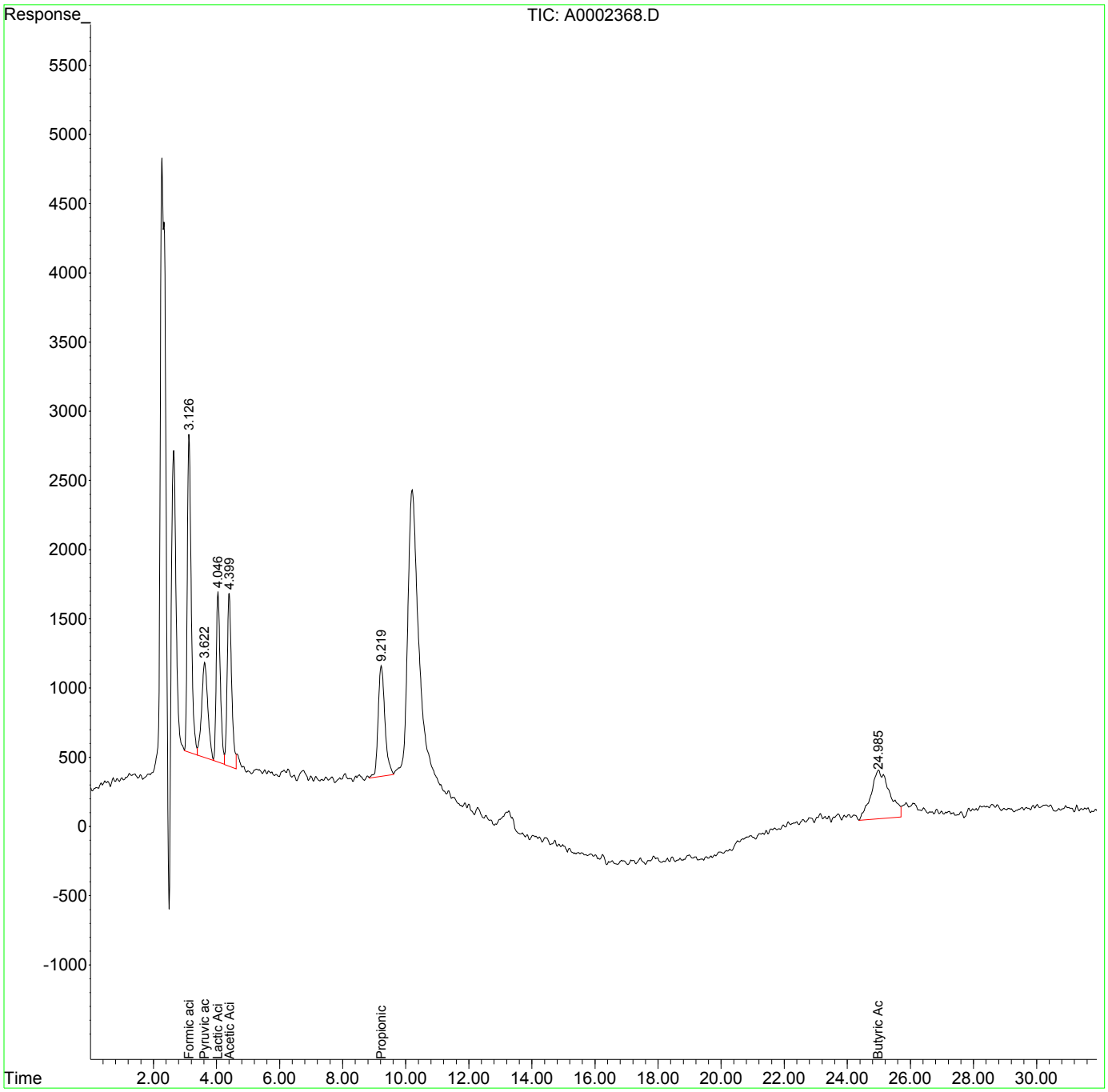
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



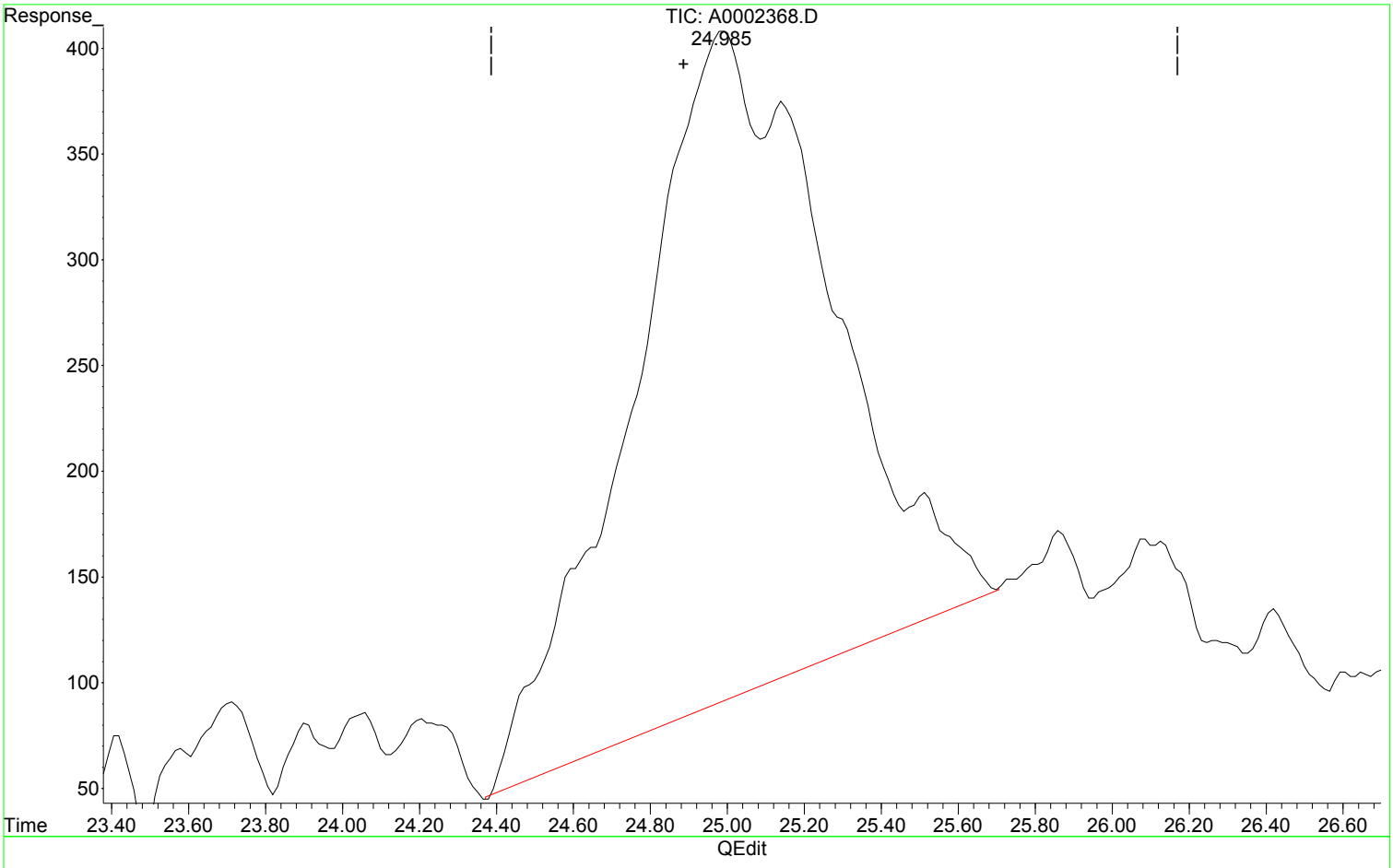
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.991min 1.857 ppm

response 112205

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

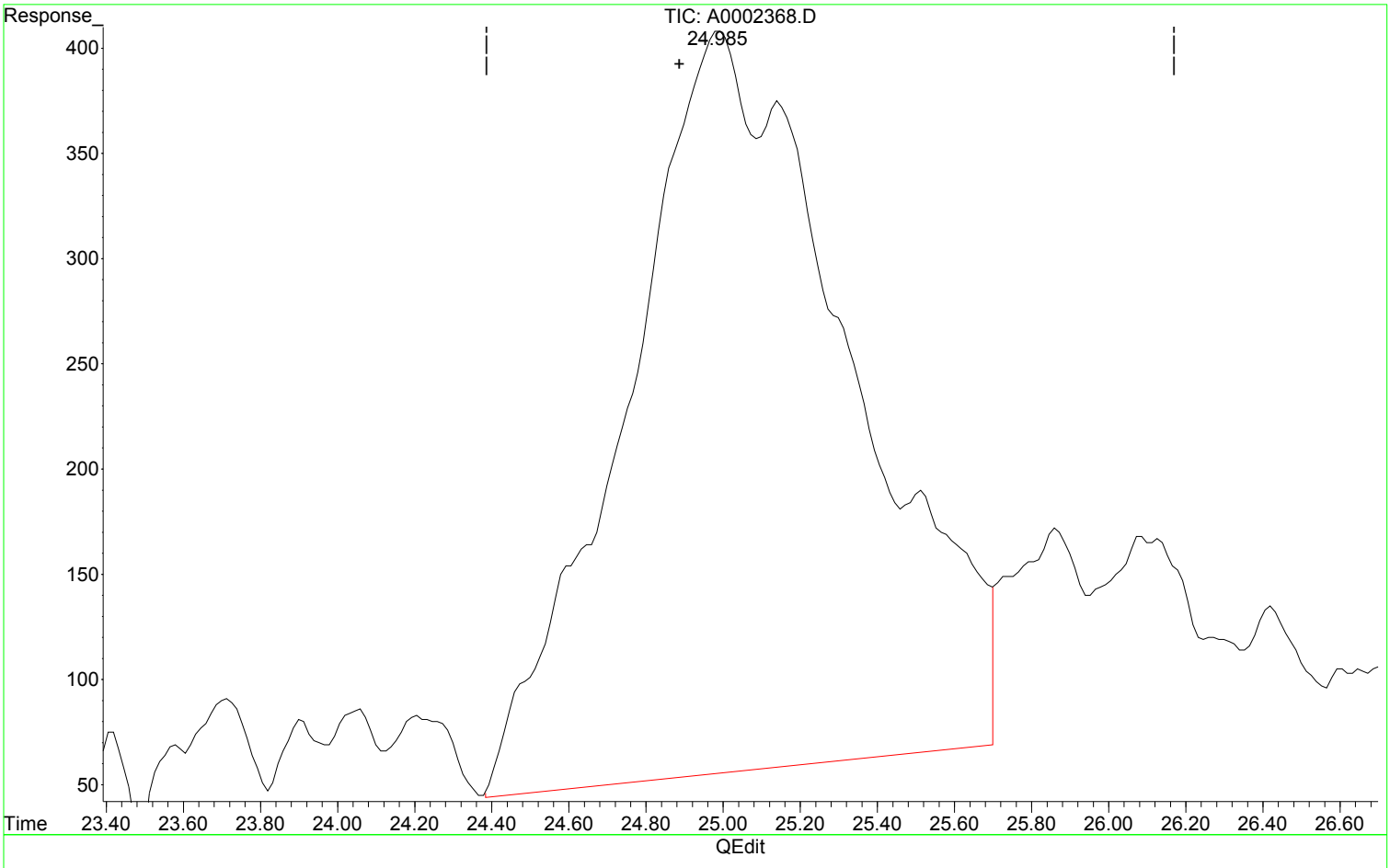
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.985min 2.381 ppm m

response 143852

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

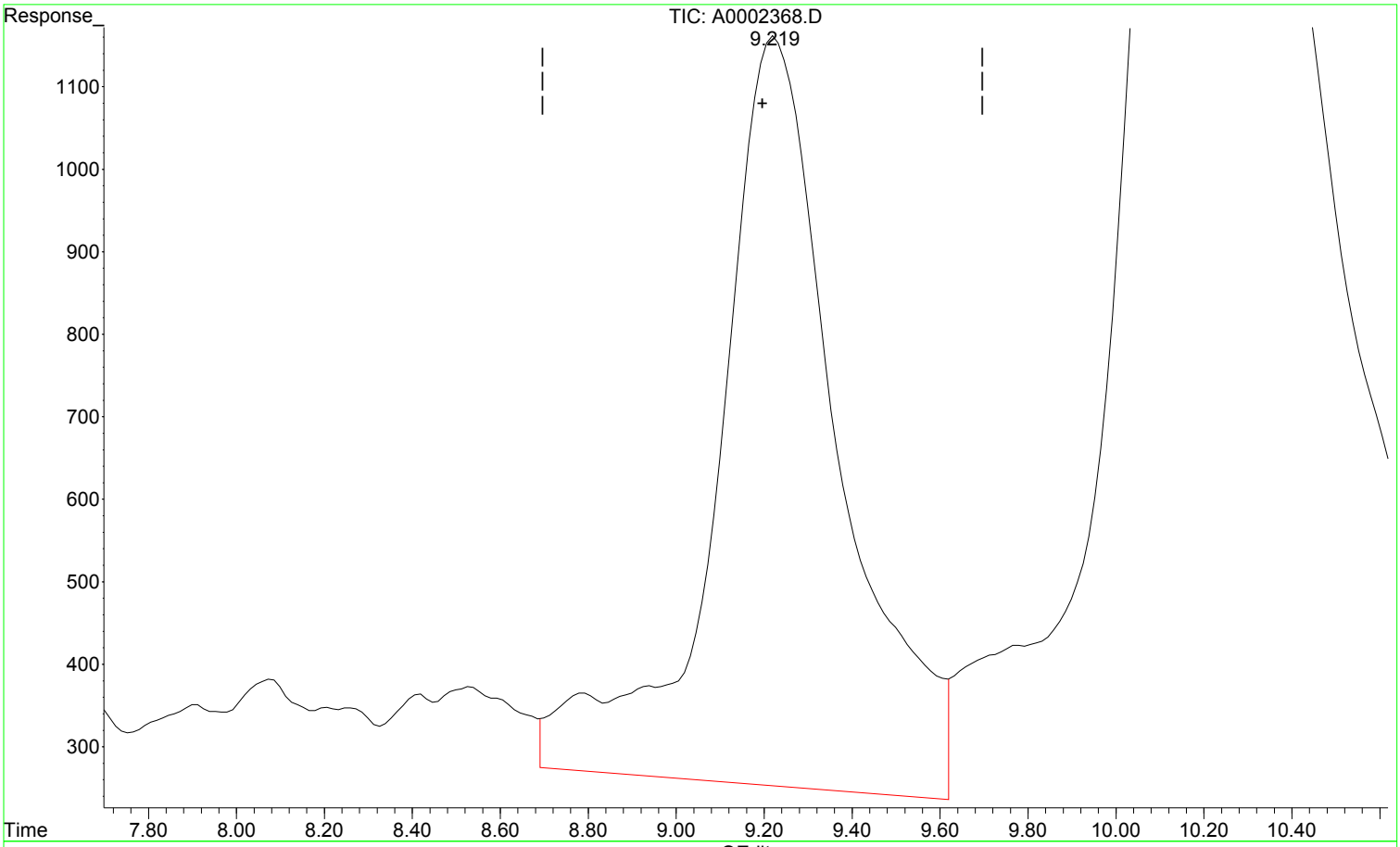
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.226min 3.005 ppm

response 177221

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

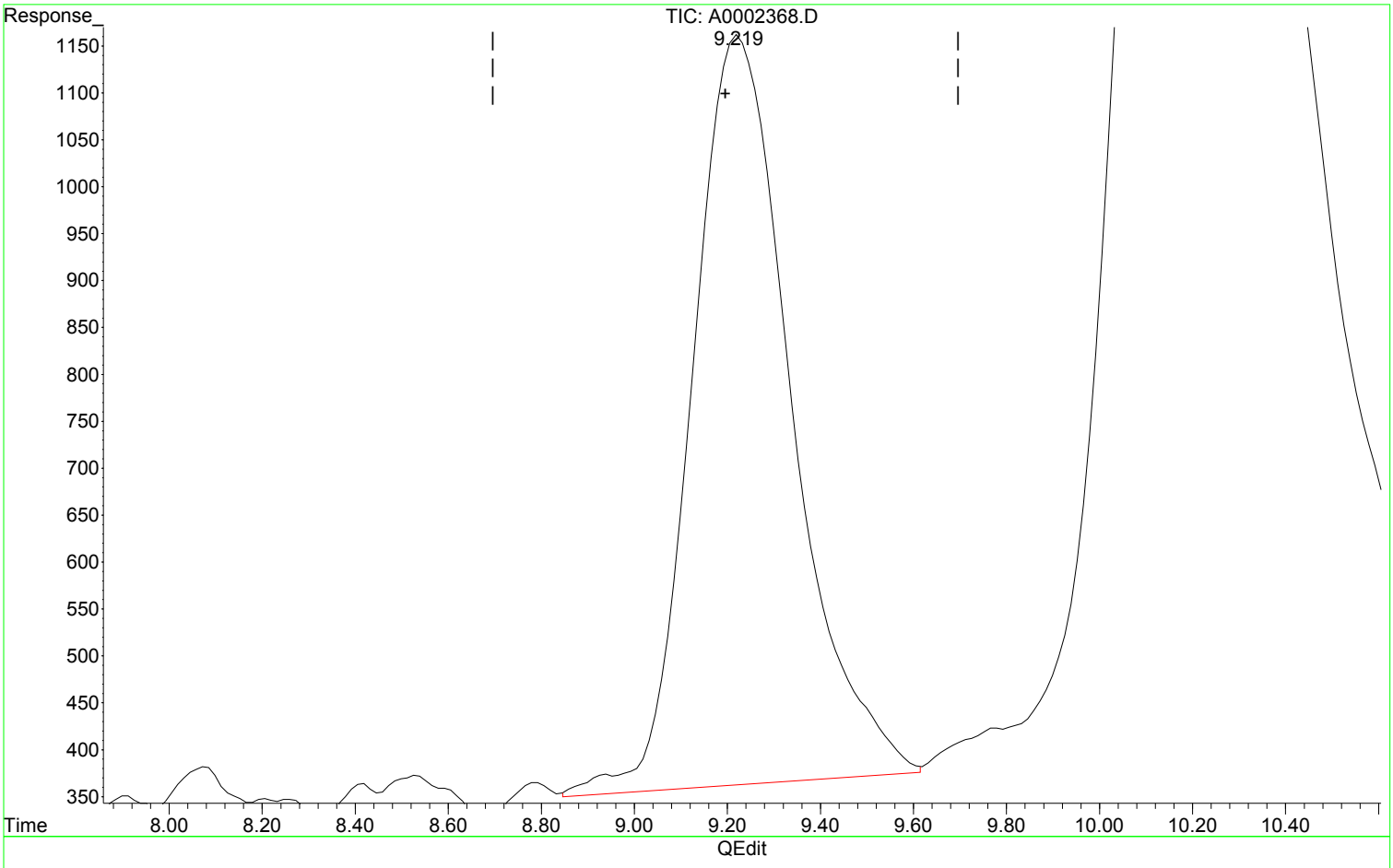
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.219min 2.004 ppm m

response 118189

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

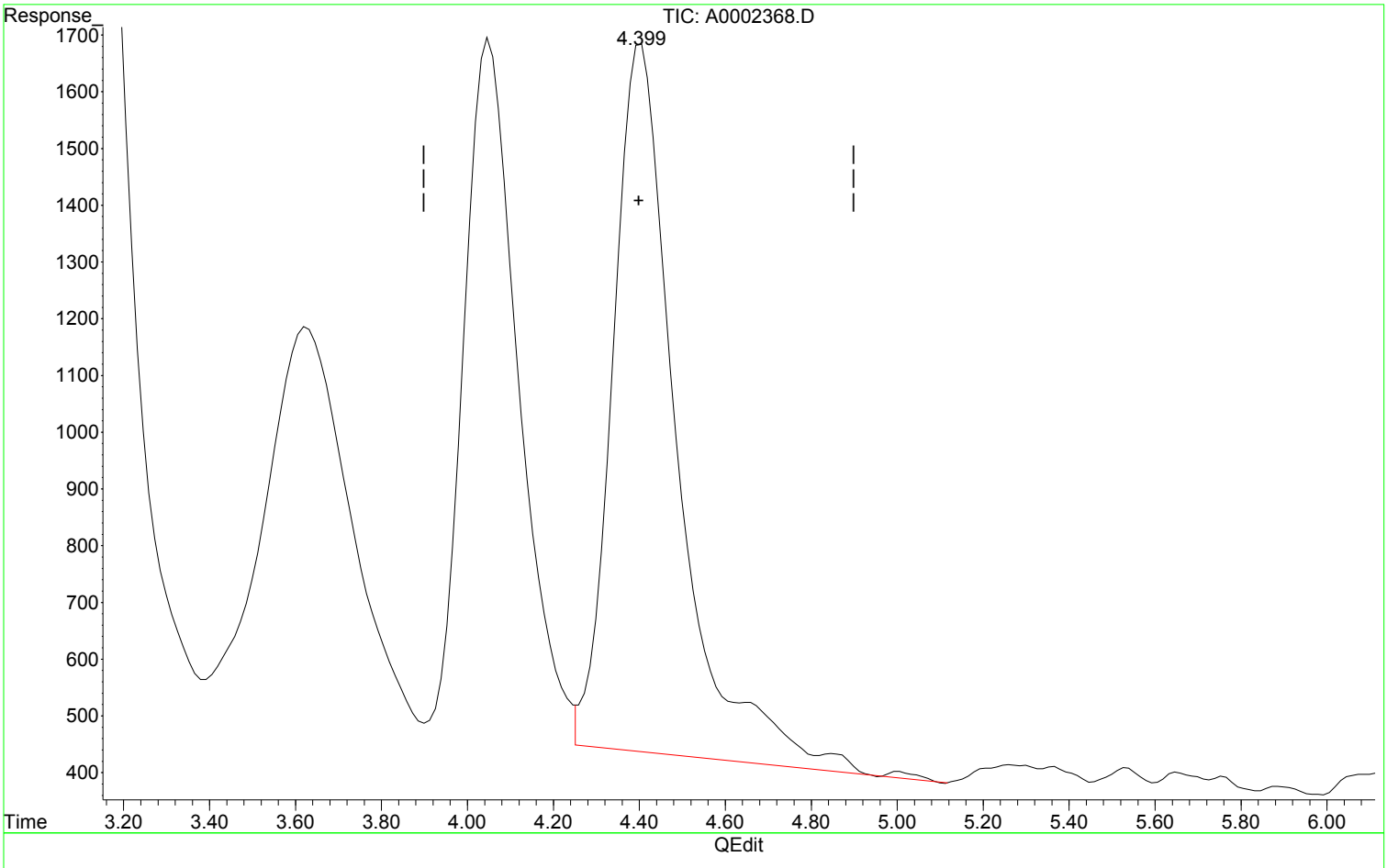
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

1st BA 10/05/18
2nd MLP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.406min 2.212 ppm

response 130945

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

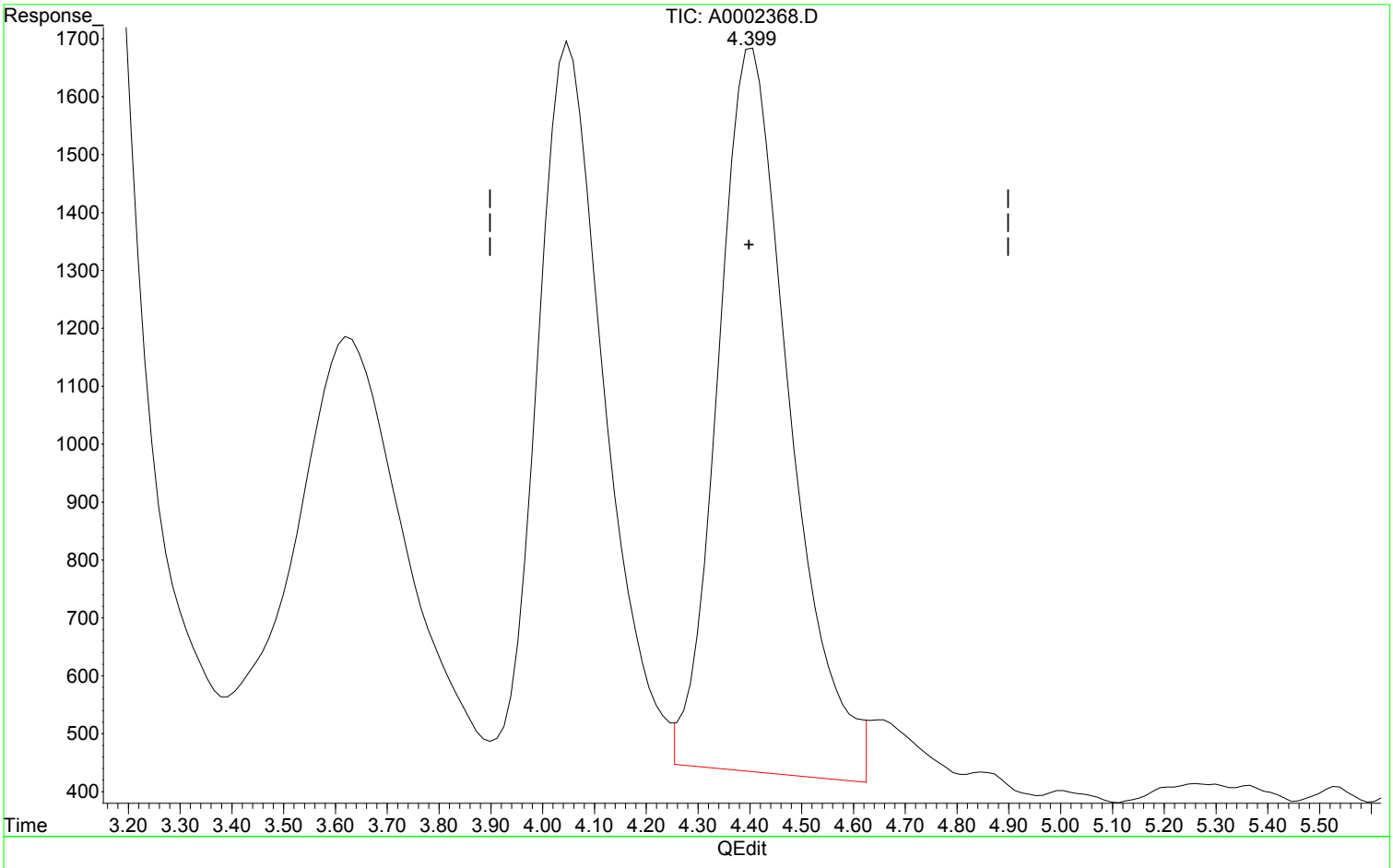
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.399min 2.050 ppm m

response 121343

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

Quantitation Report (QT Reviewed)

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002367.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 12:01:56
Operator : b.allgeier
Sample : 0.1-1.0ppm
Misc :
ALS Vial : 2 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:47 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.133	101923	1.082	ppm	
2) T	Pyruvic acid	3.631	46367	0.103	ppm	
3) T	Lactic Acid	4.052	58945	1.114	ppm	
4) T	Acetic Acid	4.404	60257	1.018	ppm	
5) T	Propionic Acid	9.215	69400	1.177	ppm	m
6) T	Butyric Acid	24.964	74253	1.229	ppm	m

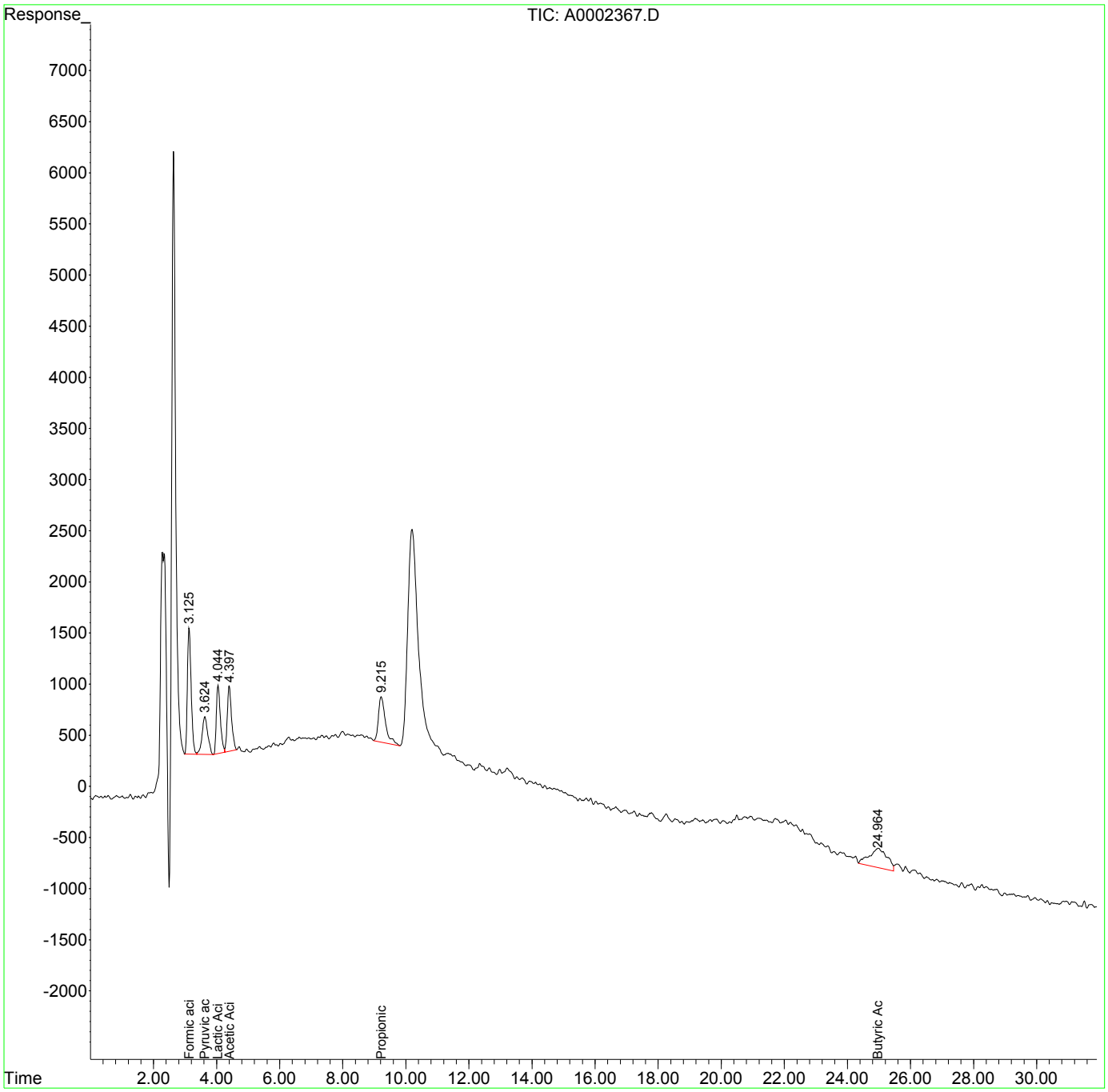
(f)=RT Delta > 1/2 Window (m)=manual int.

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002367.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 12:01:56
Operator : b.allgeier
Sample : 0.1-1.0ppm
Misc :
ALS Vial : 2 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:42:47 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



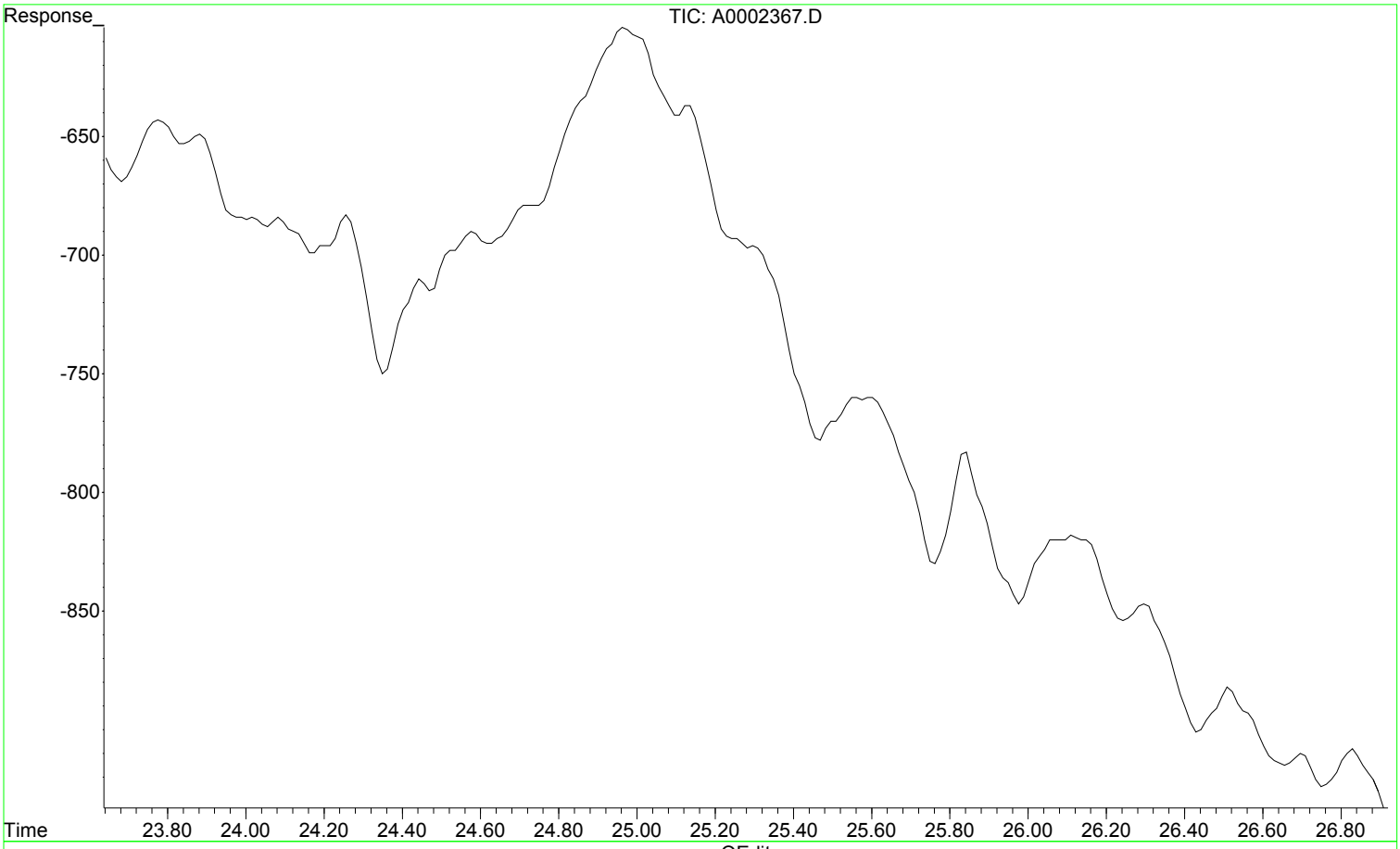
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002367.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 12:01:56
Operator : b.allgeier
Sample : 0.1-1.0ppm
Misc :
ALS Vial : 2 Sample Multiplier: 1

1st BA 10/05/18
2nd MLP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:42:47 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.887min 0.000 ppm

response 0

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

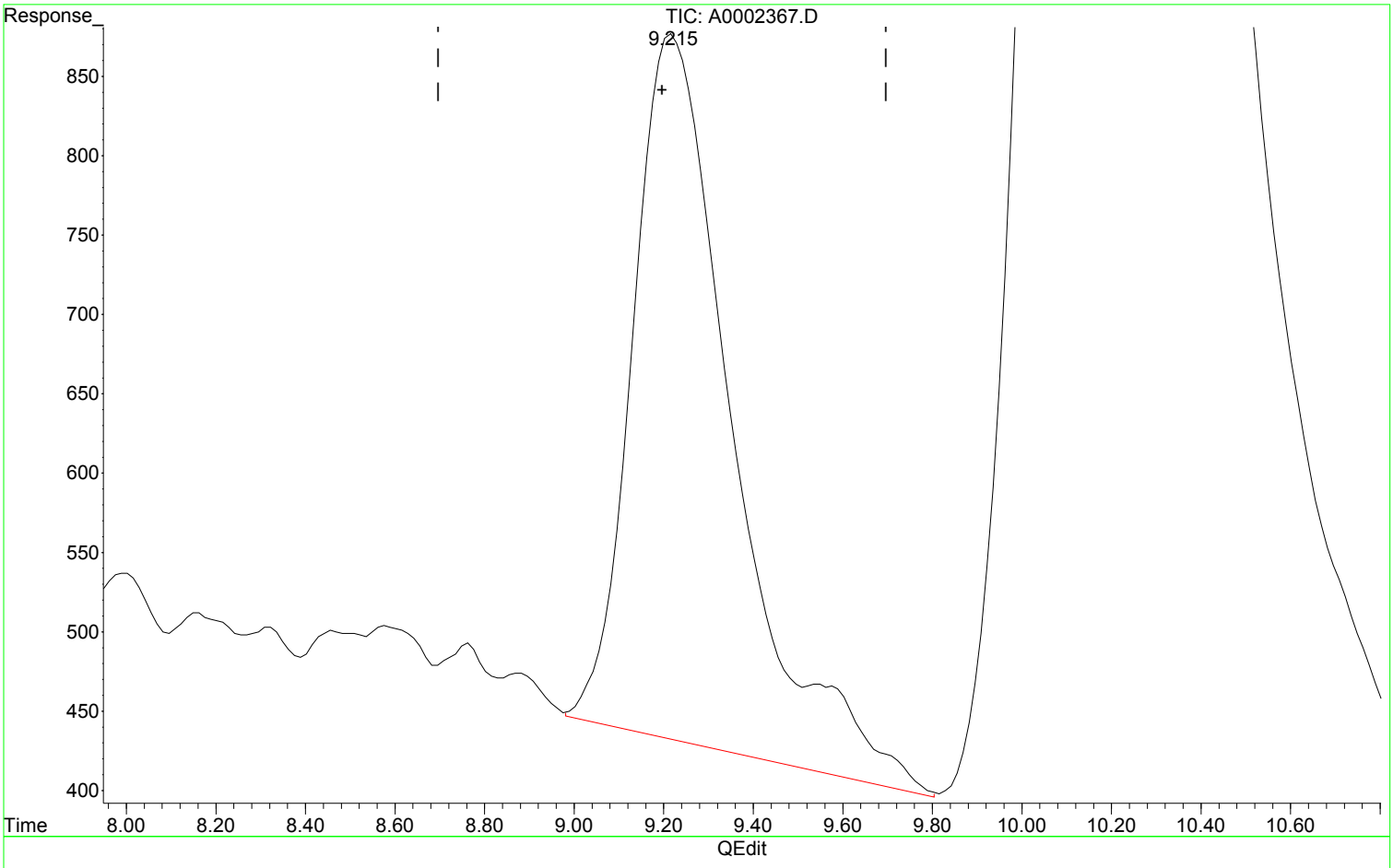
Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002367.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 12:01:56
Operator : b.allgeier
Sample : 0.1-1.0ppm
Misc :
ALS Vial : 2 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 13:42:47 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.215min 1.177 ppm m

response 69400

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002366.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 11:26:57
Operator : b.allgeier
Sample : inst blk
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:43:03 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	0.000	0	N.D.	ppm	
2) T	Pyruvic acid	3.655	25630	0.057	ppm	m
3) T	Lactic Acid	0.000	0	N.D.	ppm	
4) T	Acetic Acid	0.000	0	N.D.	ppm	
5) T	Propionic Acid	0.000	0	N.D.	ppm	
6) T	Butyric Acid	0.000	0	N.D.	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

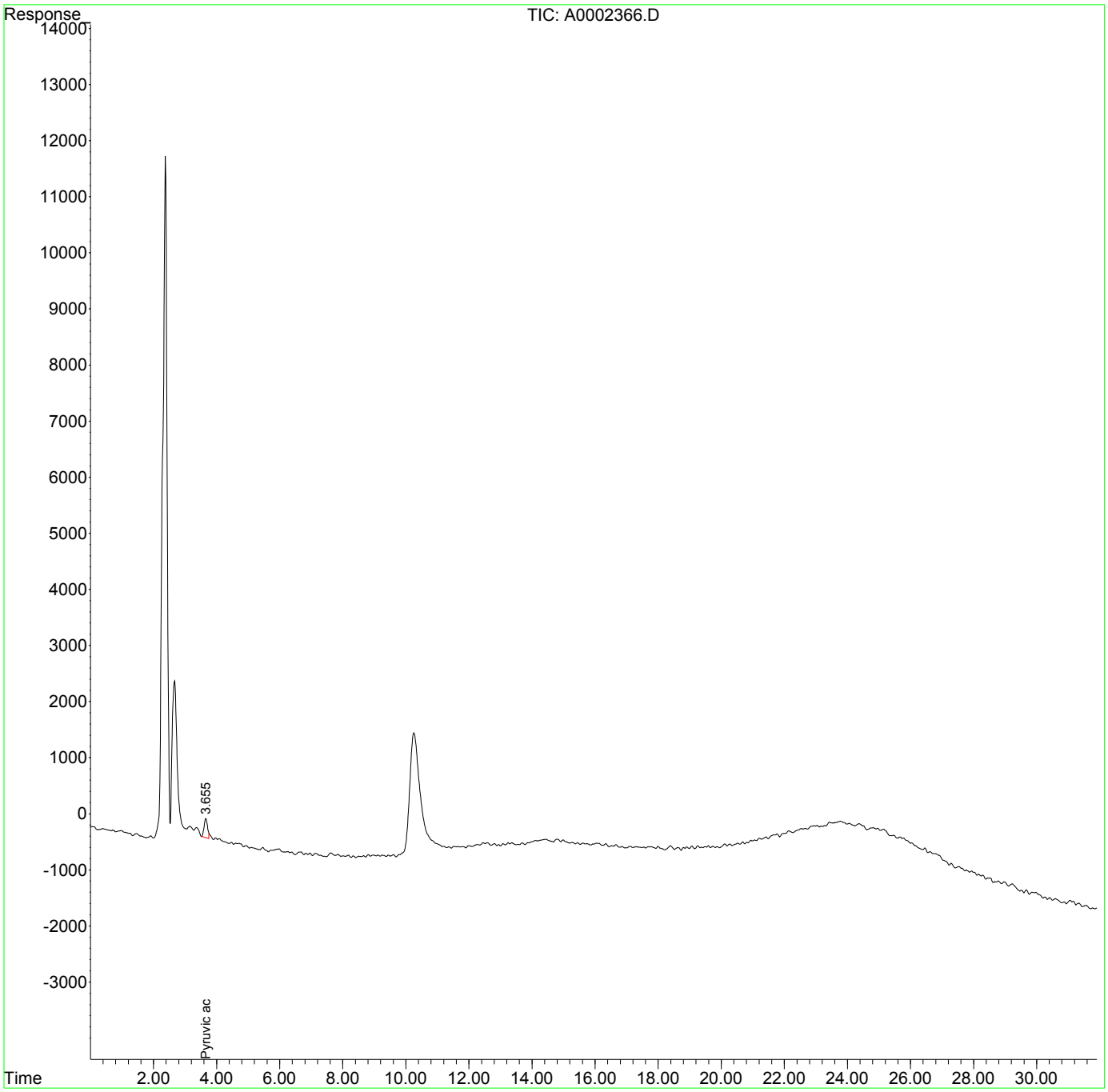
Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002366.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 11:26:57
Operator : b.allgeier
Sample : inst blk
Misc :
ALS Vial : 1 Sample Multiplier: 1

1st BA 10/05/18
2nd MP 10/09/18

Integration File: MA1.E
Quant Time: Oct 04 16:43:03 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58

Service Request: R1809340
Calibration Date: 10/4/2018

Initial Calibration Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Calibration ID: RC1800114
Instrument ID: R-HPLC-05

Signal ID: synergi hydro rp

#	Lab Code	Sample Name	File Location	Acquisition Date
01	RC1800114-01	0.1-1.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002367.D	10/04/2018 12:01
02	RC1800114-02	0.2-2.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002368.D	10/04/2018 12:32
03	RC1800114-03	0.5-5.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002369.D	10/04/2018 13:04
04	RC1800114-04	1.0-10.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002370.D	10/04/2018 13:36
05	RC1800114-05	2.0-20.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002371.D	10/04/2018 14:21
06	RC1800114-06	5.0-50.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002372.D	10/04/2018 14:56
07	RC1800114-07	10.0-100.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002373.D	10/04/2018 15:31
08	RC1800114-08	20.0-200.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002374.D	10/04/2018 16:03

Analyte

Acetic Acid

#	Amount	RF	#	Amount	RF	#	Amount	RF	#	Amount	RF
01	1.000	6.026E4	02	2.000	6.067E4	03	5.000	6.189E4	04	10.000	5.859E4
05	20.000	5.483E4	06	50.000	6.053E4	07	100.000	5.725E4	08	200.000	5.933E4

Butanoic Acid (Butyric Acid)

#	Amount	RF	#	Amount	RF	#	Amount	RF	#	Amount	RF
01	1.000	7.425E4	02	2.000	7.193E4	03	5.000	6.215E4	04	10.000	6.021E4
05	20.000	6.035E4	06	50.000	5.865E4	07	100.000	5.511E4	08	200.000	6.053E4

Lactic Acid

#	Amount	RF	#	Amount	RF	#	Amount	RF	#	Amount	RF
01	1.000	5.895E4	02	2.000	5.416E4	03	5.000	5.388E4	04	10.000	5.286E4
05	20.000	5.017E4	06	50.000	5.423E4	07	100.000	5.216E4	08	200.000	5.371E4

Propionic Acid

#	Amount	RF	#	Amount	RF	#	Amount	RF	#	Amount	RF
01	1.000	6.94E4	02	2.000	5.909E4	03	5.000	6.128E4	04	10.000	5.86E4
05	20.000	5.703E4	06	50.000	5.9E4	07	100.000	5.508E4	08	200.000	5.726E4

Pyruvic Acid

#	Amount	RF	#	Amount	RF	#	Amount	RF	#	Amount	RF
01	0.100	4.637E5	02	0.200	4.71E5	03	0.500	4.552E5	04	1.000	4.481E5
05	2.000	4.25E5	06	5.000	4.588E5	07	10.000	4.43E5	08	20.000	4.585E5

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58

Service Request: R1809340
Calibration Date: 10/4/2018

Initial Calibration Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Calibration ID: RC1800114
Instrument ID: R-HPLC-05

Signal ID: synergi hydro rp

		Calibration Evaluation				Calibration Evaluation	
Analyte Name	Compound Type	Fit Type	Eval	Eval Result	Control Criteria	Average RRF	Minimum RRF
Acetic Acid	TRG	Average RF	% RSD	3.8	≤	5.917E4	
Butanoic Acid (Butyric Acid)	TRG	Average RF	% RSD	10.6	≤	6.29E4	
Lactic Acid	TRG	Average RF	% RSD	4.6	≤	5.376E4	
Propionic Acid	TRG	Average RF	% RSD	7.3	≤	5.959E4	
Pyruvic Acid	TRG	Average RF	% RSD	3.1	≤	4.529E5	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58

Service Request: R1809340
Calibration Date: 10/4/2018

Initial Calibration Verification Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Calibration ID: RC1800114
Instrument ID: R-HPLC-05

Signal ID: synergi hydro rp

#	Lab Code	Sample Name	File Location	Acquisition Date
09	RC1800114-09	icv	I:\ACQUDATA\hplc05\data\100418\A0002375.D	10/04/2018 16:35

Analyte Name	Expected	Result	Average RF	SSV RF	Rec.	Criteria	Curve Fit
Pyruvic Acid	2.00	3.00	4.529E5	6.787E5	150*	85-115	Average RF
Acetic Acid	20.0	20.6	5.917E4	6.092E4	103	85-115	Average RF
Butanoic Acid (Butyric Acid)	20.0	18.1	6.29E4	5.694E4	90.5	85-115	Average RF
Lactic Acid	20.0	20.2	5.376E4	5.434E4	101	85-115	Average RF
Propionic Acid	20.0	19.2	5.959E4	5.733E4	96.0	85-115	Average RF

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58/NWO1312.0150

Service Request: R1809340
Date Analyzed: 10/04/18 17:16

Continuing Calibration Verification (CCV) Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids
File ID: I:\ACQUDATA\hplc05\data\100418\A0002376.D\
Signal ID: synergi hydro rp

Calibration Date: 10/4/2018
Calibration ID: RC1800114
Analysis Lot: 609639
Units: mg/L

Analyte Name	Expected	Result	Average RF	CCV RF	% D	% Drift	Criteria	Curve Fit
Pyruvic Acid	5.03	5.11	4.529E5	4.608E5	1.7	NA	±15	Average RF
Acetic Acid	50.1	51.7	5.917E4	6.1E4	3.1	NA	±15	Average RF
Butanoic Acid (Butyric Acid)	50.8	45.9	6.29E4	5.677E4	-9.7	NA	±15	Average RF
Lactic Acid	49.8	51.2	5.376E4	5.528E4	2.8	NA	±15	Average RF
Propionic Acid	50.3	49.3	5.959E4	5.839E4	-2.0	NA	±15	Average RF

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Analyzed:**	10/04/18 23:40

Continuing Calibration Verification (CCV) Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method:	Organic Acids	**Calibration Date:**	10/4/2018
File ID:	I:\ACQUDATA\hplc05\data\100418\A0002387.D\	**Calibration ID:**	RC1800114
Signal ID:	synergi hydro rp	**Analysis Lot:**	609639
		Units:	mg/L

Analyte Name	Expected	Result	Average RF	CCV RF	% D	% Drift	Criteria	Curve Fit
Pyruvic Acid	5.03	5.08	4.529E5	4.579E5	1.1	NA	±15	Average RF
Acetic Acid	50.1	52.3	5.917E4	6.17E4	4.3	NA	±15	Average RF
Butanoic Acid (Butyric Acid)	50.8	46.7	6.29E4	5.78E4	-8.1	NA	±15	Average RF
Lactic Acid	49.8	51.3	5.376E4	5.543E4	3.1	NA	±15	Average RF
Propionic Acid	50.3	49.3	5.959E4	5.838E4	-2.0	NA	±15	Average RF

ALS Group USA, Corp.
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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58/NWO1312.0150

Service Request: R1809340
Date Analyzed: 10/05/18 01:25

Continuing Calibration Verification (CCV) Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids
File ID: I:\ACQUDATA\hplc05\data\100418\A0002390.D\
Signal ID: synergi hydro rp

Calibration Date: 10/4/2018
Calibration ID: RC1800114
Analysis Lot: 609639
Units: mg/L

Analyte Name	Expected	Result	Average RF	CCV RF	% D	% Drift	Criteria	Curve Fit
Pyruvic Acid	5.03	4.66	4.529E5	4.201E5	-7.2	NA	±15	Average RF
Acetic Acid	50.1	49.8	5.917E4	5.88E4	-0.6	NA	±15	Average RF
Butanoic Acid (Butyric Acid)	50.8	46.0	6.29E4	5.689E4	-9.6	NA	±15	Average RF
Lactic Acid	49.8	49.3	5.376E4	5.327E4	-0.9	NA	±15	Average RF
Propionic Acid	50.3	49.2	5.959E4	5.823E4	-2.3	NA	±15	Average RF

ALS Group USA, Corp.
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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58/NWO1312.0150

Service Request: R1809340
Date Analyzed: 10/05/18 10:29

Continuing Calibration Verification (CCV) Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids
File ID: I:\ACQUDATA\hplc05\data\100518\A0002392.D\
Signal ID: synergi hydro rp

Calibration Date: 10/4/2018
Calibration ID: RC1800114
Analysis Lot: 609806
Units: mg/L

Analyte Name	Expected	Result	Average RF	CCV RF	% D	% Drift	Criteria	Curve Fit
Pyruvic Acid	5.03	5.01	4.529E5	4.514E5	-0.3	NA	±15	Average RF
Acetic Acid	50.1	51.2	5.917E4	6.044E4	2.2	NA	±15	Average RF
Butanoic Acid (Butyric Acid)	50.8	46.7	6.29E4	5.78E4	-8.1	NA	±15	Average RF
Lactic Acid	49.8	50.2	5.376E4	5.429E4	1.0	NA	±15	Average RF
Propionic Acid	50.3	48.8	5.959E4	5.778E4	-3.0	NA	±15	Average RF

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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58/NWO1312.0150

Service Request: R1809340
Date Analyzed: 10/05/18 15:09

Continuing Calibration Verification (CCV) Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids
File ID: I:\ACQUDATA\hplc05\data\100518\A0002400.D\
Signal ID: synergi hydro rp

Calibration Date: 10/4/2018
Calibration ID: RC1800114
Analysis Lot: 609806
Units: mg/L

Analyte Name	Expected	Result	Average RF	CCV RF	% D	% Drift	Criteria	Curve Fit
Pyruvic Acid	5.03	5.04	4.529E5	4.543E5	0.3	NA	±15	Average RF
Acetic Acid	50.1	50.8	5.917E4	6.004E4	1.5	NA	±15	Average RF
Butanoic Acid (Butyric Acid)	50.8	46.5	6.29E4	5.757E4	-8.5	NA	±15	Average RF
Lactic Acid	49.8	50.5	5.376E4	5.46E4	1.6	NA	±15	Average RF
Propionic Acid	50.3	48.1	5.959E4	5.691E4	-4.5	NA	±15	Average RF

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QA/QC Report

Client: ALS Environmental - US **Service Request:**R1809340
Project: LHAAP / Site 58/NWO1312.0150

Analysis Run Log
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids **Analysis Lot:**609639
Instrument ID:R-HPLC-05

Raw Data File	Sample Name	Lab Code	Date Analyzed	Time Analyzed	Q
I:\ACQUDATA\hplc05\data\100418 \A0002385.D\	LHSMW07_092618	R1809340-004	12/29/2000	23:10:21	
I:\ACQUDATA\hplc05\data\100418 \A0002379.D\	Duplicate Lab Control Sample	RQ1810603-06	12/29/2000	23:47:53	
I:\ACQUDATA\hplc05\data\100418 \A0002384.D\	35AWW20_092618_a	R1809340-003	12/30/2000	16:48:23	
I:\ACQUDATA\hplc05\data\100418 \A0002376.D\	Continuing Calibration Verification	RQ1810603-01	10/4/2018	17:16:44	
I:\ACQUDATA\hplc05\data\100418 \A0002377.D\	Method Blank	RQ1810603-04	10/4/2018	17:51:39	
I:\ACQUDATA\hplc05\data\100418 \A0002378.D\	Lab Control Sample	RQ1810603-05	10/4/2018	18:26:33	
I:\ACQUDATA\hplc05\data\100418 \A0002379.D\	Duplicate Lab Control Sample	RQ1810603-06	10/4/2018	19:00:00	
I:\ACQUDATA\hplc05\data\100418 \A0002383.D\	35AWW20_092618	R1809340-002	10/4/2018	21:21:05	
I:\ACQUDATA\hplc05\data\100418 \A0002384.D\	35AWW20_092618_a	R1809340-003	10/4/2018	21:53:00	
I:\ACQUDATA\hplc05\data\100418 \A0002385.D\	LHSMW07_092618	R1809340-004	10/4/2018	22:25:00	
I:\ACQUDATA\hplc05\data\100418 \A0002386.D\	ZZZZZZZ	ZZZZZZZ	10/4/2018	23:05:51	
I:\ACQUDATA\hplc05\data\100418 \A0002387.D\	Continuing Calibration Verification	RQ1810603-02	10/4/2018	23:40:52	
I:\ACQUDATA\hplc05\data\100418 \A0002388.D\	ZZZZZZZ	ZZZZZZZ	10/5/2018	00:15:52	
I:\ACQUDATA\hplc05\data\100418 \A0002390.D\	Continuing Calibration Verification	RQ1810603-03	10/5/2018	01:25:46	

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QA/QC Report

Client: ALS Environmental - US **Service Request:**R1809340
Project: LHAAP / Site 58/NWO1312.0150

Analysis Run Log
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids **Analysis Lot:**609806
Instrument ID:R-HPLC-05

Raw Data File	Sample Name	Lab Code	Date Analyzed	Time Analyzed	Q
I:\ACQUDATA\hplc05\data\100518 \A0002395.D\	Duplicate Lab Control Sample	RQ1810656-05	12/29/2000	23:18:07	
I:\ACQUDATA\hplc05\data\100518 \A0002399.D\	ZZZZZZZ	ZZZZZZZ	12/31/2000	02:47:48	
I:\ACQUDATA\hplc05\data\100518 \A0002392.D\	Continuing Calibration Verification	RQ1810656-01	10/5/2018	10:29:40	
I:\ACQUDATA\hplc05\data\100518 \A0002393.D\	Method Blank	RQ1810656-03	10/5/2018	11:04:39	
I:\ACQUDATA\hplc05\data\100518 \A0002394.D\	Lab Control Sample	RQ1810656-04	10/5/2018	11:39:38	
I:\ACQUDATA\hplc05\data\100518 \A0002395.D\	Duplicate Lab Control Sample	RQ1810656-05	10/5/2018	12:02:00	
I:\ACQUDATA\hplc05\data\100518 \A0002396.D\	35AWW06_092618	R1809340-001	10/5/2018	12:49:31	
I:\ACQUDATA\hplc05\data\100518 \A0002397.D\	35AWW06_092618 MS	RQ1810656-06	10/5/2018	13:24:22	
I:\ACQUDATA\hplc05\data\100518 \A0002398.D\	35AWW06_092618 DMS	RQ1810656-07	10/5/2018	13:59:20	
I:\ACQUDATA\hplc05\data\100518 \A0002399.D\	ZZZZZZZ	ZZZZZZZ	10/5/2018	14:30:00	
I:\ACQUDATA\hplc05\data\100518 \A0002400.D\	Continuing Calibration Verification	RQ1810656-02	10/5/2018	15:09:20	

Analysis: 10/5/18 Analyst: BA Run Method: NEWMETA

Date: Organic Acids Instr. HPLC-05 Quant Method: MA100918

LIMS Run#: 609806

Setup: Column: Synergi Hydro RP 150x4.6 Col.Temp: 35 Flow: 0.6 ml/min

Mobile Phase: 0.02KH2PO4 prep 0.1PO4 ul Inj.: 50

Pos.	Sample	Diln.	Stds. ID	File#	OK?	Comments
	BLK			A0002391	—	
	CCV	1000/1ml	193753	92	YC	
	MET BLK			93	Y	
	LCS	1000/1ml	193754	94	Y	PYRUVIC ↓
	DLCS	↓	↓	95	Y	↓
	R1809340-001	10.0		96	Y	
	-001	10.0mg	1000/1ml 193754	97	Y	
	-001	10.0mg50	↓ ↓	98	Y	
	R1809393-003			99	Y	
	CCV	1000/1ml	193753	2400	YC	

BD 10/5/18

All samples = _____mL + _____uL Combined IS/Surr.;

Primary :_____ exp: Secondary :_____ exp:

Primary:_____ exp: Secondary :_____ exp:

Runlog HPLC05r1
1/10/13

Analysis: 10/4/18 Analyst: BA Run Method: NEWMETA (BA)

Date: Organic Acids Instr. _HPLC-05_____ Quant Method: ~~MA0926.8~~ MA100418

LIMS Run#: 609639

Setup: Column: Synergi Hydro RP 150x46 Col.Temp: 35 Flow: 0.6 ml/min

Mobile Phase: 0.2 KH2 prep 0.1 PO4 ul Inj.: 50

Pos.	Sample	Diln.	Stds. ID	File#	OK?	Comments
	BLK			A0003365	—	
	INST BLK			66	Y	
	0.1-1.0 PPM	200/1ml	193753	67	Y	
	0.2-2.0	400/		68	Y	
	0.5-5.0	1000/		69	Y	
	1.0-10.0	2000/		70	Y	
	2.0-20.0	4000/		71	Y	
	5.0-50.0	10000/		72	Y	
	10.0-100.0	20000/		73	Y	
	20.0-200.0	40000/		74	Y	
	ICV	10000/	193754	75	Y	Pyruvic out
	CCV	10000/1ml	193753	76	YC	
	MET BLK			77	Y	
	LCS	10000/1ml	193754	78	Y	Pyruvic out
	LCSD			79	Y	
	R1809340-001			80	(N)	RPT 1/10
	-001	MS 10000/1ml	193754	81		
	-001	MSD		82		
	-002			83	Y	
	-003			84	Y	
	-004			85	Y	
	R1809393-001			86	Y	
	CCV	10000/1ml	193754	87	YC	
	-002			88	Y	
	-003			89	(N)	RPT 1/10
	CCV	10000/1ml	193754	90	YC	
			10/4/18			
	BA					

All samples = _____mL + _____uL Combined IS/Surr.;

Primary :_____ exp: Secondary :_____ exp:

Primary:_____ exp: Secondary :_____ exp:

Runlog HPLC05r1
1/10/13

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General Chemistry

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

ALS Group USA, Corp.
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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 09:20
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	35AWW06_092618	**Basis:**	NA
Lab Code:	R1809340-001		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**27.8**	mg/L	1.0	0.8	0.3	10	09/27/18 20:00	*

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dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 11:15
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	35AWW20_092618	**Basis:**	NA
Lab Code:	R1809340-002		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**1.38**	mg/L	0.10	0.08	0.03	1	09/27/18 20:00	*

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 11:15
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	35AWW20_092618_a	**Basis:**	NA
Lab Code:	R1809340-003		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**1.41**	mg/L	0.10	0.08	0.03	1	09/27/18 20:00	*

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809340
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	09/26/18 12:30
Sample Matrix:	Water	**Date Received:**	09/27/18 09:15
Sample Name:	LHSMW07_092618	**Basis:**	NA
Lab Code:	R1809340-004		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**0.93**	mg/L	0.10	0.08	0.03	1	09/27/18 20:00	*

Analytical Results Summary

Instrument Name: R-UV-VIS-05 **Analyst:** MROGERSON **Analysis Lot:** 609189 **Method/Testcode:** SM 3500-Fe B.4.c/Ferrous DOD

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
RQ1810495-01	Iron, Divalent (Ferrous Iron)	CCV		Water	1.99 mg/L	5 mL	1.99 mg/L	1					9/27/18 20:00	N	IV
RQ1810495-02	Iron, Divalent (Ferrous Iron)	CCB		Water	0.00 mg/L	5 mL	0.10 mg/L U	1	0.03	0.10			9/27/18 20:00	N	IV
RQ1810495-03	Iron, Divalent (Ferrous Iron)	LCS		Water	0.39 mg/L	5 mL	0.389 mg/L	1	0.03	0.10	97		9/27/18 20:00	N	IV
RQ1810495-04	Iron, Divalent (Ferrous Iron)	MB		Water	0.00 mg/L	5 mL	0.10 mg/L U	1	0.08	0.10			9/27/18 20:00:00	N	IV
R1809340-001	Iron, Divalent (Ferrous Iron)	N/A		Water	27.76 mg/L	5 mL	27.8 mg/L	10	0.3	1.0			9/27/18 20:00	Y	IV
RQ1810495-07	Iron, Divalent (Ferrous Iron)	MS	R1809340-001	Water	30.68 mg/L	5 mL	30.7 mg/L	10	0.3	1.0	73		9/27/18 20:00	N	IV
RQ1810495-08	Iron, Divalent (Ferrous Iron)	DMS	R1809340-001	Water	29.90 mg/L	5 mL	29.9 mg/L	10	0.3	1.0	54*	3	9/27/18 20:00	N	IV
R1809340-002	Iron, Divalent (Ferrous Iron)	N/A		Water	1.38 mg/L	5 mL	1.38 mg/L	1	0.03	0.10			9/27/18 20:00	N	IV
R1809340-003	Iron, Divalent (Ferrous Iron)	N/A		Water	1.41 mg/L	5 mL	1.41 mg/L	1	0.03	0.10			9/27/18 20:00	N	IV
R1809340-004	Iron, Divalent (Ferrous Iron)	N/A		Water	0.93 mg/L	5 mL	0.93 mg/L	1	0.03	0.10			9/27/18 20:00	N	IV
RQ1810495-06	Iron, Divalent (Ferrous Iron)	CCV		Water	1.99 mg/L	5 mL	1.99 mg/L	1					9/27/18 20:00	N	IV
RQ1810495-05	Iron, Divalent (Ferrous Iron)	CCB		Water	0.00 mg/L	5 mL	0.10 mg/L U	1	0.03	0.10			9/27/18 20:00	N	IV

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

Sample Dilutions

Analyst: MAR
Instrument: UV-05

Date 9/27/18
Analysis Fe^{2+}

Sample ID	Matrix of Diluent	1st Dilution			2nd Dilution			3rd Dilution			4th Dilution			5th Dilution		
		mL's of Sample	mL's of Diluent	Dilution Factor	mL's of Sample	mL's of Diluent	Dilution Factor	mL's of Sample	mL's of Diluent	Dilution Factor	mL's of Sample	mL's of Diluent	Dilution Factor	mL's of Sample	mL's of Diluent	Dilution Factor
RTB 09340-001	Fe^{2+} DI	1	9	1/10												

MAR 10/2/18

Pippetor Calibration

ALS Environmental

Frequency:

Pipettes: 3 trials for both bias and precision DOD Projects - Daily before use at each volume of use, or if more than 3 volumes of use, a high, medium, and low. Non-DOD: Monthly at high, medium, and low.	**Calculations:** %Recovery = Mean/Nominal Volume*100 %RSD = Stdev/Volume*100
Repeaters, Dispensers, and Repipettors: 3 trials for both bias and precision If used for dilutions - Daily before use and each time the volume is changed. If not used for dilutions - monthly	**Limits:** % Rec: 98-102 for Pipettes and others for dilutions % Recovery: 90-110 (Repeaters, Dispensers, Repipettors not for dilutions) %RSD: ≤1 (Pipets); ≤3 (Repeaters, Dispensers, and Repipettors)

Use a balance and DI for all except Dispensers and Repipettors which contain reagents. For these, dispense into a To Contain Class A grad cylinder and document the Max Volume of the cylinder instead of the Balance ID. Record to 1/10 the graduation of the cylinder.

Date	Init.	Equipment ID	Volume (mL)	Trial #1 (g/mL)	Trial #2 (g/mL)	Trial #3 (g/mL)	Bias %Recovery	Pass/ Fail	Precision %RSD	Pass/ Fail	Recal? Y/N	Balance ID or Class A (TC)	Comments/ Corrective Action
9/26/18	GN	DAISY	0.0060	0.0602	0.0601	0.0602	100.2718	P	0.09625	P	N	R-10 ~~DOD~~	DOD
		THOR	0.3600	0.3608	0.3605	0.3606	100.1759	P	0.0424	P	N	GN	
		↓	0.2400	0.2409	0.2405	0.2407	100.2917	P	0.0833	P	N	9/26/18	
		↓	0.7500	0.7503	0.7505	0.7504	100.0533	P	0.0133	P	N		
		Frank	1.5000	1.5003	1.5007	1.5006	100.0356	P	0.0133	P	N		
↓	↓	Nessy	6.0000	6.0015	6.0019	6.0011	100.0172	P	0.0096	P	N	↓	↓
9/28/18	mmr	Hank	5.000	5.0220	5.0131	5.0078	100.286	P	0.143	P	N	R-10	DOD
↓	↓	Thor	1.000	1.0053	1.0021	1.0020	100.31	P	0.188	P	N	↓	Monthly / DOD
↓	↓	↓	0.5000	0.5007	0.5004	0.5005	100.10	P	0.031	P	N	↓	↓
↓	↓	↓	0.2000	0.1978	0.1980	0.1980	98.97	P	0.058	P	N	↓	↓
							mmr 10/2/18						

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Analyte: Ferrous Iron By Standard Methods Analyst: MAR Date: 9/27/18

Method: 3500-Fe,D Pipette: THOR , HANK Time: 20:00

Instrument: UV-1600PC (R-UV-VIS-05)DOD Pipet Check: WC147 P. 47 Balance: NA

Calibration:

Std	Conc.	Absorb.	Result	% Rec
1	0.00	0.000	-0.001	
2	0.10	0.010	0.097	96.6%
3	0.20	0.021	0.204	101.9%
4	0.30	0.031	0.301	100.4%
5	0.40	0.041	0.399	99.7%
6	0.80	0.081	0.788	98.5%
7	1.00	0.103	1.003	100.3%
8	2.00	0.207	2.016	100.8%
9	3.00	0.308	3.000	100.0%
10	4.00	0.410	3.994	99.8%

Curve Date: 7/16/2018
C.C = 0.999986
y-int. = 0.000084
Slope: 0.102641
Wavelength: 510nm

	Misc.	Order #	Absorb.	Color Blk, if nec.	Abs. Difference Sample - Color	mg/L	Dilution	Final Result (mg/L)/(mg/Kg	Check if Soil
1	TV=2.0	ICV	0.202		0.202	1.9672	1.0	1.967	
2		ICB	0.000		0.000	-0.0008	1.0	-0.001	
3	TV=0.4	LCS	0.038		0.038	0.3694	1.0	0.369	
4		CCV	0.204		0.204	1.9867	1.0	1.987	
5		CCB	0.000		0.000	-0.0008	1.0	-0.001	
6		LCS	0.040		0.040	0.3889	1.0	0.389	
7		R1809340-001	0.285	0.005	0.285	2.7759	10.0	27.759	
8		R1809340-001 MS	0.315	0.005	0.315	3.0681	10.0	30.681	
9		R1809340-001 DMS	0.307	0.005	0.307	2.9902	10.0	29.902	
10		R1809340-002	0.154	0.012	0.142	1.3826	1.0	1.383	
11		R1809340-003	0.157	0.012	0.145	1.4119	1.0	1.412	
12		R1809340-004	0.126	0.030	0.096	0.9345	1.0	0.934	
13		CCV	0.204		0.204	1.9867	1.0	1.987	
14		CCB	0.000		0.000	-0.0008	1.0	-0.001	

ALS Environmental
1565 Jefferson Rd., Rochester, NY 14623

General Chemistry Analytical Run Cover Sheet

Analyst: MMR Date: 9/27/18

Analysis: Ferrous Iron by Method 3500-Fe, D. Instrument: R-UV-VIS-05

Quality Control:

	Same as Log#, Date,	Stocks Prep. Log#, Date,	Stock Sol (mLs)	Stock Sol (mg/L)	Final Vol (mLs)	True Value (mg/L)
a) Standards Prep.:	WC126121A,11/25/13	WC149110A, 10/13/15				
b) ICV Preparation:	WC126121B,11/25/13	191837, 7/16/18	2.5	4.0	5	2.00
b2) CCV Preparation:	WC126121B, 11/25/14	191837, 7/16/18				
c) LCS Preparation:	WC126121C, 11/25/14	191836, 7/16/18	0.5	4.0	5	0.40
d) Matrix Spike Prep.:	WC126121C, 11/25/13	191836, 7/16/18	0.5	4.0	5	0.40

Instrument log filled in? (Y) (N)

Packages: Copy and attach Standards Preparation

Comments:

All standards, QC (CCV's, LCS's, Matrix Spikes) and samples are based on the Standard Methods 3500-Fe D. Phenanthroline Method being scaled down by a factor of 10. Hence, 1.0 mL of Ammonium acetate buffer and 2.0 mL of Phenanthroline solution are added to 5.0 mL of sample, standards, or QC and brought to 10.0 mL with DI water. True values are based on sample volumes of 5.0 mLs.

Color blank absorbance is not measured where the sample itself is clear or the sample absorbance is less than the PQL. Samples above the PQL do not have their color blank absorbance subtracted if it is less than the absorbance of the low standard (PQL).

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

October 15, 2018

Marcia Olive
Bhate Environmental Associates, Inc.
445 Union Blvd Ste 129
Lakewood, CO 80228

Work Order: **HS18091510**

Laboratory Results for: **LHAAP-58**

Dear Marcia,

ALS Environmental received 4 sample(s) on Sep 28, 2018 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,

Generated By: DAYNA.FISHER
RJ Modashia
Project Manager

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Work Order: HS18091510

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18091510-01	35AWW24_092718	Groundwater		27-Sep-2018 09:30	28-Sep-2018 08:55	☐
HS18091510-02	35AWW19_092718	Groundwater		27-Sep-2018 10:35	28-Sep-2018 08:55	☐
HS18091510-03	35AWW11_092718	Groundwater		27-Sep-2018 11:50	28-Sep-2018 08:55	☐
HS18091510-04	Trip Blank	Water	ALS 090718-90	27-Sep-2018 00:00	28-Sep-2018 08:55	☐

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc. **CASE NARRATIVE**
Project: LHAAP-58
Work Order: HS18091510

Work Order Comments

- The analyses for RSK-175 Dissolved Gases and CO2 were subcontracted to ALS Environmental in Simi Valley, CA. Final Report attached.

  The analyses for Ferrous Iron and Volatile Fatty Acids were subcontracted to ALS Environmental in Rochester, NY. Final Report attached.

  The analysis for TOC was subcontracted to ALS Environmental in Kelso, WA. Final Report attached.

  The analyses for DHC/DHB were subcontracted to Microbial Insights in Knoxville, TN. Final Report attached.

GCMS Volatiles by Method SW8260

Batch ID: R325112

Sample ID: 35AWW24_092718 (HS18091510-01MS)

- MS and/or MSD recovered outside control limits for multiple compounds

Metals by Method SW6020

Batch ID: 133110

Sample ID: 35AWW24_092718 (HS18091510-01MS)

- The recovery of the Matrix Spike (MS) associated to this analyte was outside of the established control limits. However, the LCS was within control limits. The recovery of the MS may be due to sample matrix interference. Iron and Manganese.

Sample ID: 35AWW24_092718 (HS18091510-01MSD)

- The recovery of the Matrix Spike Duplicate (MSD) associated to this analyte was outside of the established control limits. However, the LCS was within control limits. The failed recovery of the MSD may be due to sample matrix interference. Iron and Manganese.

Sample ID: 35AWW24_092718 (HS18091510-01PDS)

- The recovery of the Post Digestion Spike was outside of the control limit. Iron.

Batch ID: 133107

Sample ID: 35AWW24_092718 (HS18091510-01MS)

- Iron failed in the MS/MSD but passed in the PDS.

WetChemistry by Method E376.1

Batch ID: R324851

Sample ID: HS18091438-01MS

- MS is for an unrelated sample

WetChemistry by Method SM2320B

Batch ID: R324730

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

WetChemistry by Method SW9056

Batch ID: R324594

Sample ID: 35AWW11_092718 (HS18091510-03)

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Work Order: HS18091510

CASE NARRATIVE

WetChemistry by Method SW9056

Batch ID: R324594

- The reporting limit is elevated due to dilution for high concentrations of non-target analytes. (Nitrogen, Nitrate (As N),Nitrogen, Nitrite (As N))

Sample ID: 35AWW24_092718 (HS18091510-01MS)

- 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)

Sample ID: HS18091438-01MS

- MS and MSD are for an unrelated sample (Chloride)

WetChemistry by Method E365.3

Batch ID: 133178

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW24_092718
Collection Date: 27-Sep-2018 09:30

ANALYTICAL REPORT
WorkOrder:HS18091510
Lab ID:HS18091510-01
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:34
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	10-Oct-2018 14:34
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	10-Oct-2018 14:34
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:34
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	10-Oct-2018 14:34
Acetone	2.0	U	0.40	2.0	2.0	ug/L	1	10-Oct-2018 14:34
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	10-Oct-2018 14:34
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34

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

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW24_092718
Collection Date: 27-Sep-2018 09:30

ANALYTICAL REPORT
WorkOrder:HS18091510
Lab ID:HS18091510-01
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	10-Oct-2018 14:34
Methylene chloride	0.50	U	0.40	0.50	2.0	ug/L	1	10-Oct-2018 14:34
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:34
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:34
Surr: 1,2-Dichloroethane-d4	*94.5*			**0**	*81-118*	*%REC*	*1*	*10-Oct-2018 14:34*
Surr: 4-Bromofluorobenzene	*92.4*			**0**	*85-114*	*%REC*	*1*	*10-Oct-2018 14:34*
Surr: Dibromofluoromethane	*87.6*			**0**	*80-119*	*%REC*	*1*	*10-Oct-2018 14:34*
Surr: Toluene-d8	*106*			**0**	*89-112*	*%REC*	*1*	*10-Oct-2018 14:34*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 03-Oct-2018		Analyst: JDE
Iron	**1.06**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	12-Oct-2018 15:45
Manganese	**0.108**		**0.000700**	**0.00100**	**0.00500**	**mg/L**	1	12-Oct-2018 15:45
DISSOLVED METALS BY SW6020A		**Method:SW6020 (dissolved)**				Prep:SW3010A / 03-Oct-2018		Analyst: JDE
Iron	**6.55**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	12-Oct-2018 14:15
Manganese	**0.127**		**0.000700**	**0.00100**	**0.00500**	**mg/L**	1	12-Oct-2018 14:15
PHOSPHORUS BY E365.3		**Method:E365.3**				Prep:E365.3 / 04-Oct-2018		Analyst: MZD
Phosphorus, Total (As P)	**0.0620**		**0.0200**	**0.0250**	**0.0500**	**mg/L**	1	04-Oct-2018 14:35
SULFIDE BY E376.1		**Method:E376.1**						Analyst: KVL
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	03-Oct-2018 11:45

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

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW24_092718
Collection Date: 27-Sep-2018 09:30

ANALYTICAL REPORT
WorkOrder:HS18091510
Lab ID:HS18091510-01
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**50.8**		**5.00**	**5.00**	**5.00**	**mg/L**	1	04-Oct-2018 14:39
ANIONS BY SW9056A		**Method:SW9056**						Analyst: AJH
Chloride	**110**		**2.00**	**5.00**	**5.00**	**mg/L**	10	28-Sep-2018 16:28
Nitrogen, Nitrate (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	28-Sep-2018 15:45
Nitrogen, Nitrite (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	28-Sep-2018 15:45
Sulfate	**69.9**		**0.200**	**0.500**	**0.500**	**mg/L**	1	28-Sep-2018 15:45
SUBCONTRACT ANALYSIS - DHC/DHB		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	03-Oct-2018 15:10
SUBCONTRACT ANALYSIS - FERROUS IRON		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	09-Oct-2018 14:23
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 09:55
SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51

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

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW19_092718
Collection Date: 27-Sep-2018 10:35

ANALYTICAL REPORT
WorkOrder:HS18091510
Lab ID:HS18091510-02
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,1-Dichloroethane	**1.8**		**0.20**	**0.50**	**1.0**	**ug/L**	1	10-Oct-2018 14:59
1,1-Dichloroethene	**8.8**		**0.20**	**0.50**	**1.0**	**ug/L**	1	10-Oct-2018 14:59
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,2-Dichloroethane	**2.4**		**0.20**	**0.50**	**1.0**	**ug/L**	1	10-Oct-2018 14:59
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:59
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	10-Oct-2018 14:59
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	10-Oct-2018 14:59
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:59
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	10-Oct-2018 14:59
Acetone	2.0	U	0.40	2.0	2.0	ug/L	1	10-Oct-2018 14:59
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	10-Oct-2018 14:59
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59

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

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW19_092718
Collection Date: 27-Sep-2018 10:35

ANALYTICAL REPORT
WorkOrder:HS18091510
Lab ID:HS18091510-02
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	10-Oct-2018 14:59
Methylene chloride	0.50	U	0.40	0.50	2.0	ug/L	1	10-Oct-2018 14:59
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 14:59
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Trichloroethene	**0.59**	J	**0.20**	**0.50**	**1.0**	**ug/L**	1	10-Oct-2018 14:59
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 14:59
Surr: 1,2-Dichloroethane-d4	*94.0*			**0**	*81-118*	*%REC*	*1*	*10-Oct-2018 14:59*
Surr: 4-Bromofluorobenzene	*92.6*			**0**	*85-114*	*%REC*	*1*	*10-Oct-2018 14:59*
Surr: Dibromofluoromethane	*88.3*			**0**	*80-119*	*%REC*	*1*	*10-Oct-2018 14:59*
Surr: Toluene-d8	*107*			**0**	*89-112*	*%REC*	*1*	*10-Oct-2018 14:59*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 03-Oct-2018		Analyst: JDE
Iron	**4.24**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	12-Oct-2018 15:55
Manganese	**6.39**		**0.00700**	**0.0100**	**0.0500**	**mg/L**	10	12-Oct-2018 17:33
DISSOLVED METALS BY SW6020A		**Method:SW6020 (dissolved)**				Prep:SW3010A / 03-Oct-2018		Analyst: JDE
Iron	**4.22**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	12-Oct-2018 14:25
Manganese	**6.27**		**0.00700**	**0.0100**	**0.0500**	**mg/L**	10	12-Oct-2018 16:17
PHOSPHORUS BY E365.3		**Method:E365.3**				Prep:E365.3 / 04-Oct-2018		Analyst: MZD
Phosphorus, Total (As P)	**0.0340**	J	**0.0200**	**0.0250**	**0.0500**	**mg/L**	1	04-Oct-2018 14:35
SULFIDE BY E376.1		**Method:E376.1**						Analyst: KVL
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	03-Oct-2018 11:45

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

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW19_092718
Collection Date: 27-Sep-2018 10:35

ANALYTICAL REPORT
WorkOrder:HS18091510
Lab ID:HS18091510-02
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**213**		**5.00**	**5.00**	**5.00**	**mg/L**	1	04-Oct-2018 14:51
ANIONS BY SW9056A		**Method:SW9056**						Analyst: AJH
Chloride	**1,230**		**20.0**	**50.0**	**50.0**	**mg/L**	100	28-Sep-2018 17:56
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	28-Sep-2018 17:12
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	28-Sep-2018 17:12
Sulfate	**989**		**20.0**	**50.0**	**50.0**	**mg/L**	100	28-Sep-2018 17:56
SUBCONTRACT ANALYSIS - DHC/DHB		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	03-Oct-2018 15:10
SUBCONTRACT ANALYSIS - FERROUS IRON		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	09-Oct-2018 14:23
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 09:55
SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51

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

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW11_092718
Collection Date: 27-Sep-2018 11:50

ANALYTICAL REPORT
WorkOrder:HS18091510
Lab ID:HS18091510-03
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,1-Dichloroethane	**1.0**		**0.20**	**0.50**	**1.0**	**ug/L**	1	10-Oct-2018 15:49
1,1-Dichloroethene	**2.3**		**0.20**	**0.50**	**1.0**	**ug/L**	1	10-Oct-2018 15:49
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 15:49
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
2-Butanone	**330**		**0.50**	**1.0**	**2.0**	**ug/L**	1	10-Oct-2018 15:49
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	10-Oct-2018 15:49
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 15:49
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	10-Oct-2018 15:49
Acetone	**590**		**2.0**	**10**	**10**	**ug/L**	5	10-Oct-2018 17:29
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Carbon disulfide	**5.0**		**0.60**	**1.0**	**2.0**	**ug/L**	1	10-Oct-2018 15:49
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49

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

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW11_092718
Collection Date: 27-Sep-2018 11:50

ANALYTICAL REPORT
WorkOrder:HS18091510
Lab ID:HS18091510-03
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	10-Oct-2018 15:49
Methylene chloride	0.50	U	0.40	0.50	2.0	ug/L	1	10-Oct-2018 15:49
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 15:49
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 15:49
Surr: 1,2-Dichloroethane-d4	*92.8*			**0**	*81-118*	*%REC*	*1*	*10-Oct-2018 15:49*
Surr: 1,2-Dichloroethane-d4	*92.7*			**0**	*81-118*	*%REC*	*5*	*10-Oct-2018 17:29*
Surr: 4-Bromofluorobenzene	*94.0*			**0**	*85-114*	*%REC*	*1*	*10-Oct-2018 15:49*
Surr: 4-Bromofluorobenzene	*94.1*			**0**	*85-114*	*%REC*	*5*	*10-Oct-2018 17:29*
Surr: Dibromofluoromethane	*91.9*			**0**	*80-119*	*%REC*	*1*	*10-Oct-2018 15:49*
Surr: Dibromofluoromethane	*90.9*			**0**	*80-119*	*%REC*	*5*	*10-Oct-2018 17:29*
Surr: Toluene-d8	*103*			**0**	*89-112*	*%REC*	*1*	*10-Oct-2018 15:49*
Surr: Toluene-d8	*105*			**0**	*89-112*	*%REC*	*5*	*10-Oct-2018 17:29*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 03-Oct-2018		Analyst: JDE
Iron	**31.7**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	12-Oct-2018 15:57
Manganese	**6.21**		**0.00700**	**0.0100**	**0.0500**	**mg/L**	10	12-Oct-2018 17:35
DISSOLVED METALS BY SW6020A		**Method:SW6020 (dissolved)**				Prep:SW3010A / 03-Oct-2018		Analyst: JDE
Iron	**31.7**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	12-Oct-2018 14:27
Manganese	**6.53**		**0.00700**	**0.0100**	**0.0500**	**mg/L**	10	12-Oct-2018 16:19

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

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW11_092718
Collection Date: 27-Sep-2018 11:50

ANALYTICAL REPORT
WorkOrder:HS18091510
Lab ID:HS18091510-03
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
PHOSPHORUS BY E365.3		**Method:E365.3**				Prep:E365.3 / 04-Oct-2018		Analyst: MZD
Phosphorus, Total (As P)	**0.341**		**0.0200**	**0.0250**	**0.0500**	**mg/L**	1	04-Oct-2018 14:35
SULFIDE BY E376.1		**Method:E376.1**						Analyst: KVL
Sulfide	**22.4**		**1.00**	**1.00**	**1.00**	**mg/L**	1	03-Oct-2018 11:45
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**1,190**		**5.00**	**5.00**	**5.00**	**mg/L**	1	04-Oct-2018 15:02
ANIONS BY SW9056A		**Method:SW9056**						Analyst: AJH
Chloride	**2,110**		**20.0**	**50.0**	**50.0**	**mg/L**	100	28-Sep-2018 19:08
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	28-Sep-2018 18:39
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	28-Sep-2018 18:39
Sulfate	**285**		**2.00**	**5.00**	**5.00**	**mg/L**	10	28-Sep-2018 18:54
SUBCONTRACT ANALYSIS - DHC/DHB		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	03-Oct-2018 15:10
SUBCONTRACT ANALYSIS - FERROUS IRON		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	09-Oct-2018 14:23
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 09:55
SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	11-Oct-2018 12:51

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

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: Trip Blank
Collection Date: 27-Sep-2018 00:00

ANALYTICAL REPORT
WorkOrder:HS18091510
Lab ID:HS18091510-04
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 13:44
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
2-Butanone	1.0	U	0.50	1.0	2.0	ug/L	1	10-Oct-2018 13:44
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
2-Hexanone	1.0	U	1.0	1.0	2.0	ug/L	1	10-Oct-2018 13:44
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 13:44
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	ug/L	1	10-Oct-2018 13:44
Acetone	2.0	U	0.40	2.0	2.0	ug/L	1	10-Oct-2018 13:44
Benzene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Bromobenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Bromochloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Bromodichloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Bromoform	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Bromomethane	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Carbon disulfide	1.0	U	0.60	1.0	2.0	ug/L	1	10-Oct-2018 13:44
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Chlorobenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Chloroethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Chloroform	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44

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

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: Trip Blank
Collection Date: 27-Sep-2018 00:00

ANALYTICAL REPORT
WorkOrder:HS18091510
Lab ID:HS18091510-04
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Dibromochloromethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Dibromomethane	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Ethylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Hexachlorobutadiene	0.50	U	1.0	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Isopropylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
m,p-Xylene	1.0	U	0.50	1.0	2.0	ug/L	1	10-Oct-2018 13:44
Methylene chloride	0.50	U	0.40	0.50	2.0	ug/L	1	10-Oct-2018 13:44
n-Butylbenzene	0.50	U	0.40	0.50	1.0	ug/L	1	10-Oct-2018 13:44
n-Propylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Naphthalene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
o-Xylene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Styrene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Tetrachloroethene	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Toluene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Trichloroethene	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Vinyl chloride	0.50	U	0.20	0.50	1.0	ug/L	1	10-Oct-2018 13:44
Surr: 1,2-Dichloroethane-d4	*93.3*			**0**	*81-118*	*%REC*	*1*	*10-Oct-2018 13:44*
Surr: 4-Bromofluorobenzene	*92.9*			**0**	*85-114*	*%REC*	*1*	*10-Oct-2018 13:44*
Surr: Dibromofluoromethane	*88.0*			**0**	*80-119*	*%REC*	*1*	*10-Oct-2018 13:44*
Surr: Toluene-d8	*107*			**0**	*89-112*	*%REC*	*1*	*10-Oct-2018 13:44*

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

ALS Houston, US

Date: 15-Oct-18

WEIGHT LOG

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

Batch ID: 133107 **Method:** ICP-MS METALS BY SW6020A **Prep:** 3010A

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18091510-01	1	10	10 (mL)	1
HS18091510-02	1	10	10 (mL)	1
HS18091510-03	1	10	10 (mL)	1

Batch ID: 133110 **Method:** DISSOLVED METALS BY SW6020A **Prep:** 3010A DISS

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18091510-01	1	10	10 (mL)	1
HS18091510-02	1	10	10 (mL)	1
HS18091510-03	1	10	10 (mL)	1

Batch ID: 133178 **Method:** PHOSPHORUS BY E365.3 **Prep:** P_TW_PR

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18091510-01	1	50	50 (mL)	1
HS18091510-02	1	50	50 (mL)	1
HS18091510-03	1	50	50 (mL)	1

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID 133107	**Test Name :** ICP-MS METALS BY SW6020A			**Matrix:** Groundwater		
HS18091510-01	35AWW24_092718	27 Sep 2018 09:30		03 Oct 2018 10:00	12 Oct 2018 15:45	1
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35		03 Oct 2018 10:00	12 Oct 2018 17:33	10
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35		03 Oct 2018 10:00	12 Oct 2018 15:55	1
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50		03 Oct 2018 10:00	12 Oct 2018 17:35	10
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50		03 Oct 2018 10:00	12 Oct 2018 15:57	1
Batch ID 133110	**Test Name :** DISSOLVED METALS BY SW6020A			**Matrix:** Groundwater		
HS18091510-01	35AWW24_092718	27 Sep 2018 09:30		03 Oct 2018 11:00	12 Oct 2018 14:15	1
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35		03 Oct 2018 11:00	12 Oct 2018 16:17	10
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35		03 Oct 2018 11:00	12 Oct 2018 14:25	1
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50		03 Oct 2018 11:00	12 Oct 2018 16:19	10
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50		03 Oct 2018 11:00	12 Oct 2018 14:27	1
Batch ID 133178	**Test Name :** PHOSPHORUS BY E365.3			**Matrix:** Groundwater		
HS18091510-01	35AWW24_092718	27 Sep 2018 09:30		04 Oct 2018 09:30	04 Oct 2018 14:35	1
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35		04 Oct 2018 09:30	04 Oct 2018 14:35	1
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50		04 Oct 2018 09:30	04 Oct 2018 14:35	1
Batch ID R324594	**Test Name :** ANIONS BY SW9056A			**Matrix:** Groundwater		
HS18091510-01	35AWW24_092718	27 Sep 2018 09:30			28 Sep 2018 16:28	10
HS18091510-01	35AWW24_092718	27 Sep 2018 09:30			28 Sep 2018 15:45	1
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35			28 Sep 2018 17:56	100
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35			28 Sep 2018 17:12	2
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50			28 Sep 2018 19:08	100
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50			28 Sep 2018 18:54	10
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50			28 Sep 2018 18:39	2
Batch ID R324652	**Test Name :** SUBCONTRACT ANALYSIS - DHC/DHB			**Matrix:** Groundwater		
HS18091510-01	35AWW24_092718	27 Sep 2018 09:30			03 Oct 2018 15:10	1
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35			03 Oct 2018 15:10	1
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50			03 Oct 2018 15:10	1
Batch ID R324730	**Test Name :** ALKALINITY BY SM2320B			**Matrix:** Groundwater		
HS18091510-01	35AWW24_092718	27 Sep 2018 09:30			04 Oct 2018 14:39	1
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35			04 Oct 2018 14:51	1
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50			04 Oct 2018 15:02	1
Batch ID R324851	**Test Name :** SULFIDE BY E376.1			**Matrix:** Groundwater		
HS18091510-01	35AWW24_092718	27 Sep 2018 09:30			03 Oct 2018 11:45	1
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35			03 Oct 2018 11:45	1
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50			03 Oct 2018 11:45	1

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID R325032	**Test Name :** SUBCONTRACT ANALYSIS - RSK				**Matrix:** Groundwater	
HS18091510-01	35AWW24_092718	27 Sep 2018 09:30			09 Oct 2018 14:23	1
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35			09 Oct 2018 14:23	1
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50			09 Oct 2018 14:23	1
Batch ID R325112	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C				**Matrix:** Water	
HS18091510-04	Trip Blank	27 Sep 2018 00:00			10 Oct 2018 13:44	1
Batch ID R325112	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C				**Matrix:** Groundwater	
HS18091510-01	35AWW24_092718	27 Sep 2018 09:30			10 Oct 2018 14:34	1
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35			10 Oct 2018 14:59	1
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50			10 Oct 2018 17:29	5
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50			10 Oct 2018 15:49	1
Batch ID R325174	**Test Name :** SUBCONTRACT ANALYSIS - TOC ANALYSIS				**Matrix:** Groundwater	
HS18091510-01	35AWW24_092718	27 Sep 2018 09:30			11 Oct 2018 09:55	1
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35			11 Oct 2018 09:55	1
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50			11 Oct 2018 09:55	1
Batch ID R325206	**Test Name :** SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS				**Matrix:** Groundwater	
HS18091510-01	35AWW24_092718	27 Sep 2018 09:30			11 Oct 2018 12:51	1
HS18091510-01	35AWW24_092718	27 Sep 2018 09:30			11 Oct 2018 12:51	1
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35			11 Oct 2018 12:51	1
HS18091510-02	35AWW19_092718	27 Sep 2018 10:35			11 Oct 2018 12:51	1
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50			11 Oct 2018 12:51	1
HS18091510-03	35AWW11_092718	27 Sep 2018 11:50			11 Oct 2018 12:51	1

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: 133107 **Instrument: ICPMS05** **Method: SW6020**

MBLK Sample ID: **MBLK-133107** Units: **mg/L** Analysis Date: **12-Oct-2018 14:11**
Client ID: Run ID: **ICPMS05_325303** SeqNo: **4770574** PrepDate: **03-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	0.100	0.200								U
Manganese	0.000827	0.00500								J

LCS Sample ID: **LCS-133107** Units: **mg/L** Analysis Date: **12-Oct-2018 14:13**
Client ID: Run ID: **ICPMS05_325303** SeqNo: **4770575** PrepDate: **03-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	4.734	0.200	5	0	94.7	80 - 120				
Manganese	0.04672	0.00500	0.05	0	93.4	80 - 120				

MS Sample ID: **HS18091510-01MS** Units: **mg/L** Analysis Date: **12-Oct-2018 15:49**
Client ID: **35AWW24_092718** Run ID: **ICPMS05_325303** SeqNo: **4770719** PrepDate: **03-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	8.85	0.200	5	1.06	156	80 - 120				S
Manganese	0.1588	0.00500	0.05	0.1081	101	80 - 120				

MSD Sample ID: **HS18091510-01MSD** Units: **mg/L** Analysis Date: **12-Oct-2018 17:50**
Client ID: **35AWW24_092718** Run ID: **ICPMS05_325303** SeqNo: **4771036** PrepDate: **03-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	9.125	0.200	5	1.06	161	80 - 120	8.85	3.07	20	S

MSD Sample ID: **HS18091510-01MSD** Units: **mg/L** Analysis Date: **12-Oct-2018 15:51**
Client ID: **35AWW24_092718** Run ID: **ICPMS05_325303** SeqNo: **4770720** PrepDate: **03-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Manganese	0.1622	0.00500	0.05	0.1081	108	80 - 120	0.1588	2.08	20	

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: 133107 **Instrument: ICPMS05** **Method: SW6020**

PDS Sample ID: **HS18091510-01PDS** Units: **mg/L** Analysis Date: **12-Oct-2018 15:53**
Client ID: **35AWW24_092718** Run ID: **ICPMS05_325303** SeqNo: **4770721** PrepDate: **03-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	12.38	0.200	10	1.06	113	75 - 125				
Manganese	0.1982	0.00500	0.1	0.1081	90.1	75 - 125				

SD Sample ID: **HS18091510-01SD** Units: **mg/L** Analysis Date: **12-Oct-2018 15:47**
Client ID: **35AWW24_092718** Run ID: **ICPMS05_325303** SeqNo: **4770718** PrepDate: **03-Oct-2018** DF: **5**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Iron	1.076	1.00					1.06	1.54	10	
Manganese	0.1133	0.0250					0.1081	4.76	10	

The following samples were analyzed in this batch: HS18091510-01 HS18091510-02 HS18091510-03

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: 133110 **Instrument: ICPMS05** **Method: SW6020 (dissolved) (DISSOLVED)**

MBLK Sample ID: **MBLK-133110** Units: **mg/L** Analysis Date: **12-Oct-2018 14:03**
Client ID: Run ID: **ICPMS05_325303** SeqNo: **4770570** PrepDate: **03-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	0.100	0.200								U
Manganese	0.00100	0.00500								U

LCS Sample ID: **LCS-133110** Units: **mg/L** Analysis Date: **12-Oct-2018 14:05**
Client ID: Run ID: **ICPMS05_325303** SeqNo: **4770571** PrepDate: **03-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	4.834	0.200	5	0	96.7	80 - 120				
Manganese	0.04756	0.00500	0.05	0	95.1	80 - 120				

MS Sample ID: **HS18091510-01MS** Units: **mg/L** Analysis Date: **12-Oct-2018 14:19**
Client ID: **35AWW24_092718** Run ID: **ICPMS05_325303** SeqNo: **4770585** PrepDate: **03-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	8.65	0.200	5	6.551	42.0	75 - 125				S
Manganese	0.1569	0.00500	0.05	0.1266	60.6	75 - 125				S

MSD Sample ID: **HS18091510-01MSD** Units: **mg/L** Analysis Date: **12-Oct-2018 14:21**
Client ID: **35AWW24_092718** Run ID: **ICPMS05_325303** SeqNo: **4770586** PrepDate: **03-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	7.793	0.200	5	6.551	24.8	75 - 125	8.65	10.4	20	S
Manganese	0.1553	0.00500	0.05	0.1266	57.3	75 - 125	0.1569	1.06	20	S

PDS Sample ID: **HS18091510-01PDS** Units: **mg/L** Analysis Date: **12-Oct-2018 14:23**
Client ID: **35AWW24_092718** Run ID: **ICPMS05_325303** SeqNo: **4770587** PrepDate: **03-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	14	0.200	10	6.551	74.4	75 - 125				S
Manganese	0.2076	0.00500	0.1	0.1266	80.9	75 - 125				

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: 133110 **Instrument: ICPMS05** **Method: SW6020 (dissolved) (DISSOLVED)**

SD Sample ID: **HS18091510-01SD** Units: **mg/L** Analysis Date: **12-Oct-2018 14:17**
Client ID: **35AWW24_092718** Run ID: **ICPMS05_325303** SeqNo: **4770584** PrepDate: **03-Oct-2018** DF: **5**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Iron	6.921	1.00					6.551	5.65	10	
Manganese	0.1319	0.0250					0.1266	4.16	10	

The following samples were analyzed in this batch: HS18091510-01 HS18091510-02 HS18091510-03

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R325112 **Instrument: VOA9** **Method: SW8260**

MBLK Sample ID: **VBLKW-181010** Units: **ug/L** Analysis Date: **10-Oct-2018 13:18**
Client ID: Run ID: **VOA9_325112** SeqNo: **4767275** 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-Trichloroethane	0.50	1.0								U
1,1-Dichloroethane	0.50	1.0								U
1,1-Dichloroethene	0.50	1.0								U
1,1-Dichloropropene	0.50	1.0								U
1,2,3-Trichlorobenzene	0.50	1.0								U
1,2,3-Trichloropropane	0.50	1.0								U
1,2,4-Trichlorobenzene	0.50	1.0								U
1,2,4-Trimethylbenzene	0.50	1.0								U
1,2-Dibromo-3-chloropropane	0.50	1.0								U
1,2-Dibromoethane	0.50	1.0								U
1,2-Dichlorobenzene	0.50	1.0								U
1,2-Dichloroethane	0.50	1.0								U
1,2-Dichloropropane	0.50	1.0								U
1,3,5-Trimethylbenzene	0.50	1.0								U
1,3-Dichlorobenzene	0.50	1.0								U
1,3-Dichloropropane	0.50	1.0								U
1,4-Dichlorobenzene	0.50	1.0								U
2,2-Dichloropropane	0.50	1.0								U
2-Butanone	1.0	2.0								U
2-Chlorotoluene	0.50	1.0								U
2-Hexanone	1.0	2.0								U
4-Chlorotoluene	0.50	1.0								U
4-Isopropyltoluene	0.50	1.0								U
4-Methyl-2-pentanone	1.0	2.0								U
Acetone	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
Bromomethane	0.50	1.0								U

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R325112 **Instrument: VOA9** **Method: SW8260**

MBLK Sample ID: **VBLKW-181010** Units: **ug/L** Analysis Date: **10-Oct-2018 13:18**
Client ID: Run ID: **VOA9_325112** SeqNo: **4767275** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
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	0.50	1.0								U
Isopropylbenzene	0.50	1.0								U
m,p-Xylene	1.0	2.0								U
Methylene chloride	0.50	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	*46.61*	*1.0*	*50*	*0*	*93.2*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*46.1*	*1.0*	*50*	*0*	*92.2*	*85 - 114*				
Surr: Dibromofluoromethane	*44.09*	*1.0*	*50*	*0*	*88.2*	*80 - 119*				
Surr: Toluene-d8	*53.57*	*1.0*	*50*	*0*	*107*	*89 - 112*				

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R325112 **Instrument: VOA9** **Method: SW8260**

LCS Sample ID: **VLCSW-181010** Units: **ug/L** Analysis Date: **10-Oct-2018 12:28**
Client ID: Run ID: **VOA9_325112** SeqNo: **4767274** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
1,1,1,2-Tetrachloroethane	18.99	1.0	20	0	95.0	78 - 124				
1,1,1-Trichloroethane	17.03	1.0	20	0	85.1	74 - 131				
1,1,2,2-Tetrachloroethane	21.24	1.0	20	0	106	71 - 121				
1,1,2-Trichloroethane	20.27	1.0	20	0	101	80 - 119				
1,1-Dichloroethane	18.77	1.0	20	0	93.8	77 - 125				
1,1-Dichloroethene	18.27	1.0	20	0	91.4	71 - 131				
1,1-Dichloropropene	19.97	1.0	20	0	99.8	78 - 125				
1,2,3-Trichlorobenzene	21.23	1.0	20	0	106	69 - 129				
1,2,3-Trichloropropane	19.25	1.0	20	0	96.3	73 - 122				
1,2,4-Trichlorobenzene	21.48	1.0	20	0	107	69 - 130				
1,2,4-Trimethylbenzene	20.67	1.0	20	0	103	76 - 124				
1,2-Dibromo-3-chloropropane	16.67	1.0	20	0	83.4	62 - 128				
1,2-Dibromoethane	19.84	1.0	20	0	99.2	77 - 121				
1,2-Dichlorobenzene	21.14	1.0	20	0	106	80 - 119				
1,2-Dichloroethane	19.91	1.0	20	0	99.6	73 - 128				
1,2-Dichloropropane	20.83	1.0	20	0	104	78 - 122				
1,3,5-Trimethylbenzene	20.51	1.0	20	0	103	75 - 124				
1,3-Dichlorobenzene	21.5	1.0	20	0	108	80 - 119				
1,3-Dichloropropane	20.44	1.0	20	0	102	80 - 119				
1,4-Dichlorobenzene	21.7	1.0	20	0	108	79 - 118				
2,2-Dichloropropane	18.32	1.0	20	0	91.6	60 - 139				
2-Butanone	37.7	2.0	40	0	94.2	56 - 143				
2-Chlorotoluene	20.57	1.0	20	0	103	79 - 122				
2-Hexanone	37.77	2.0	40	0	94.4	57 - 139				
4-Chlorotoluene	20.9	1.0	20	0	104	78 - 122				
4-Isopropyltoluene	21.17	1.0	20	0	106	77 - 127				
4-Methyl-2-pentanone	37.79	2.0	40	0	94.5	67 - 130				
Acetone	49.81	2.0	40	0	125	39 - 160				
Benzene	21.02	1.0	20	0	105	79 - 120				
Bromobenzene	19.73	1.0	20	0	98.6	80 - 120				
Bromochloromethane	19.93	1.0	20	0	99.6	78 - 123				
Bromodichloromethane	17.74	1.0	20	0	88.7	79 - 125				
Bromoform	15.07	1.0	20	0	75.4	66 - 130				
Bromomethane	17.72	1.0	20	0	88.6	53 - 141				

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R325112 **Instrument: VOA9** **Method: SW8260**

LCS Sample ID: **VLCSW-181010** Units: **ug/L** Analysis Date: **10-Oct-2018 12:28**
Client ID: Run ID: **VOA9_325112** SeqNo: **4767274** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Carbon disulfide	39.93	2.0	40	0	99.8	64 - 133				
Carbon tetrachloride	17.63	1.0	20	0	88.1	72 - 136				
Chlorobenzene	20.05	1.0	20	0	100	82 - 118				
Chloroethane	20.68	1.0	20	0	103	60 - 138				
Chloroform	18.91	1.0	20	0	94.6	79 - 124				
Chloromethane	19.26	1.0	20	0	96.3	50 - 139				
cis-1,2-Dichloroethene	18.98	1.0	20	0	94.9	78 - 123				
cis-1,3-Dichloropropene	18.37	1.0	20	0	91.8	75 - 124				
Dibromochloromethane	17.9	1.0	20	0	89.5	74 - 126				
Dibromomethane	19.13	1.0	20	0	95.6	79 - 123				
Dichlorodifluoromethane	23.59	1.0	20	0	118	32 - 152				
Ethylbenzene	19.79	1.0	20	0	99.0	79 - 121				
Hexachlorobutadiene	25.19	1.0	20	0	126	66 - 134				
Isopropylbenzene	19.69	1.0	20	0	98.4	72 - 131				
m,p-Xylene	39.47	2.0	40	0	98.7	80 - 121				
Methylene chloride	20.79	2.0	20	0	104	74 - 124				
Naphthalene	20.37	1.0	20	0	102	61 - 128				
n-Butylbenzene	22.13	1.0	20	0	111	75 - 128				
n-Propylbenzene	21.06	1.0	20	0	105	76 - 126				
o-Xylene	19.91	1.0	20	0	99.5	78 - 122				
sec-Butylbenzene	21.15	1.0	20	0	106	77 - 126				
Styrene	20.13	1.0	20	0	101	78 - 123				
tert-Butylbenzene	21.36	1.0	20	0	107	78 - 124				
Tetrachloroethene	19.8	1.0	20	0	99.0	74 - 129				
Toluene	20.76	1.0	20	0	104	80 - 121				
trans-1,2-Dichloroethene	19.3	1.0	20	0	96.5	75 - 124				
trans-1,3-Dichloropropene	17.56	1.0	20	0	87.8	73 - 127				
Trichloroethene	19.21	1.0	20	0	96.0	79 - 123				
Trichlorofluoromethane	17.89	1.0	20	0	89.5	65 - 141				
Vinyl chloride	21.14	1.0	20	0	106	58 - 137				
Surr: 1,2-Dichloroethane-d4	*45.8*	*1.0*	*50*	*0*	*91.6*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*49.86*	*1.0*	*50*	*0*	*99.7*	*85 - 114*				
Surr: Dibromofluoromethane	*46.29*	*1.0*	*50*	*0*	*92.6*	*80 - 119*				
Surr: Toluene-d8	*53.41*	*1.0*	*50*	*0*	*107*	*89 - 112*				

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R325112 **Instrument: VOA9** **Method: SW8260**

MS Sample ID: **HS18091510-01MS** Units: **ug/L** Analysis Date: **10-Oct-2018 16:14**
Client ID: **35AWW24_092718** Run ID: **VOA9_325112** SeqNo: **4767282** 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	20.63	1.0	20	0	103	78 - 124				
1,1,1-Trichloroethane	19.9	1.0	20	0	99.5	74 - 131				
1,1,2,2-Tetrachloroethane	22.42	1.0	20	0	112	71 - 121				
1,1,2-Trichloroethane	21.87	1.0	20	0	109	80 - 119				
1,1-Dichloroethane	21.37	1.0	20	0	107	77 - 125				
1,1-Dichloroethene	21.44	1.0	20	0	107	71 - 131				
1,1-Dichloropropene	22.86	1.0	20	0	114	78 - 125				
1,2,3-Trichlorobenzene	21.53	1.0	20	0	108	69 - 129				
1,2,3-Trichloropropane	20.25	1.0	20	0	101	73 - 122				
1,2,4-Trichlorobenzene	22.01	1.0	20	0	110	69 - 130				
1,2,4-Trimethylbenzene	22.61	1.0	20	0	113	76 - 124				
1,2-Dibromo-3-chloropropane	18.37	1.0	20	0	91.8	62 - 128				
1,2-Dibromoethane	21.41	1.0	20	0	107	77 - 121				
1,2-Dichlorobenzene	22.16	1.0	20	0	111	80 - 119				
1,2-Dichloroethane	21.44	1.0	20	0	107	73 - 128				
1,2-Dichloropropane	22.56	1.0	20	0	113	78 - 122				
1,3,5-Trimethylbenzene	22	1.0	20	0	110	75 - 124				
1,3-Dichlorobenzene	22.7	1.0	20	0	113	80 - 119				
1,3-Dichloropropane	22.3	1.0	20	0	111	80 - 119				
1,4-Dichlorobenzene	22.77	1.0	20	0	114	79 - 118				
2,2-Dichloropropane	19.32	1.0	20	0	96.6	60 - 139				
2-Butanone	40.86	2.0	40	0	102	56 - 143				
2-Chlorotoluene	22.09	1.0	20	0	110	79 - 122				
2-Hexanone	40.55	2.0	40	0	101	57 - 139				
4-Chlorotoluene	22.11	1.0	20	0	111	78 - 122				
4-Isopropyltoluene	22.93	1.0	20	0	115	77 - 127				
4-Methyl-2-pentanone	40.55	2.0	40	0	101	67 - 130				
Acetone	52.15	2.0	40	0	130	39 - 160				
Benzene	23.12	1.0	20	0	116	79 - 120				
Bromobenzene	20.98	1.0	20	0	105	80 - 120				
Bromochloromethane	21.63	1.0	20	0	108	78 - 123				
Bromodichloromethane	19.68	1.0	20	0	98.4	79 - 125				
Bromoform	16.92	1.0	20	0	84.6	66 - 130				
Bromomethane	6.088	1.0	20	0	30.4	53 - 141				S

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R325112 **Instrument: VOA9** **Method: SW8260**

MS Sample ID: **HS18091510-01MS** Units: **ug/L** Analysis Date: **10-Oct-2018 16:14**
Client ID: **35AWW24_092718** Run ID: **VOA9_325112** SeqNo: **4767282** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Carbon disulfide	47.13	2.0	40	0	118	64 - 133				
Carbon tetrachloride	21.48	1.0	20	0	107	72 - 136				
Chlorobenzene	21.97	1.0	20	0	110	82 - 118				
Chloroethane	27.8	1.0	20	0	139	60 - 138				S
Chloroform	20.84	1.0	20	0	104	79 - 124				
Chloromethane	17	1.0	20	0	85.0	50 - 139				
cis-1,2-Dichloroethene	20.33	1.0	20	0	102	78 - 123				
cis-1,3-Dichloropropene	19.35	1.0	20	0	96.8	75 - 124				
Dibromochloromethane	19.81	1.0	20	0	99.1	74 - 126				
Dibromomethane	21.14	1.0	20	0	106	79 - 123				
Dichlorodifluoromethane	23.04	1.0	20	0	115	32 - 152				
Ethylbenzene	21.52	1.0	20	0	108	79 - 121				
Hexachlorobutadiene	24.31	1.0	20	0	122	66 - 134				
Isopropylbenzene	22	1.0	20	0	110	72 - 131				
m,p-Xylene	43.29	2.0	40	0	108	80 - 121				
Methylene chloride	22.42	2.0	20	0	112	74 - 124				
Naphthalene	21.39	1.0	20	0	107	61 - 128				
n-Butylbenzene	23.43	1.0	20	0	117	75 - 128				
n-Propylbenzene	22.97	1.0	20	0	115	76 - 126				
o-Xylene	21.45	1.0	20	0	107	78 - 122				
sec-Butylbenzene	23.02	1.0	20	0	115	77 - 126				
Styrene	21.65	1.0	20	0	108	78 - 123				
tert-Butylbenzene	23.33	1.0	20	0	117	78 - 124				
Tetrachloroethene	22.54	1.0	20	0	113	74 - 129				
Toluene	22.73	1.0	20	0	114	80 - 121				
trans-1,2-Dichloroethene	21.59	1.0	20	0	108	75 - 124				
trans-1,3-Dichloropropene	19.42	1.0	20	0	97.1	73 - 127				
Trichloroethene	21.35	1.0	20	0	107	79 - 123				
Trichlorofluoromethane	21.82	1.0	20	0	109	65 - 141				
Vinyl chloride	23.01	1.0	20	0	115	58 - 137				
Surr: 1,2-Dichloroethane-d4	*46.67*	*1.0*	*50*	*0*	*93.3*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*48.84*	*1.0*	*50*	*0*	*97.7*	*85 - 114*				
Surr: Dibromofluoromethane	*47.81*	*1.0*	*50*	*0*	*95.6*	*80 - 119*				
Surr: Toluene-d8	*53.14*	*1.0*	*50*	*0*	*106*	*89 - 112*				

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R325112 **Instrument: VOA9** **Method: SW8260**

MSD Sample ID: **HS18091510-01MSD** Units: **ug/L** Analysis Date: **10-Oct-2018 16:39**
Client ID: **35AWW24_092718** Run ID: **VOA9_325112** SeqNo: **4767283** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
1,1,1,2-Tetrachloroethane	20.27	1.0	20	0	101	78 - 124	20.63	1.74	20	
1,1,1-Trichloroethane	19.21	1.0	20	0	96.0	74 - 131	19.9	3.53	20	
1,1,2,2-Tetrachloroethane	22.03	1.0	20	0	110	71 - 121	22.42	1.75	20	
1,1,2-Trichloroethane	22.1	1.0	20	0	111	80 - 119	21.87	1.06	20	
1,1-Dichloroethane	20.75	1.0	20	0	104	77 - 125	21.37	2.97	20	
1,1-Dichloroethene	20.63	1.0	20	0	103	71 - 131	21.44	3.85	20	
1,1-Dichloropropene	22.14	1.0	20	0	111	78 - 125	22.86	3.17	20	
1,2,3-Trichlorobenzene	21.71	1.0	20	0	109	69 - 129	21.53	0.818	20	
1,2,3-Trichloropropane	20.24	1.0	20	0	101	73 - 122	20.25	0.0532	20	
1,2,4-Trichlorobenzene	21.45	1.0	20	0	107	69 - 130	22.01	2.58	20	
1,2,4-Trimethylbenzene	21.86	1.0	20	0	109	76 - 124	22.61	3.37	20	
1,2-Dibromo-3-chloropropane	17.7	1.0	20	0	88.5	62 - 128	18.37	3.73	20	
1,2-Dibromoethane	21.27	1.0	20	0	106	77 - 121	21.41	0.632	20	
1,2-Dichlorobenzene	21.66	1.0	20	0	108	80 - 119	22.16	2.28	20	
1,2-Dichloroethane	21.27	1.0	20	0	106	73 - 128	21.44	0.82	20	
1,2-Dichloropropane	22.38	1.0	20	0	112	78 - 122	22.56	0.81	20	
1,3,5-Trimethylbenzene	21.34	1.0	20	0	107	75 - 124	22	3.06	20	
1,3-Dichlorobenzene	22.32	1.0	20	0	112	80 - 119	22.7	1.66	20	
1,3-Dichloropropane	22.09	1.0	20	0	110	80 - 119	22.3	0.947	20	
1,4-Dichlorobenzene	22.5	1.0	20	0	113	79 - 118	22.77	1.18	20	
2,2-Dichloropropane	18.31	1.0	20	0	91.6	60 - 139	19.32	5.35	20	
2-Butanone	41.96	2.0	40	0	105	56 - 143	40.86	2.66	20	
2-Chlorotoluene	21.66	1.0	20	0	108	79 - 122	22.09	1.98	20	
2-Hexanone	41.5	2.0	40	0	104	57 - 139	40.55	2.32	20	
4-Chlorotoluene	21.86	1.0	20	0	109	78 - 122	22.11	1.14	20	
4-Isopropyltoluene	22.52	1.0	20	0	113	77 - 127	22.93	1.78	20	
4-Methyl-2-pentanone	40.71	2.0	40	0	102	67 - 130	40.55	0.394	20	
Acetone	53.86	2.0	40	0	135	39 - 160	52.15	3.22	20	
Benzene	22.4	1.0	20	0	112	79 - 120	23.12	3.15	20	
Bromobenzene	20.47	1.0	20	0	102	80 - 120	20.98	2.44	20	
Bromochloromethane	20.69	1.0	20	0	103	78 - 123	21.63	4.44	20	
Bromodichloromethane	19.21	1.0	20	0	96.0	79 - 125	19.68	2.44	20	
Bromoform	16.77	1.0	20	0	83.9	66 - 130	16.92	0.867	20	
Bromomethane	7.45	1.0	20	0	37.3	53 - 141	6.088	20.1	20	SR

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R325112 **Instrument: VOA9** **Method: SW8260**

MSD Sample ID: **HS18091510-01MSD** Units: **ug/L** Analysis Date: **10-Oct-2018 16:39**
Client ID: **35AWW24_092718** Run ID: **VOA9_325112** SeqNo: **4767283** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
Carbon disulfide	54.62	2.0	40	0	137	64 - 133	47.13	14.7	20	S
Carbon tetrachloride	20.58	1.0	20	0	103	72 - 136	21.48	4.26	20	
Chlorobenzene	21.53	1.0	20	0	108	82 - 118	21.97	2.02	20	
Chloroethane	25.39	1.0	20	0	127	60 - 138	27.8	9.04	20	
Chloroform	20.32	1.0	20	0	102	79 - 124	20.84	2.53	20	
Chloromethane	15.29	1.0	20	0	76.5	50 - 139	17	10.6	20	
cis-1,2-Dichloroethene	19.77	1.0	20	0	98.9	78 - 123	20.33	2.76	20	
cis-1,3-Dichloropropene	18.78	1.0	20	0	93.9	75 - 124	19.35	2.99	20	
Dibromochloromethane	19.48	1.0	20	0	97.4	74 - 126	19.81	1.68	20	
Dibromomethane	20.76	1.0	20	0	104	79 - 123	21.14	1.82	20	
Dichlorodifluoromethane	22.35	1.0	20	0	112	32 - 152	23.04	3.03	20	
Ethylbenzene	21.28	1.0	20	0	106	79 - 121	21.52	1.1	20	
Hexachlorobutadiene	24.53	1.0	20	0	123	66 - 134	24.31	0.92	20	
Isopropylbenzene	21.65	1.0	20	0	108	72 - 131	22	1.62	20	
m,p-Xylene	42.86	2.0	40	0	107	80 - 121	43.29	0.98	20	
Methylene chloride	26.65	2.0	20	0	133	74 - 124	22.42	17.2	20	S
Naphthalene	21.33	1.0	20	0	107	61 - 128	21.39	0.277	20	
n-Butylbenzene	23.1	1.0	20	0	116	75 - 128	23.43	1.39	20	
n-Propylbenzene	22.54	1.0	20	0	113	76 - 126	22.97	1.88	20	
o-Xylene	20.96	1.0	20	0	105	78 - 122	21.45	2.32	20	
sec-Butylbenzene	22.58	1.0	20	0	113	77 - 126	23.02	1.92	20	
Styrene	20.82	1.0	20	0	104	78 - 123	21.65	3.89	20	
tert-Butylbenzene	22.88	1.0	20	0	114	78 - 124	23.33	1.92	20	
Tetrachloroethene	21.9	1.0	20	0	109	74 - 129	22.54	2.92	20	
Toluene	22.42	1.0	20	0	112	80 - 121	22.73	1.35	20	
trans-1,2-Dichloroethene	20.62	1.0	20	0	103	75 - 124	21.59	4.61	20	
trans-1,3-Dichloropropene	18.55	1.0	20	0	92.7	73 - 127	19.42	4.59	20	
Trichloroethene	20.96	1.0	20	0	105	79 - 123	21.35	1.82	20	
Trichlorofluoromethane	20.65	1.0	20	0	103	65 - 141	21.82	5.51	20	
Vinyl chloride	21.51	1.0	20	0	108	58 - 137	23.01	6.74	20	
Surr: 1,2-Dichloroethane-d4	*45.98*	*1.0*	*50*	*0*	*92.0*	*81 - 118*	*46.67*	*1.48*	*20*	
Surr: 4-Bromofluorobenzene	*49.52*	*1.0*	*50*	*0*	*99.0*	*85 - 114*	*48.84*	*1.38*	*20*	
Surr: Dibromofluoromethane	*46.74*	*1.0*	*50*	*0*	*93.5*	*80 - 119*	*47.81*	*2.27*	*20*	
Surr: Toluene-d8	*53.49*	*1.0*	*50*	*0*	*107*	*89 - 112*	*53.14*	*0.653*	*20*	

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R325112 **Instrument: VOA9** **Method: SW8260**

The following samples were analyzed in this batch:	HS18091510-01	HS18091510-02	HS18091510-03	HS18091510-04

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: 133178 **Instrument: UV-2450** **Method: E365.3**

MBLK Sample ID: **MBLK-133178** Units: **mg/L** Analysis Date: **04-Oct-2018 14:35**
Client ID: Run ID: **UV-2450_324727** SeqNo: **4754626** PrepDate: **04-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.0250	0.0500								U

LCS Sample ID: **LCS-133178** Units: **mg/L** Analysis Date: **04-Oct-2018 14:35**
Client ID: Run ID: **UV-2450_324727** SeqNo: **4754625** PrepDate: **04-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.252	0.0500	0.25	0	101	80 - 120				

MS Sample ID: **HS18091510-01MS** Units: **mg/L** Analysis Date: **04-Oct-2018 14:35**
Client ID: **35AWW24_092718** Run ID: **UV-2450_324727** SeqNo: **4754623** PrepDate: **04-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.302	0.0500	0.25	0.062	96.0	80 - 120				

MS Sample ID: **HS18091438-01MS** Units: **mg/L** Analysis Date: **04-Oct-2018 14:35**
Client ID: Run ID: **UV-2450_324727** SeqNo: **4754621** PrepDate: **04-Oct-2018** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	5.18	0.500	2.5	2.67	100	80 - 120				

MSD Sample ID: **HS18091510-01MSD** Units: **mg/L** Analysis Date: **04-Oct-2018 14:35**
Client ID: **35AWW24_092718** Run ID: **UV-2450_324727** SeqNo: **4754624** PrepDate: **04-Oct-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.299	0.0500	0.25	0.062	94.8	80 - 120	0.302	0.998	20	

MSD Sample ID: **HS18091438-01MSD** Units: **mg/L** Analysis Date: **04-Oct-2018 14:35**
Client ID: Run ID: **UV-2450_324727** SeqNo: **4754622** PrepDate: **04-Oct-2018** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	5.17	0.500	2.5	2.67	100	80 - 120	5.18	0.193	20	

The following samples were analyzed in this batch: HS18091510-01 HS18091510-02 HS18091510-03

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R324594 **Instrument: ICS2100** **Method: SW9056**

MBLK Sample ID: **WBLKW1-092718** Units: **mg/L** Analysis Date: **28-Sep-2018 03:26**
Client ID: Run ID: **ICS2100_324594** SeqNo: **4751753** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	0.500	0.500								U
Nitrogen, Nitrate (As N)	0.100	0.100								U
Nitrogen, Nitrite (As N)	0.100	0.100								U
Sulfate	0.500	0.500								U

LCS Sample ID: **WLCSW1-092718** Units: **mg/L** Analysis Date: **28-Sep-2018 03:40**
Client ID: Run ID: **ICS2100_324594** SeqNo: **4751754** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	20.28	0.500	20	0	101	80 - 120				
Nitrogen, Nitrate (As N)	3.935	0.100	4	0	98.4	80 - 120				
Nitrogen, Nitrite (As N)	4.217	0.100	4	0	105	80 - 120				
Sulfate	20.06	0.500	20	0	100	80 - 120				

LCSD Sample ID: **WLCSDW1-092718** Units: **mg/L** Analysis Date: **28-Sep-2018 03:55**
Client ID: Run ID: **ICS2100_324594** SeqNo: **4751755** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	20.46	0.500	20	0	102	80 - 120	20.28	0.889	20	
Nitrogen, Nitrate (As N)	3.977	0.100	4	0	99.4	80 - 120	3.935	1.06	20	
Nitrogen, Nitrite (As N)	4.261	0.100	4	0	107	80 - 120	4.217	1.04	20	
Sulfate	20.25	0.500	20	0	101	80 - 120	20.06	0.962	20	

MS Sample ID: **HS18091510-01MS** Units: **mg/L** Analysis Date: **28-Sep-2018 15:59**
Client ID: **35AWW24_092718** Run ID: **ICS2100_324594** SeqNo: **4765748** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	121.6	0.500	10	113.6	79.8	80 - 120				SEO
Nitrogen, Nitrate (As N)	2.028	0.100	2	0	101	80 - 120				
Nitrogen, Nitrite (As N)	2.096	0.100	2	0	105	80 - 120				
Sulfate	78.31	0.500	10	69.87	84.4	80 - 120				O

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R324594 **Instrument: ICS2100** **Method: SW9056**

MS Sample ID: **HS18091510-01MS** Units: **mg/L** Analysis Date: **28-Sep-2018 16:43**
Client ID: **35AWW24_092718** Run ID: **ICS2100_324594** SeqNo: **4765751** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	205.7	5.00	100	109.5	96.2	80 - 120				
Nitrogen, Nitrate (As N)	18.53	1.00	20	0	92.6	80 - 120				
Nitrogen, Nitrite (As N)	20.08	1.00	20	0	100	80 - 120				
Sulfate	161.2	5.00	100	65.28	95.9	80 - 120				

MS Sample ID: **HS18091438-01MS** Units: **mg/L** Analysis Date: **28-Sep-2018 04:39**
Client ID: Run ID: **ICS2100_324594** SeqNo: **4751758** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	1025	5.00	100	909.6	115	80 - 120				EO
Nitrogen, Nitrate (As N)	19.46	1.00	20	0	97.3	80 - 120				
Nitrogen, Nitrite (As N)	22.99	1.00	20	0	115	80 - 120				
Sulfate	599.9	5.00	100	507.7	92.3	80 - 120				O

MSD Sample ID: **HS18091510-01MSD** Units: **mg/L** Analysis Date: **28-Sep-2018 16:58**
Client ID: **35AWW24_092718** Run ID: **ICS2100_324594** SeqNo: **4765752** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	205.3	5.00	100	109.5	95.8	80 - 120	205.7	0.187	20	
Nitrogen, Nitrate (As N)	18.36	1.00	20	0	91.8	80 - 120	18.53	0.905	20	
Nitrogen, Nitrite (As N)	20.1	1.00	20	0	101	80 - 120	20.08	0.11	20	
Sulfate	161.2	5.00	100	65.28	96.0	80 - 120	161.2	0.0192	20	

MSD Sample ID: **HS18091510-01MSD** Units: **mg/L** Analysis Date: **28-Sep-2018 16:14**
Client ID: **35AWW24_092718** Run ID: **ICS2100_324594** SeqNo: **4765749** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	124.1	0.500	10	113.6	104	80 - 120	121.6	2.01	20	EO
Nitrogen, Nitrate (As N)	2.057	0.100	2	0	103	80 - 120	2.028	1.42	20	
Nitrogen, Nitrite (As N)	2.131	0.100	2	0	107	80 - 120	2.096	1.66	20	
Sulfate	79.53	0.500	10	69.87	96.6	80 - 120	78.31	1.54	20	O

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R324594 **Instrument: ICS2100** **Method: SW9056**

MSD Sample ID: **HS18091438-01MSD** Units: **mg/L** Analysis Date: **28-Sep-2018 04:53**
Client ID: Run ID: **ICS2100_324594** SeqNo: **4751759** PrepDate: DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	1031	5.00	100	909.6	121	80 - 120	1025	0.584	20	SEO
Nitrogen, Nitrate (As N)	19.5	1.00	20	0	97.5	80 - 120	19.46	0.2	20	
Nitrogen, Nitrite (As N)	23.21	1.00	20	0	116	80 - 120	22.99	0.957	20	
Sulfate	607.2	5.00	100	507.7	99.5	80 - 120	599.9	1.2	20	O

The following samples were analyzed in this batch: HS18091510-01 HS18091510-02 HS18091510-03

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R324730 **Instrument: ManTech01** **Method: SM2320B**

MBLK Sample ID: **WBLKW1-181004** Units: **mg/L** Analysis Date: **04-Oct-2018 13:26**
Client ID: Run ID: **ManTech01_324730** SeqNo: **4754685** 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: **WLCS1-181004** Units: **mg/L** Analysis Date: **04-Oct-2018 13:34**
Client ID: Run ID: **ManTech01_324730** SeqNo: **4754686** 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)	1073	5.00	1000	0	107	85 - 115				

LCSD Sample ID: **WLCSD1-181004** Units: **mg/L** Analysis Date: **04-Oct-2018 13:44**
Client ID: Run ID: **ManTech01_324730** SeqNo: **4754687** 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)	1083	5.00	1000	0	108	85 - 115	1073	0.945	20	

DUP Sample ID: **HS18091510-01DUP** Units: **mg/L** Analysis Date: **04-Oct-2018 14:45**
Client ID: **35AWW24_092718** Run ID: **ManTech01_324730** SeqNo: **4754697** 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)	51.45	5.00					50.82	1.23	20	

The following samples were analyzed in this batch: HS18091510-01 HS18091510-02 HS18091510-03

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18091510

QC BATCH REPORT

Batch ID: R324851 **Instrument: WetChem_HS** **Method: E376.1**

MBLK Sample ID: **MBLK-R324851** Units: **mg/L** Analysis Date: **03-Oct-2018 11:45**
Client ID: Run ID: **WetChem_HS_324851** SeqNo: **4760404** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	1.00	1.00								U

LCS Sample ID: **LCS-R324851** Units: **mg/L** Analysis Date: **03-Oct-2018 11:45**
Client ID: Run ID: **WetChem_HS_324851** SeqNo: **4760403** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	21.36	1.00	25	0	85.4	80 - 120				

LCSD Sample ID: **LCSD-R324851** Units: **mg/L** Analysis Date: **03-Oct-2018 11:45**
Client ID: Run ID: **WetChem_HS_324851** SeqNo: **4760402** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	21.16	1.00	25	0	84.6	80 - 120	21.36	0.941	20	

MS Sample ID: **HS18091510-01MS** Units: **mg/L** Analysis Date: **03-Oct-2018 11:45**
Client ID: **35AWW24_092718** Run ID: **WetChem_HS_324851** SeqNo: **4760401** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	21.36	1.00	25	0.36	84.0	80 - 120				

MS Sample ID: **HS18091438-01MS** Units: **mg/L** Analysis Date: **03-Oct-2018 11:45**
Client ID: Run ID: **WetChem_HS_324851** SeqNo: **4760399** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	21.56	1.00	25	1.96	78.4	80 - 120				S

The following samples were analyzed in this batch: HS18091510-01 HS18091510-02 HS18091510-03

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: **HS18091510**

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

ALS Houston, US Date: 15-Oct-18

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
North Carolina	624-2018	31-Dec-2018
Arkansas	88-0356	27-Mar-2019
Texas	T10470231-18-21	30-Apr-2019
North Dakota	R193 2018-2019	30-Apr-2019
Illinois	004438	29-Jun-2019
Louisiana	03087	30-Jun-2019
Dept of Defense	ANAB L2231	22-Dec-2018
Kentucky	123043 - 2018	30-Apr-2019
Kansas	E-10352 2018-2019	31-Jul-2019
Oklahoma	2018-156	31-Aug-2019

ALS Houston, US Date: 15-Oct-18

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Work Order: HS18091510

SAMPLE TRACKING

Lab Samp ID	Client Sample ID	Action	Date	Person	New Location
HS18091510-01	35AWW24_092718	Login	9/28/2018 12:40:50 PM	JRM	WET367
HS18091510-01	35AWW24_092718	Login	9/28/2018 12:40:50 PM	JRM	WET367
HS18091510-01	35AWW24_092718	Login	9/28/2018 12:40:50 PM	JRM	WET367
HS18091510-01	35AWW24_092718	Login	9/28/2018 12:40:50 PM	JRM	MET067
HS18091510-01	35AWW24_092718	Login	9/28/2018 12:40:50 PM	JRM	MET067
HS18091510-01	35AWW24_092718	Login	9/28/2018 12:40:50 PM	JRM	VOA197
HS18091510-01	35AWW24_092718	Login	9/28/2018 12:40:50 PM	JRM	Sub
HS18091510-01	35AWW24_092718	Login	9/28/2018 12:40:50 PM	JRM	Sub
HS18091510-02	35AWW19_092718	Login	9/28/2018 12:40:50 PM	JRM	WET367
HS18091510-02	35AWW19_092718	Login	9/28/2018 12:40:50 PM	JRM	WET367
HS18091510-02	35AWW19_092718	Login	9/28/2018 12:40:50 PM	JRM	WET367
HS18091510-02	35AWW19_092718	Login	9/28/2018 12:40:50 PM	JRM	MET067
HS18091510-02	35AWW19_092718	Login	9/28/2018 12:40:50 PM	JRM	MET067
HS18091510-02	35AWW19_092718	Login	9/28/2018 12:40:50 PM	JRM	VOA197
HS18091510-02	35AWW19_092718	Login	9/28/2018 12:40:50 PM	JRM	Sub
HS18091510-02	35AWW19_092718	Login	9/28/2018 12:40:50 PM	JRM	Sub
HS18091510-03	35AWW11_092718	Login	9/28/2018 12:40:50 PM	JRM	WET367
HS18091510-03	35AWW11_092718	Login	9/28/2018 12:40:50 PM	JRM	WET367
HS18091510-03	35AWW11_092718	Login	9/28/2018 12:40:50 PM	JRM	WET367
HS18091510-03	35AWW11_092718	Login	9/28/2018 12:40:50 PM	JRM	MET067
HS18091510-03	35AWW11_092718	Login	9/28/2018 12:40:50 PM	JRM	MET067
HS18091510-03	35AWW11_092718	Login	9/28/2018 12:40:50 PM	JRM	VOA197
HS18091510-03	35AWW11_092718	Login	9/28/2018 12:40:50 PM	JRM	Sub
HS18091510-03	35AWW11_092718	Login	9/28/2018 12:40:50 PM	JRM	Sub
HS18091510-04	Trip Blank	Login	9/28/2018 12:40:50 PM	JRM	VOA197

ALS Houston, US Date: 15-Oct-18

Sample Receipt Checklist

Client Name: Bhate Environmental
Work Order: HS18091510
Date/Time Received: **28-Sep-2018 08:55**
Received by: **NDR**

Checklist completed by: *Jared R. Makan* eSignature 28-Sep-2018 Date
Reviewed by: *RJ Modashia* eSignature 1-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 ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
TX1005 solids received in hermetically sealed vials?	Yes ☐	No ☐	N/A ☑
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):	1.0c/0.6c UC/C	IR11	
Cooler(s)/Kit(s):	44326		
Date/Time sample(s) sent to storage:	09/28/2018 15:30		
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: Neat volume for 35AWW11_092718 appears a darker color to the rest of the sample, logged in for analysis to catch hold time on anions (NO3/NO2).

Client Contacted: Date Contacted: Person Contacted:

Contacted By: Regarding:

Comments:

Corrective Action:

00944191

bhate ENVIRONMENTAL ASSOCIATES, INC.

Page: ____ of ____

Project/Phase No: NWO1312.0150

COC Number(1): ____

LIMS Number: ____

1608 13th Avenue South, Suite 300
Birmingham Alabama 35205
Tel: 205-918-4000
Fax: 205-918-4050

Chain of Custody and Analytical Request

Facility/Base I.D.: LHAAP

Project/Site Name: LHAAP / Site 58

Client Name:

Collected by: Scott Beesinger

Field Sample ID (30 Characters Max)	ERPIMS LOCID (15 Characters Max)	Date Collected (dd-mmm-yyyy)	Time Collected (Military) (hhmm)	Sample Depth (beginning - ending)	SA Code [2]	Sample Number [3]	Sample Matrix [4]	Number of containers	VOC	MEE	TOC	Carbon Dioxide	Anions/Alkalinity	Total Phosphorous	Total Manganese & Iron	Dissolved Manganese & Iron	Sulfide	Ambient Blank Lot Control Number	Equipment Blank Lot Control Number	Trip Blank Lot Control Number	Cooler ID
35AWW24_092718		27 Sep 2018	0930	-	N		WG	12	X	X	X	X	X	X	X	X	X				
35AWW19_092718		27 Sep 2018	1035	-	N		WG	12	X	X	X	X	X	X	X	X	X				
35AWW11_092718		27 Sep 2018	1150	-	N		WG	12	X	X	X	X	X	X	X	X	X				
TRIP BLANK		27 Sep 2018			TB		W	2	X												
				-																	
				-																	
				-																	
				-																	
				-																	
				-																	

Sample Analysis Requested [5] | Quality Assurance Samples [6]

HS18091510

Bhate Environmental Associates, Inc.

LHAAP-58

COMMENTS: ____

Custody Transfers Prior to Receipt by Laboratory

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1. Scott Beesinger	9/27/18	1400	1. ND	9/28/18	0855
2.			2.		
3.			3.		

Sample Delivery Details / Laboratory Receipt

Delivered Directly to Lab: ____ Shipped ____ No.:

____ Method of Shipment: ____

____ Fed Ex ____ Airbill Number:

____ Analytical Lab: ALS 10450 Stanciff Rd, Suite 210, Houston, TX 77099 (281) 530-5656

ATTN: SONIA WEST Lab Recipient: Delivery Date/Time:

1.) Chain of Custody Number = date collected + custody number (e.g. 09-02-1999-01)

2.) Sample Type (SA) Codes: N = Normal Sample, TB = Trip Blank (-c) Sample, FD = Field Duplicate (-a) Samples, FR = Field Replicate (-b) Samples, EB = Equipment Blank (-d) Samples, MS = Matrix Spike, SD = Matrix Spike Duplicate, AB = Ambient Blank (-e)

3.) Sample Number: Unique sample number collected from a particular location per day. (e.g. Groundwater sample collected from MW-1 on 10/10/99 = 01, if sampled again on 10/10/99 = 02, etc.)

4.) Matrix Codes: GS = Soil Gas, WG = Groundwater, WS = Surface Water, SO = Soil, SE = Sediment, SL = Sludge, SS = Surface Soil Samples, WQ = Aqueous Blank Samples (trip, equipment, ambient, etc), SB = Soil Blanks

5.) Sample Analysis Requested: Analytical method requested and number of containers provided for each.

6.) Quality assurance samples are assigned by date (ddmmyy) and the sample number associated with the sample (01, 02, etc) (e.g. Equipment blank collected in association with MW-1 on 10/10/99 will be designated 10109901 in the Equipment Blank Lot Control

44326

Temp - 4.1 C 1.0

IR # 11 CF -0.1

00944192

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

44320

CUSTODY SEAL
Date: 9/27/18 Time: 1450
Name: Scott Beesinger
Company: BHATE

Seal Broken By: SW
Date: 9/28/18

44326

SEP 28 2018

Must Deliver Next Business Day
Time and Tempature Sensitive!

ALS

44326

ORIGIN ID:SGRA (903) 930-6193
SCOTT BEESINER
BHATE ENVIRONMENTAL ASSOCIATES
1203-B EAST GRAND AVE. PMB202
MARSHALL, TX 75670
UNITED STATES US

SHIP DATE: 07AUG18
ACTWGT: 1.00 LB MAN
CAD: 300130/CAFE3111
DIMS: 26x14x14 IN

TO CLIENT SERVICES
ALS LABORATORY GROUP
10450 STANCLIFF ROAD
SUITE 210
HOUSTON TX 77099
(281) 530-5656
REF: LHAAP-58-RJ

RMA:

FedEx Express

E

FedEx
TRK# 0221 4380 9531 5109

FRI - 28 SEP 10:30A
PRIORITY OVERNIGHT

AB SGRA

77099
TX-US
IAH

FID 102786 27SEP18 GGGA 653C1/F70C/0C8A

LABORATORY REPORT

October 9, 2018

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

RE: HS18091510

Dear RJ:

Enclosed are the results of the samples submitted to our laboratory on October 2, 2018. For your reference, these analyses have been assigned our service request number P1805214.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at www.alsglobal.com. Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

ALS | Environmental

Kate Kaneko

By Kate Kaneko at 12:08 pm, 10/09/18

Kate Kaneko
Laboratory Director

Client: ALS Laboratory Group Service Request No: P1805214
Project: HS18091510

CASE NARRATIVE

The samples were received intact under chain of custody on October 2, 2018 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

Carbon Dioxide Analysis

The samples were analyzed for carbon dioxide using a gas chromatograph equipped with a thermal conductivity detector (TCD). A known amount of liquid was displaced by injecting 8.0 milliliters of helium creating a headspace in the sample vial. Each sample vial was agitated using a sonic disrupter for fifteen minutes and then allowed to equilibrate for at least four hours. A volume of the headspace was withdrawn using a gas-tight syringe and analyzed using a manual injection technique. The amount of dissolved gases (carbon dioxide) in the original sample was calculated using Henry's Law. This method was performed with guidance from RSK 175 as described in laboratory SOP VOA-DISGAS. This analyte is included on the laboratory's NELAP and DoD-ELAP scope of accreditation.

Methane, Ethene and Ethane Analysis

The samples were also analyzed for methane, ethene and ethane using a gas chromatograph equipped with a flame ionization detector (FID). A known amount of liquid was displaced by injecting 8.0 milliliters of helium creating a headspace in the sample vial. Each sample vial was agitated using a sonic disrupter for fifteen minutes and then allowed to equilibrate for at least two hours. A volume of the headspace was withdrawn using a gas-tight syringe and analyzed using a manual injection technique. The amount of dissolved gases (methane, ethene and ethane) in the original sample was calculated using Henry's Law. This method was performed with guidance from RSK 175. This method is included on the laboratory's NELAP and DoD-ELAP scope of accreditation. Any analytes flagged with an X are not included on the laboratory's NELAP or DoD-ELAP accreditation.

The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and ALS Environmental (ALS) is not responsible for utilization of less than the complete report.

Use of ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to ALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.

ALS Environmental – Simi Valley

CERTIFICATIONS, ACCREDITATIONS, AND REGISTRATIONS

Agency	Web Site	Number
Alaska DEC	http://dec.alaska.gov/eh/lab.aspx	17-019
Arizona DHS	http://www.azdhs.gov/preparedness/state-laboratory/lab-licensure-certification/index.php#laboratory-licensure-home	AZ0694
Florida DOH (NELAP)	http://www.floridahealth.gov/licensing-and-regulation/environmental-laboratories/index.html	E871020
Louisiana DEQ (NELAP)	http://www.deq.louisiana.gov/page/la-lab-accreditation	05071
Maine DHHS	http://www.maine.gov/dhhs/mecdc/environmental-health/dwp/professionals/labCert.shtml	2016036
Minnesota DOH (NELAP)	http://www.health.state.mn.us/accreditation	1347317
New Jersey DEP (NELAP)	http://www.nj.gov/dep/enforcement/oqa.html	CA009
New York DOH (NELAP)	http://www.wadsworth.org/labcert/elap/elap.html	11221
Oregon PHD (NELAP)	http://www.oregon.gov/oha/ph/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx	4068-005
Pennsylvania DEP	http://www.dep.pa.gov/Business/OtherPrograms/Labs/Pages/Laboratory-Accreditation-Program.aspx	68-03307 (Registration)
PJLA (DoD ELAP)	http://www.pjlabs.com/search-accredited-labs	65818 (Testing)
Texas CEQ (NELAP)	http://www.tceq.texas.gov/agency/qa/env_lab_accreditation.html	T104704413-18-9
Utah DOH (NELAP)	http://health.utah.gov/lab/lab_cert_env	CA016272018-9
Washington DOE	http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html	C946

Analyses were performed according to our laboratory's NELAP and DoD-ELAP approved quality assurance program. A complete listing of specific NELAP and DoD-ELAP certified analytes can be found in the certifications section at www.alsglobal.com, or at the accreditation body's website.

Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact the laboratory for information corresponding to a particular certification.

ALS ENVIRONMENTAL

DETAIL SUMMARY REPORT

Client: ALS Laboratory Group
Project ID: HS18091510

Service Request: P1805214

Date Received: 10/2/2018
Time Received: 09:30

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	RSK 175 - CO2	RSK 175 - Gases
35AWW24_092718	P1805214-001	Water	9/27/2018	09:30	X	X
35AWW19_092718	P1805214-002	Water	9/27/2018	10:35	X	X
35AWW11_092718	P1805214-003	Water	9/27/2018	11:50	X	X

00944197

P1805214

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: 9917

SUBCONTRACT TO:

ALS Environmental
2655 Park Center Drive, Suite A
Simi Valley, CA 93065

Phone: +1 805 526 7161

CUSTOMER INFORMATION:

Company:	ALS Houston
Contact:	RJ Modashia
Address:	10450 Stancliff Rd, Ste 210
Phone:	+1 281 530 5656
Email:	RJ.Modashia@alsglobal.com
Alternate Contact:	Jumoke M. Lawal
Email:	jumoke.lawal@alsglobal.com

INVOICE INFORMATION:

Company:	ALS Houston
Contact:	Accounts Payable
Address:	10450 Stancliff Rd, Ste 210
Phone:	+1 281 530 5656
Reference:	HS18091510
TSR:	Danielle Winnings

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18091510-01**	**35AWW24_092718**	**Groundwater**	**27 Sep 2018 09:30**
	MEE plus CO2 Sub to ALS SimiValley			08 Oct 2018
2.	**HS18091510-02**	**35AWW19_092718**	**Groundwater**	**27 Sep 2018 10:35**
	MEE plus CO2 Sub to ALS SimiValley			08 Oct 2018
3.	**HS18091510-03**	**35AWW11_092718**	**Groundwater**	**27 Sep 2018 11:50**
	MEE plus CO2 Sub to ALS SimiValley			08 Oct 2018

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

Neat vials for CO2 analysis

QC Level: DOD IV (DoD Data Package)

Relinquished By: _____ Date/Time: 10/1/18 1800

Received By: _____ Date/Time: 10-2-18 0950

Cooler ID(s): _____ Temperature(s): _____ 5° wet ice temp acceptable

ALS Environmental
Sample Acceptance Check Form

Client: ALS Laboratory Group Work order: P1805214

Project: HS18091510

Sample(s) received on: 10/2/18 Date opened: 10/2/18 by: ADAVID

Note: This form is used for all samples received by ALS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

		Yes	No	N/A
1	Were **sample containers** properly marked with client sample ID?	☒	☐	☐
2	Did **sample containers** arrive in good condition?	☒	☐	☐
3	Were **chain-of-custody** papers used and filled out?	☒	☐	☐
4	Did **sample container labels** and/or tags agree with custody papers?	☒	☐	☐
5	Was **sample volume** received adequate for analysis?	☒	☐	☐
6	Are samples within specified holding times?	☒	☐	☐
7	Was proper **temperature** (thermal preservation) of cooler at receipt adhered to?	☒	☐	☐
	Cooler Temperature: 3° C Blank Temperature: ° C Thermometer ID CO907034581 Wet Ic			
8	Were **custody seals** on outside of cooler/Box/Container?	☒	☐	☐
	Location of seal(s)? Cooler lid. Sealing Lid?	☒	☐	☐
	Were signature and date included?	☒	☐	☐
	Were seals intact?	☒	☐	☐
9	Do containers have appropriate **preservation**, according to method/SOP or Client specified information?	☒	☐	☐
	Is there a client indication that the submitted samples are **pH** preserved?	☒	☐	☐
	Were **VOA vials** checked for presence/absence of air bubbles?	☒	☐	☐
	Does the client/method/SOP require that the analyst check the sample pH and if necessary alter it?	☐	☒	☐
10	**Tubes:** Are the tubes capped and intact?	☐	☐	☒
11	**Badges:** Are the badges properly capped and intact?	☐	☐	☒
	Are dual bed badges separated and individually capped and intact?	☐	☐	☒

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1805214-001.01	40mL VOA NP		7		A	MR 10/05/18
P1805214-001.02	40mL VOA NP				A	
P1805214-001.04	40ml VOA HCL		1		A	MR 10/04/18
P1805214-001.05	40ml VOA HCL				A	
P1805214-002.01	40mL VOA NP		7		A	MR 10/05/18
P1805214-002.02	40mL VOA NP				A	
P1805214-002.04	40ml VOA HCL		1		A	MR 10/04/18
P1805214-002.05	40ml VOA HCL				A	
P1805214-003.01	40mL VOA NP		6		A	MR 10/05/18
P1805214-003.02	40mL VOA NP				A	
P1805214-003.04	40ml VOA HCL		1		A	MR 10/04/18
P1805214-003.05	40ml VOA HCL				A	

Explain any discrepancies: (include lab sample ID numbers):

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Project ID: **HS18091510** ALS Project ID: P1805214

Carbon Dioxide

Test Code: RSK 175
Instrument ID: HP5890A/GC10/TCD
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date(s) Collected: 9/27/18
Date Received: 10/2/18
Date Analyzed: 10/5/18

Client Sample ID	ALS Sample ID	Injection Volume ml(s)	**Result µg/L**	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
35AWW24_092718	P1805214-001	0.10	**330,000**	1,000	860	370	**B**
35AWW19_092718	P1805214-002	0.10	**250,000**	1,000	860	370	**B**
35AWW11_092718	P1805214-003	0.050	**320,000**	2,000	1,700	740	**B**
Method Control Sample	P181005-MB	0.10	**640**	1,000	860	370	**J**

The Method Control Sample is laboratory water carried through the entire analytical process.
U = Compound was analyzed for, but not detected above the laboratory detection limit.
LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
B = Analyte was detected in both the sample and associated Method Control Sample.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Client: **ALS Laboratory Group**
Client Sample ID: **Duplicate Lab Control Sample** ALS Project ID: P1805214
Client Project ID: **HS18091510** ALS Sample ID: P181005-DLCS

Test Code: RSK 175 Date Collected: NA
Instrument ID: HP5890A/GC10/TCD Date Received: NA
Analyst: Wade Henton Date Analyzed: 10/05/18
Matrix: Water Volume(s) Analyzed: NA ml(s)
Test Notes:

CAS #	Compound	Spike Amount LCS / DLCS ug/L	Result$_1$ LCS ug/L	Result$_1$ DLCS ug/L	% Recovery LCS	% Recovery DLCS	DOD Acceptance Limits	RPD	RPD Limit	Data Qualifier
124-38-9	Carbon Dioxide	22,900	18,900	19,200	**83**	**84**	80-122	1	15	

$_1$ = The concentration shown includes a subtraction of the Method Control Sample value, even if the result is less than the MRL.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Sample ID: **35AWW24_092718**
Client Project ID: **HS18091510**

ALS Project ID: P1805214
ALS Sample ID: P1805214-001

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 9/27/18
Date Received: 10/2/18
Date Analyzed: 10/4/18
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	**190**	1.3	1.0	0.51	**B**
74-85-1	Ethene	0.55	1.0	0.55	0.24	**U**
74-84-0	Ethane	0.47	0.60	0.47	0.16	**U**

U = Compound was analyzed for, but not detected above the laboratory detection limit.
LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
B = Analyte detected in both the sample and associated method blank.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Sample ID: **35AWW19_092718**
Client Project ID: **HS18091510**

ALS Project ID: P1805214
ALS Sample ID: P1805214-002

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 9/27/18
Date Received: 10/2/18
Date Analyzed: 10/4/18
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	**27**	1.3	1.0	0.51	**B**
74-85-1	Ethene	**0.32**	1.0	0.55	0.24	**J**
74-84-0	Ethane	0.47	0.60	0.47	0.16	**U**

U = Compound was analyzed for, but not detected above the laboratory detection limit.
LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.
B = Analyte detected in both the sample and associated method blank.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Sample ID: **35AWW11_092718**
Client Project ID: **HS18091510**

ALS Project ID: P1805214
ALS Sample ID: P1805214-003

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: 9/27/18
Date Received: 10/2/18
Date Analyzed: 10/4/18
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	**1,300**	1.3	1.0	0.51	**B**
74-85-1	Ethene	**2.1**	1.0	0.55	0.24	
74-84-0	Ethane	**0.63**	0.60	0.47	0.16	

U = Compound was analyzed for, but not detected above the laboratory detection limit.
LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
B = Analyte detected in both the sample and associated method blank.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **ALS Laboratory Group**
Client Sample ID: **Method Control Sample**
Client Project ID: **HS18091510**

ALS Project ID: P1805214
ALS Sample ID: P181004-MB

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 10/04/18
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Result µg/L	LOQ µg/L	LOD µg/L	MDL µg/L	Data Qualifier
74-82-8	Methane	**0.54**	1.3	1.0	0.51	**J**
74-85-1	Ethene	0.55	1.0	0.55	0.24	**U**
74-84-0	Ethane	0.47	0.60	0.47	0.16	**U**

The Method Control Sample is laboratory water carried through the entire analytical process.
U = Compound was analyzed for, but not detected above the laboratory detection limit.
LOQ = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.
J = The result is an estimated concentration that is less than the MRL but greater than or equal to the MDL.

ALS ENVIRONMENTAL

LABORATORY CONTROL SAMPLE / DUPLICATE LABORATORY CONTROL SAMPLE SUMMARY

Client: **ALS Laboratory Group**
Client Sample ID: **Duplicate Lab Control Sample**
Client Project ID: **HS18091510**

ALS Project ID: P1805214
ALS Sample ID: P181004-LCS
P181004-DLCS

Test Code: RSK 175
Instrument ID: HP5890A/GC10/FID
Analyst: Wade Henton
Matrix: Water
Test Notes:

Date Collected: NA
Date Received: NA
Date Analyzed: 10/04/18
Volume(s) Analyzed: 0.10 ml(s)

CAS #	Compound	Spike Amount LCS / DLCS µg/L	Result$_1$ LCS µg/L	Result$_1$ DLCS µg/L	% Recovery LCS	% Recovery DLCS	DOD Acceptance Limits	RPD	RPD Limit	Data Qualifier
74-82-8	Methane	2.50	2.37	2.47	**95**	**99**	73-125	4	12	
74-85-1	Ethene	4.37	4.40	4.53	**101**	**104**	72-133	3	7	
74-84-0	Ethane	4.69	4.63	4.68	**99**	**100**	74-131	1	6	

$_1$ = The concentration shown includes a subtraction of the Method Control Sample value, even if the result is less than the MRL.

October 10, 2018 Service Request No:R1809393

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

Laboratory Results for: LHAAP / Site 58

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory September 28, 2018
For your reference, these analyses have been assigned our service request number **R1809393.**

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental 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. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental



Janice Jaeger
Project Manager

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
PHONE +1 585 288 5380 | FAX +1 585 288 8475
ALS Group USA, Corp.
dba ALS Environmental

ALS Environmental
ALS Group USA, Corp
1565 Jefferson Road, Building 300, Suite 360
Rochester, NY 14623
T : +1 585 288 5380
F : +1 585 288 8475
www.alsglobal.com

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ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

1565 Jefferson Rd, Building 300, Rochester, NY 14623 | 585-288-5380 | www.alsglobal.com

ALS Environmental

Client: ALS Environmental - US
Project: LHAAP / Site 58
Sample Matrix: Water

Service Request: R1809393
Date Received: 09/28/2018

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 all summary forms and associated raw data. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt:

Three water samples were received for analysis at ALS Environmental on 09/28/2018. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at 6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature.

Semivoa GC:

Method Organic Acids, 10/05/2018: The upper control criterion was exceeded for one or more analytes in the Laboratory Control Sample (LCS). There were no detections of the analyte(s) in the associated field samples. The error associated with elevated recovery equates to a high bias. The sample data is not significantly affected. No further corrective action was appropriate.

General Chemistry:

Ferrous Iron was not performed in the field as recommended by the EPA to meet an "immediate" or 15 minute Holding Time. Samples analyzed in the laboratory have been flagged with an "H" to indicate the "immediate" holding time has been exceeded.

Approved by _____ Date 10/10/2018

SAMPLE DETECTION SUMMARY

CLIENT ID: 35AWW24_092718			Lab ID: R1809393-001			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Iron, Divalent (Ferrous Iron)	0.31		0.03	0.10	mg/L	SM 3500-Fe B.4.c

CLIENT ID: 35AWW19_092718			Lab ID: R1809393-002			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Iron, Divalent (Ferrous Iron)	3.99		0.11	0.50	mg/L	SM 3500-Fe B.4.c

CLIENT ID: 35AWW11_092718			Lab ID: R1809393-003			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Iron, Divalent (Ferrous Iron)	36.5		1.1	5.0	mg/L	SM 3500-Fe B.4.c
Acetic Acid	1100		10	40	mg/L	Organic Acids
Propionic Acid	520		1.9	20	mg/L	Organic Acids

Sample Receipt Information

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Client: ALS Environmental - US **Service Request:**R1809393
Project: LHAAP / Site 58

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
R1809393-001	35AWW24_092718	9/27/2018	0930
R1809393-002	35AWW19_092718	9/27/2018	1035
R1809393-003	35AWW11_092718	9/27/2018	1150

bhate ENVIRONMENTAL CONSTRUCTION ENERGY

1608 13th Avenue South, Suite 300
Birmingham Alabama 35205
Tel: 205-918-4000
Fax: 205-918-4050

Page: ____ of ____

Project/Phase No: NWO1312.0150

COC Number(1): ____

LIMS Number: ____

Chain of Custody and Analytical Request

Facility/Base I.D.: LHAAP

Project/Site Name: LHAAP / Site 58

Client Name:

Collected by: Scott Beesinger

Field Sample ID (30 Characters Max)	ERPIMS LOCID (15 Characters Max)	Date Collected (dd-mmm-yyyy)	Time Collected (Military) (hhmm)	Sample Depth (beginning - ending)	SA Code (2)	Sample Number (3)	Sample Matrix (4)	Sample Analysis Requested (5): Number of containers	VFA	Ferrous Iron								Quality Assurance Samples (6): Ambient Blank Lot Control Number	Equipment Blank Lot Control Number	Trip Blank Lot Control Number	Cooler ID
35AWW24-092718		27Sep2018	0930	-	N		WG	2	X	X											
35AWW19-092718		27Sep2018	1035	-	N		WG	2	X	X											
35AWW11-092718		27Sep2018	1150	-	N		WG	2	X	X											
				-																	
				-																	
				-																	
				-																	
				-																	
				-																	

COMMENTS: ____

Custody Transfers Prior to Receipt by Laboratory

	Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1.	Scott Beesinger	9/27/18	1400	[signature]	9/28/18	@ 0900
2.						
3.						

Sample Delivery Details / Laboratory Receipt

Delivered Directly to Lab: ____ Shipped ____ No.:

Method of Shipment: ____

Fed Ex ____ Airbill Number: ____

Analytical Lab: ALS 10450 Stancliff Rd. Suite 210 Houston, TX 77099 (281) 530-5656

ATTN: SONIA WEST Lab Recipient: Delivery Date/Time:

1.) Chain of Custody Number = date collected + custody number (e.g. 09-02-1999-01)

2.) Sample Type (SA) Codes: N = Normal Sample, TB = Trip Blank (-c) Sample, FD = Field Duplicate (-a) Samples, FR = Field Replicate (-b) Samples, EB = Equipment Blank (-d) Samples, MS = Matrix Spike, SD = Matrix Spike Duplicate, AB = Ambient Blank (-e)

3.) Sample Number: Unique sample number collected from a particular location per day. (e.g. Groundwater sample collected from MW-1 on 10/10/99 = 01, if sampled again on 10/10/99 = 02, etc.)

4.) Matrix Codes: GS = Soil Gas, WG = Groundwater, WS = Surface Water, SO = Soil, SE = Sediment, SL = Sludge, SS = Surface Soil Samples, WQ = Aqueous Blank Samples (trip, equipment, ambient, etc), SQ = Soil Blanks

5.) Sample Analysis Requested: Analytical method requested and number of containers provided for each.

6.) Quality assurance samples are assigned by date (ddmmyy) and the sample number associated with the sample (01, 02, etc) (e.g. Equipment blank collected in association with MW-1 on 10/10/99 will be designated 10109901 in the Equipment Blank Lot Control

Cooler Receipt and Preservation Check Form

Project/Client Bhate Folder Number .

Cooler received on 9/28/18 by: @ **COURIER:** ALS UPS (FEDEX) VELOCITY CLIENT

1	Were **Custody seals** on outside of cooler?	(Y) (N)	5a	**Perchlorate** samples have required headspace?	Y N (NA)
2	**Custody papers** properly completed (ink, signed)?	(Y) N	5b	Did VOA vials, Alk,or Sulfide have sig* **bubbles**?	Y N (NA)
3	Did all bottles arrive in good **condition** (unbroken)?	(Y) N	6	Where did the bottles originate?	ALS/ROC (CLIENT)
4	Circle: (Wet Ice) **Dry Ice Gel packs** present?	(Y) N	7	Soil VOA received as: Bulk Encore 5035set	(NA)

8. Temperature Readings Date: 9/28/18 Time: 0935 ID: IR#7 (IR#10) From: (Temp Blank) Sample Bottle

Observed Temp (°C)	2.0						
Correction Factor (°C)	–						
Corrected Temp (°C)	2.0						
Temp from:Type of bottle	–						
Within 0-6°C?	(Y) N	Y N	Y N	Y N	Y N	Y N	Y N
If <0°C, were samples frozen?	Y N	Y N	Y N	Y N	Y N	Y N	Y N

If out of Temperature, note packing/ice condition: _____ Ice melted Poorly Packed (described below) Same Day Rule

&Client Approval to Run Samples: _____ Standing Approval Client aware at drop-off Client notified by: _____

All samples held in storage location: R-002 by @ on 9/28/18 at 0940
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown/Preservation Check**: Date: 9/28/18 Time: 1442 by: @

9.	Were all bottle labels complete (*i.e.* analysis, preservation, etc.)?	(YES)	NO
10.	Did all bottle labels and tags agree with custody papers?	(YES)	NO
11.	Were correct containers used for the tests indicated?	(YES)	NO
12.	Were 5035 vials acceptable (no extra labels, not leaking)?	YES	NO (N/A)
13.	Air Samples: Cassettes / Tubes Intact with MS? Canisters Pressurized	Tedlar® Bags Inflated	(N/A)

pH	Lot of test paper	Reagent	Preserved? Yes	Preserved? No	Lot Received	Exp	Sample ID Adjusted	Vol. Added	Lot Added	Final pH
≥12		NaOH								
≤2	209318	HNO_3	✓		1117092					
≤2	↓	H_2SO_4	✓		~~AS~~ B260052C	5/20				
<4		$NaHSO_4$								
5-9		For 608pest			No=Notify for 3day					
Residual Chlorine (-)		For CN, (Phenol), 625, 608pest, 522	✓		If +, contact PM to add $Na_2S_2O_3$ (625, 608, CN), ascorbic (phenol).					
		$Na_2S_2O_3$								
		ZnAcetate	-	-			**VOAs and 1664 Not to be tested before analysis. Otherwise, all bottles of all samples with chemical preservatives are checked (not just representatives).			
		HCl	**	**						

Bottle lot numbers: klbony

Explain all Discrepancies/ Other Comments:

CLRES	BULK
DO	FLDT
HPROD	HGFB
(HTR)	LL3541
PH	SUB
SO3	MARRS
ALS	REV

Labels secondary reviewed by: @

PC Secondary Review: MKT 10/1/18

*significant air bubbles: VOA > 5-6 mm ; WC >1 in. diameter

ALS Group USA, Corp.
dba ALS Environmental

Internal Chain of Custody Report

Client: ALS Laboratory Group **Service Request:** R1809393
Project: LHAAP / Site 58

Bottle ID	Methods	Date	Time	Sample Location / User	Disposed On
R1809393-001.01					
	SM 3500-Fe B.4.c				
		10/1/2018	0901	SMO / GLAFORCE	
		10/5/2018	1158	RT000205 / GLAFORCE	
		10/5/2018	1159	R-015 / GLAFORCE	
R1809393-001.02					
	Organic Acids				
		10/1/2018	0901	SMO / GLAFORCE	
		10/4/2018	1507	In Lab / BALLGEIER	
		10/4/2018	1508	R-002 / BALLGEIER	
R1809393-002.01					
	SM 3500-Fe B.4.c				
		10/1/2018	0901	SMO / GLAFORCE	
		10/5/2018	1158	RT000205 / GLAFORCE	
		10/5/2018	1159	R-015 / GLAFORCE	
R1809393-002.02					
	Organic Acids				
		10/1/2018	0901	SMO / GLAFORCE	
		10/4/2018	1507	In Lab / BALLGEIER	
		10/4/2018	1508	R-002 / BALLGEIER	
R1809393-003.01					
	SM 3500-Fe B.4.c				
		10/1/2018	0901	SMO / GLAFORCE	
		10/5/2018	1158	RT000205 / GLAFORCE	
		10/5/2018	1159	R-015 / GLAFORCE	
R1809393-003.02					
	Organic Acids				
		10/1/2018	0901	SMO / GLAFORCE	
		10/4/2018	1506	In Lab / BALLGEIER	
		10/4/2018	1508	R-002 / BALLGEIER	

Miscellaneous Forms

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

ALS Environmental

REPORT QUALIFIERS AND DEFINITIONS

U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.

J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Arclors).

B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.

E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.

E Organics- Concentration has exceeded the calibration range for that specific analysis.

D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.

* Indicates that a quality control parameter has exceeded laboratory limits. Under the ñNotesò column of the Form I, this qualifier denotes analysis was performed out of Holding Time.

H Analysis was performed out of hold time for tests that have an ñimmediateò hold time criteria.

Spike was diluted out.

+ Correlation coefficient for MSA is <0.995.

N Inorganics- Matrix spike recovery was outside laboratory limits.

N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.

S Concentration has been determined using Method of Standard Additions (MSA).

W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.

P Concentration >40% difference between the two GC columns.

C Confirmed by GC/MS

Q DoD reports: indicates a pesticide/Aroclor is not confirmed (Ó100% Difference between two GC columns).

X See Case Narrative for discussion.

MRL Method Reporting Limit. Also known as:
LOQ Limit of Quantitation (LOQ)
The lowest concentration at which the method analyte may be reliably quantified under the method conditions.

MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).

LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.

ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.

ACCREDITED IN ACCORDANCE WITH nelac

Rochester Lab ID # for State Certifications[1]

Connecticut ID # PH0556	Maine ID #NY0032	Pennsylvania ID# 68-786
Delaware Approved	New Hampshire ID # 2941	Rhode Island ID # 158
DoD ELAP #65817	New York ID # 10145	Virginia #460167
Florida ID # E87674	North Carolina #676	

[1] Analyses were performed according to our laboratoryôs NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to https://www.alsglobal.com/locations/americas/north-america/usa/new-york/rochester-environmental

ALS Laboratory Group

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
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.

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: ALS Environmental - US
Project: LHAAP / Site 58
Service Request: R1809393

Sample Name: 35AWW24_092718
Lab Code: R1809393-001
Sample Matrix: Water
Date Collected: 09/27/18
Date Received: 09/28/18

Analysis Method	Extracted/Digested By	Analyzed By
Organic Acids		BALLGEIER
SM 3500-Fe B.4.c		MROGERSON

Sample Name: 35AWW19_092718
Lab Code: R1809393-002
Sample Matrix: Water
Date Collected: 09/27/18
Date Received: 09/28/18

Analysis Method	Extracted/Digested By	Analyzed By
Organic Acids		BALLGEIER
SM 3500-Fe B.4.c		MROGERSON

Sample Name: 35AWW11_092718
Lab Code: R1809393-003
Sample Matrix: Water
Date Collected: 09/27/18
Date Received: 09/28/18

Analysis Method	Extracted/Digested By	Analyzed By
Organic Acids		BALLGEIER
SM 3500-Fe B.4.c		MROGERSON

INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.

Sample Results

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Semivolatile Organic Compounds by GC

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	09/27/18 09:30
Sample Matrix:	Water	**Date Received:**	09/28/18 09:00
Sample Name:	35AWW24_092718	**Units:**	mg/L
Lab Code:	R1809393-001	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	10/04/18 23:05	
Acetic Acid	ND U	4.0	2.0	1.0	1	10/04/18 23:05	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	10/04/18 23:05	
Lactic Acid	ND U	2.0	1.0	0.14	1	10/04/18 23:05	
Propionic Acid	ND U	2.0	1.0	0.19	1	10/04/18 23:05	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	09/27/18 10:35
Sample Matrix:	Water	**Date Received:**	09/28/18 09:00
Sample Name:	35AWW19_092718	**Units:**	mg/L
Lab Code:	R1809393-002	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	10/05/18 00:15	
Acetic Acid	ND U	4.0	2.0	1.0	1	10/05/18 00:15	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	10/05/18 00:15	
Lactic Acid	ND U	2.0	1.0	0.14	1	10/05/18 00:15	
Propionic Acid	ND U	2.0	1.0	0.19	1	10/05/18 00:15	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	09/27/18 11:50
Sample Matrix:	Water	**Date Received:**	09/28/18 09:00
Sample Name:	35AWW11_092718	**Units:**	mg/L
Lab Code:	R1809393-003	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND	U	2.0	1.0	0.16	10	10/05/18 14:30	
Acetic Acid	**1100**		40	20	10	10	10/05/18 14:30	
Butanoic Acid (Butyric Acid)	ND	U	20	10	3.2	10	10/05/18 14:30	
Lactic Acid	ND	U	20	10	1.4	10	10/05/18 14:30	
Propionic Acid	**520**		20	10	1.9	10	10/05/18 14:30	

General Chemistry

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
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ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	09/27/18 09:30
Sample Matrix:	Water	**Date Received:**	09/28/18 09:00
Sample Name:	35AWW24_092718	**Basis:**	NA
Lab Code:	R1809393-001		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**0.31**	mg/L	0.10	0.08	0.03	1	09/28/18 16:10	*

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	09/27/18 10:35
Sample Matrix:	Water	**Date Received:**	09/28/18 09:00
Sample Name:	35AWW19_092718	**Basis:**	NA
Lab Code:	R1809393-002		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**3.99**	mg/L	0.50	0.40	0.11	5	09/28/18 16:10	*

ALS Group USA, Corp.
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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	09/27/18 11:50
Sample Matrix:	Water	**Date Received:**	09/28/18 09:00
Sample Name:	35AWW11_092718	**Basis:**	NA
Lab Code:	R1809393-003		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**36.5**	mg/L	5.0	4.0	1.1	50	09/28/18 16:10	*

QC Summary Forms

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1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
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ALS Group USA, Corp.
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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58
Sample Matrix: Water

Service Request: R1809393
Date Analyzed: 10/04/18 17:51

Method Blank Summary

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Sample Name: Method Blank
Lab Code: RQ1810603-04

Instrument ID:R-HPLC-05
File ID:I:\ACQUDATA\hplc05\data\100418\A0002377.D\

Analysis Method: Organic Acids

Analysis Lot:609639

This Method Blank applies to the following analyses.

Sample Name	Lab Code	File ID	Date Analyzed
Lab Control Sample	RQ1810603-05	I:\ACQUDATA\hplc05\data\100418\A0002378.D\	10/04/18 18:26
Duplicate Lab Control Sample	RQ1810603-06	I:\ACQUDATA\hplc05\data\100418\A0002379.D\	10/04/18 19:00
35AWW24_092718	R1809393-001	I:\ACQUDATA\hplc05\data\100418\A0002386.D\	10/04/18 23:05
35AWW19_092718	R1809393-002	I:\ACQUDATA\hplc05\data\100418\A0002388.D\	10/05/18 00:15

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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58
Sample Matrix: Water

Service Request: R1809393
Date Analyzed: 10/05/18 11:04

Method Blank Summary

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Sample Name: Method Blank
Lab Code: RQ1810656-03

Instrument ID:R-HPLC-05
File ID:I:\ACQUDATA\hplc05\data\100518\A0002393.D\

Analysis Method: Organic Acids

Analysis Lot:609806

This Method Blank applies to the following analyses.

Sample Name	Lab Code	File ID	Date Analyzed
Lab Control Sample	RQ1810656-04	I:\ACQUDATA\hplc05\data\100518\A0002394.D\	10/05/18 11:39
Duplicate Lab Control Sample	RQ1810656-05	I:\ACQUDATA\hplc05\data\100518\A0002395.D\	10/05/18 12:02
35AWW11_092718	R1809393-003	I:\ACQUDATA\hplc05\data\100518\A0002399.D\	10/05/18 14:30

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Sample Name:	Method Blank	**Units:**	mg/L
Lab Code:	RQ1810603-04	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND	U	0.20	0.10	0.016	1	10/04/18 17:51	
Acetic Acid	ND	U	4.0	2.0	1.0	1	10/04/18 17:51	
Butanoic Acid (Butyric Acid)	ND	U	2.0	1.0	0.32	1	10/04/18 17:51	
Lactic Acid	ND	U	2.0	1.0	0.14	1	10/04/18 17:51	
Propionic Acid	ND	U	2.0	1.0	0.19	1	10/04/18 17:51	

ALS Group USA, Corp.
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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Sample Name:	Method Blank	**Units:**	mg/L
Lab Code:	RQ1810656-03	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	10/05/18 11:04	
Acetic Acid	ND U	4.0	2.0	1.0	1	10/05/18 11:04	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	10/05/18 11:04	
Lactic Acid	ND U	2.0	1.0	0.14	1	10/05/18 11:04	
Propionic Acid	ND U	2.0	1.0	0.19	1	10/05/18 11:04	

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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58
Sample Matrix: Water

Service Request: R1809393
Date Analyzed: 10/04/18 18:26

Lab Control Sample Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Sample Name: Lab Control Sample
Lab Code: RQ1810603-05

Instrument ID:R-HPLC-05
File ID:I:\ACQUDATA\hplc05\data\100418\A0002378.D\

Analysis Method: Organic Acids
Analysis Lot:609639

This Lab Control Sample applies to the following analyses.

Sample Name	Lab Code	File ID	Date Analyzed
Method Blank	RQ1810603-04	I:\ACQUDATA\hplc05\data\100418\A0002377.D\	10/04/18 17:51
Duplicate Lab Control Sample	RQ1810603-06	I:\ACQUDATA\hplc05\data\100418\A0002379.D\	10/04/18 19:00
35AWW24_092718	R1809393-001	I:\ACQUDATA\hplc05\data\100418\A0002386.D\	10/04/18 23:05
35AWW19_092718	R1809393-002	I:\ACQUDATA\hplc05\data\100418\A0002388.D\	10/05/18 00:15

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QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Analyzed:**	10/05/18 11:39
Sample Matrix:	Water		

Lab Control Sample Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Sample Name:	Lab Control Sample	**Instrument ID:**	R-HPLC-05
Lab Code:	RQ1810656-04	**File ID:**	I:\ACQUDATA\hplc05\data\100518\A0002394.D\
Analysis Method:	Organic Acids	**Analysis Lot:**	609806

This Lab Control Sample applies to the following analyses.

Sample Name	Lab Code	File ID	Date Analyzed
Method Blank	RQ1810656-03	I:\ACQUDATA\hplc05\data\100518\A0002393.D\	10/05/18 11:04
Duplicate Lab Control Sample	RQ1810656-05	I:\ACQUDATA\hplc05\data\100518\A0002395.D\	10/05/18 12:02
35AWW11_092718	R1809393-003	I:\ACQUDATA\hplc05\data\100518\A0002399.D\	10/05/18 14:30

ALS Group USA, Corp.
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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58
Sample Matrix: Water

Service Request: R1809393
Date Analyzed: 10/04/18

Duplicate Lab Control Sample Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Units:mg/L
Basis:NA

		Lab Control Sample			Duplicate Lab Control Sample					
		RQ1810603-05			RQ1810603-06					
Analyte Name	**Analytical Method**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Pyruvic Acid	Organic Acids	2.97	2.02	147 *	3.00	2.02	148 *	73-122	1	30
Acetic Acid	Organic Acids	20.7	19.9	104	20.9	19.9	105	80-130	<1	30
Butanoic Acid (Butyric Acid)	Organic Acids	18.2	20.3	90	17.5	20.3	86	86-128	4	30
Lactic Acid	Organic Acids	20.3	20.6	98	20.5	20.6	99	81-114	1	30
Propionic Acid	Organic Acids	18.8	20.0	94	18.9	20.0	95	63-153	<1	30

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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58
Sample Matrix: Water

Service Request: R1809393
Date Analyzed: 10/05/18

Duplicate Lab Control Sample Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Units:mg/L
Basis:NA

		Lab Control Sample			Duplicate Lab Control Sample					
		RQ1810656-04			RQ1810656-05					
Analyte Name	**Analytical Method**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Pyruvic Acid	Organic Acids	2.99	2.02	148 *	2.97	2.02	147 *	73-122	<1	30
Acetic Acid	Organic Acids	20.7	19.9	104	20.8	19.9	105	80-130	<1	30
Butanoic Acid (Butyric Acid)	Organic Acids	18.4	20.3	90	17.8	20.3	88	86-128	3	30
Lactic Acid	Organic Acids	20.3	20.6	98	20.2	20.6	98	81-114	<1	30
Propionic Acid	Organic Acids	19.1	20.0	95	18.6	20.0	93	63-153	2	30

General Chemistry

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1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	NA
Sample Matrix:	Water	**Date Received:**	NA
Sample Name:	Method Blank	**Basis:**	NA
Lab Code:	R1809393-MB		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	ND U	mg/L	0.10	0.08	0.03	1	09/28/18 16:10	

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QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	09/27/18
Sample Matrix:	Water	**Date Received:**	09/28/18
		Date Analyzed:	09/28/18

Duplicate Matrix Spike Summary
Iron, Divalent (Ferrous Iron)

Sample Name:	35AWW24_092718	**Units:**	mg/L
Lab Code:	R1809393-001	**Basis:**	NA
Analysis Method:	SM 3500-Fe B.4.c		

		Matrix Spike R1809393-001MS			Duplicate Matrix Spike R1809393-001DMS					
Analyte Name	**Sample Result**	**Result**	**Spike Amount**	**% Rec**	**Result**	**Spike Amount**	**% Rec**	**% Rec Limits**	**RPD**	**RPD Limit**
Iron, Divalent (Ferrous Iron)	0.31	0.81	0.40	124	0.81	0.40	124	67-129	<1	20

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
Project: LHAAP / Site 58
Sample Matrix: Water

Service Request: R1809393
Date Analyzed: 09/28/18

Lab Control Sample Summary
General Chemistry Parameters

Units:mg/L
Basis:NA

Lab Control Sample
R1809393-LCS

Analyte Name	Analytical Method	Result	Spike Amount	% Rec	% Rec Limits
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	0.39	0.40	97	67-129

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:**R1809393
Project: LHAAP / Site 58

Continuing Calibration Blank (CCB) Summary
Iron, Divalent (Ferrous Iron)

Analysis Method: SM 3500-Fe B.4.c **Units:**mg/L

	Analysis Lot	Lab Code	Date Analyzed	LOQ	LOD	MDL	Result	Q
CCB1	609190	RQ1810496-02	09/28/18 16:10	0.10	0.08	0.03	ND	U
CCB2	609190	RQ1810496-05	09/28/18 16:10	0.10	0.08	0.03	ND	U

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QA/QC Report

Client: ALS Environmental - US **Service Request:** R1809393
Project: LHAAP / Site 58

Continuing Calibration Verification (CCV) Summary

Iron, Divalent (Ferrous Iron)

Analysis Method: SM 3500-Fe B.4.c **Units:** mg/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	609190	RQ1810496-01	09/28/18 16:10	2.00	2.00	100	90-110
CCV2	609190	RQ1810496-06	09/28/18 16:10	2.00	2.00	100	90-110

Raw Data

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1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	09/27/18 09:30
Sample Matrix:	Water	**Date Received:**	09/28/18 09:00
Sample Name:	35AWW24_092718	**Units:**	mg/L
Lab Code:	R1809393-001	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND	U	0.20	0.10	0.016	1	10/04/18 23:05	
Acetic Acid	ND	U	4.0	2.0	1.0	1	10/04/18 23:05	
Butanoic Acid (Butyric Acid)	ND	U	2.0	1.0	0.32	1	10/04/18 23:05	
Lactic Acid	ND	U	2.0	1.0	0.14	1	10/04/18 23:05	
Propionic Acid	ND	U	2.0	1.0	0.19	1	10/04/18 23:05	

ALS Group USA, Corp.
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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	09/27/18 10:35
Sample Matrix:	Water	**Date Received:**	09/28/18 09:00
Sample Name:	35AWW19_092718	**Units:**	mg/L
Lab Code:	R1809393-002	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	10/05/18 00:15	
Acetic Acid	ND U	4.0	2.0	1.0	1	10/05/18 00:15	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	10/05/18 00:15	
Lactic Acid	ND U	2.0	1.0	0.14	1	10/05/18 00:15	
Propionic Acid	ND U	2.0	1.0	0.19	1	10/05/18 00:15	

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	09/27/18 11:50
Sample Matrix:	Water	**Date Received:**	09/28/18 09:00
Sample Name:	35AWW11_092718	**Units:**	mg/L
Lab Code:	R1809393-003	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND	U	2.0	1.0	0.16	10	10/05/18 14:30	
Acetic Acid	**1100**		40	20	10	10	10/05/18 14:30	
Butanoic Acid (Butyric Acid)	ND	U	20	10	3.2	10	10/05/18 14:30	
Lactic Acid	ND	U	20	10	1.4	10	10/05/18 14:30	
Propionic Acid	**520**		20	10	1.9	10	10/05/18 14:30	

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002386.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 23:05:51
Operator : b.allgeier
Sample : r1809393-001
Misc :
ALS Vial : 20 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:15 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units
Target Compounds					
1) t	Formic acid	0.000	0	N.D.	ppm
2) T	Pyruvic acid	0.000	0	N.D.	ppm
3) T	Lactic Acid	0.000	0	N.D.	ppm
4) T	Acetic Acid	0.000	0	N.D.	ppm
5) T	Propionic Acid	0.000	0	N.D.	ppm
6) T	Butyric Acid	0.000	0	N.D.	ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

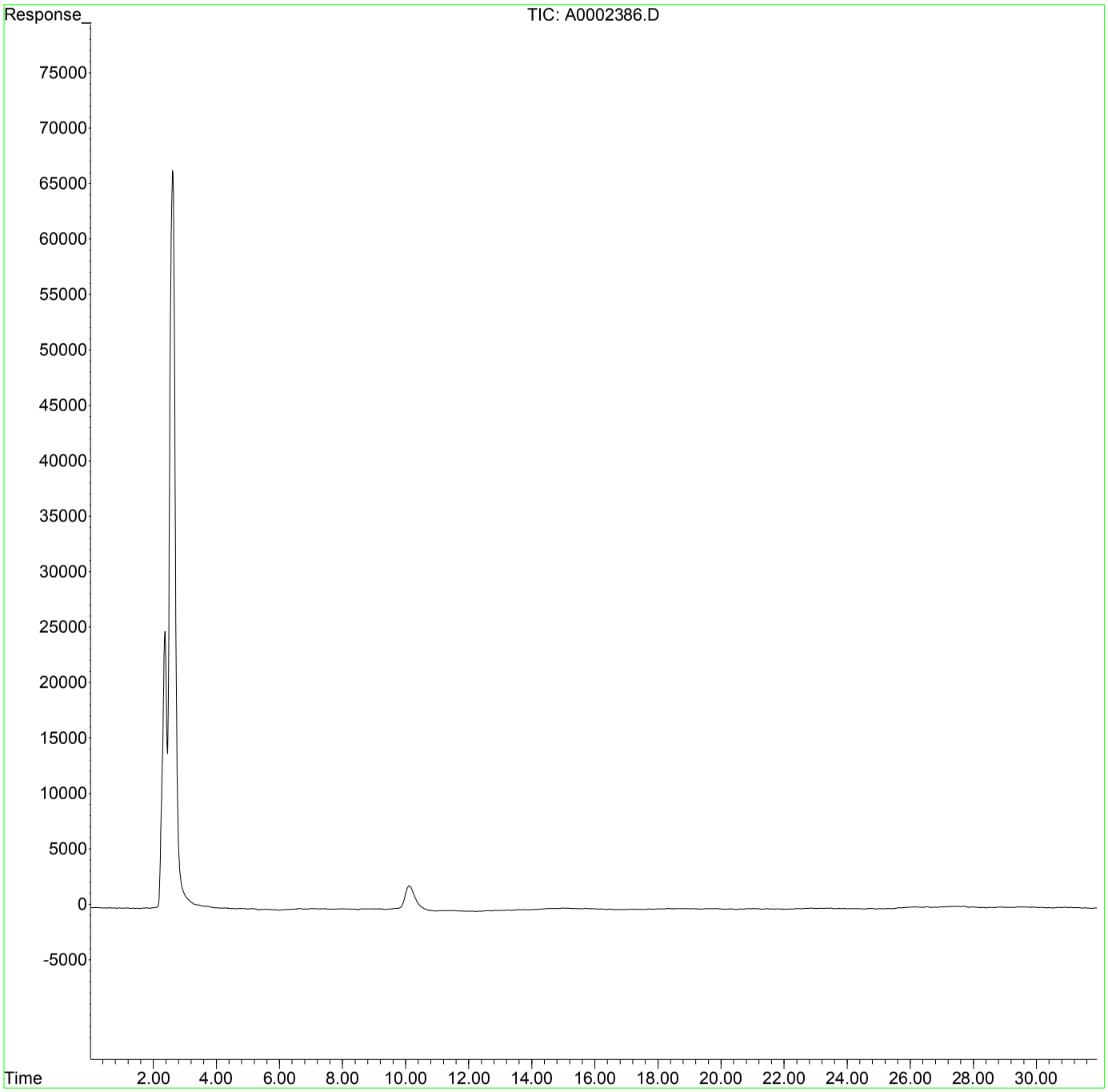
00944253

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002386.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 23:05:51
Operator : b.allgeier
Sample : r1809393-001
Misc :
ALS Vial : 20 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:15 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944254

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002388.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 00:15:52
Operator : b.allgeier
Sample : r1809393-002
Misc :
ALS Vial : 21 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:19 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units
Target Compounds					
1) t	Formic acid	0.000	0	N.D.	ppm
2) T	Pyruvic acid	0.000	0	N.D.	ppm
3) T	Lactic Acid	0.000	0	N.D.	ppm
4) T	Acetic Acid	0.000	0	N.D.	ppm
5) T	Propionic Acid	0.000	0	N.D.	ppm
6) T	Butyric Acid	0.000	0	N.D.	ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

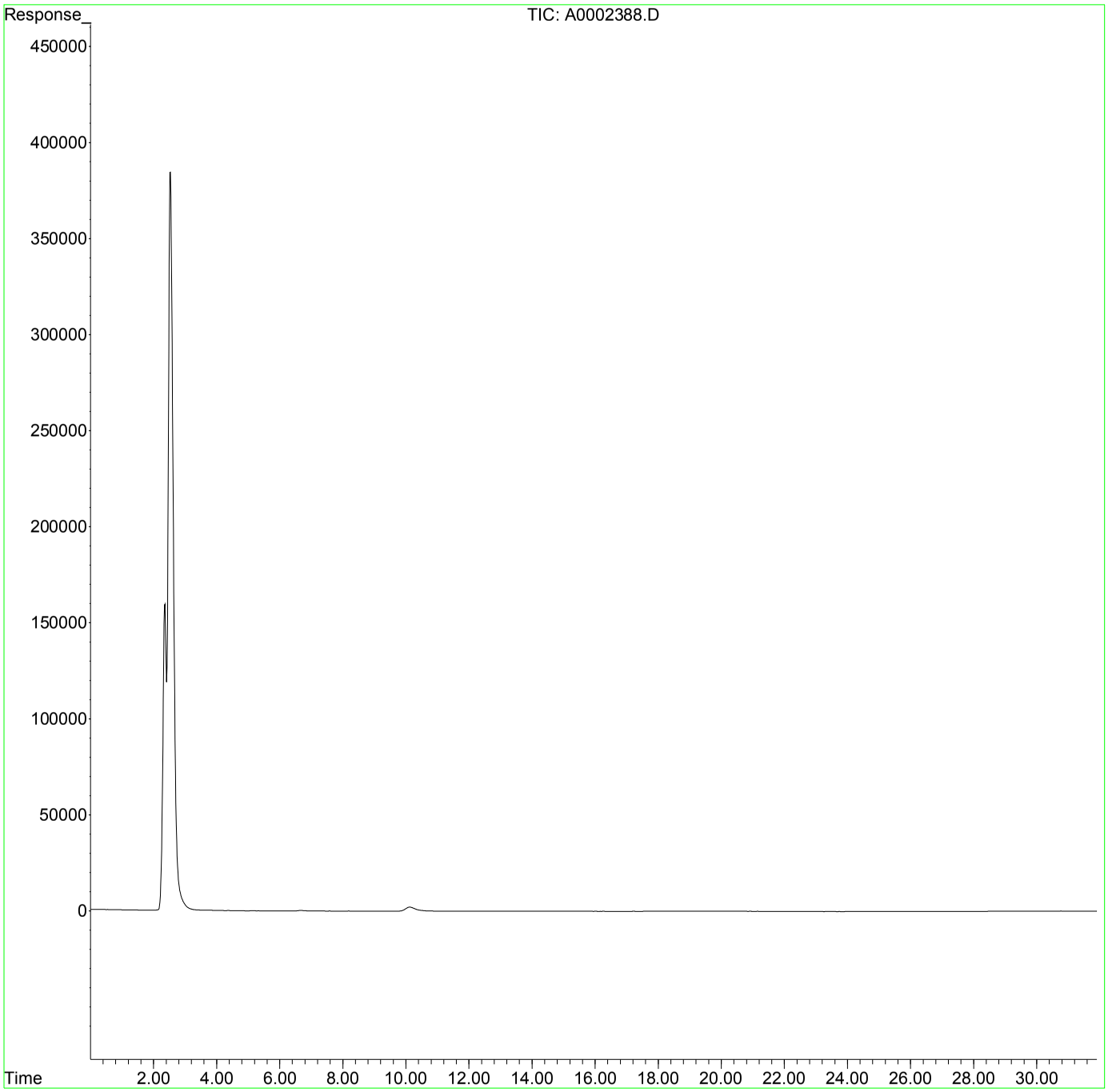
00944255

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002388.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 00:15:52
Operator : b.allgeier
Sample : r1809393-002
Misc :
ALS Vial : 21 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:19 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944256

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002399.D
Signal(s) : dad1A.ch
Acq On : ~~31-Dec-2000, 02:47:48~~ 05-Oct-2018, 14:30:00
Operator : b.allgeier
Sample : r1809393-003|10
Misc :
ALS Vial : 8 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:25 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	0.000	0	N.D.	ppm	
2) T	Pyruvic acid	0.000	0	N.D.	ppm	d
3) T	Lactic Acid	0.000	0	N.D.	ppm	d
4) T	Acetic Acid	4.363	6525516	110.285	ppm	
5) T	Propionic Acid	9.115	3125438	52.448	ppm	
6) T	Butyric Acid	0.000	0	N.D.	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

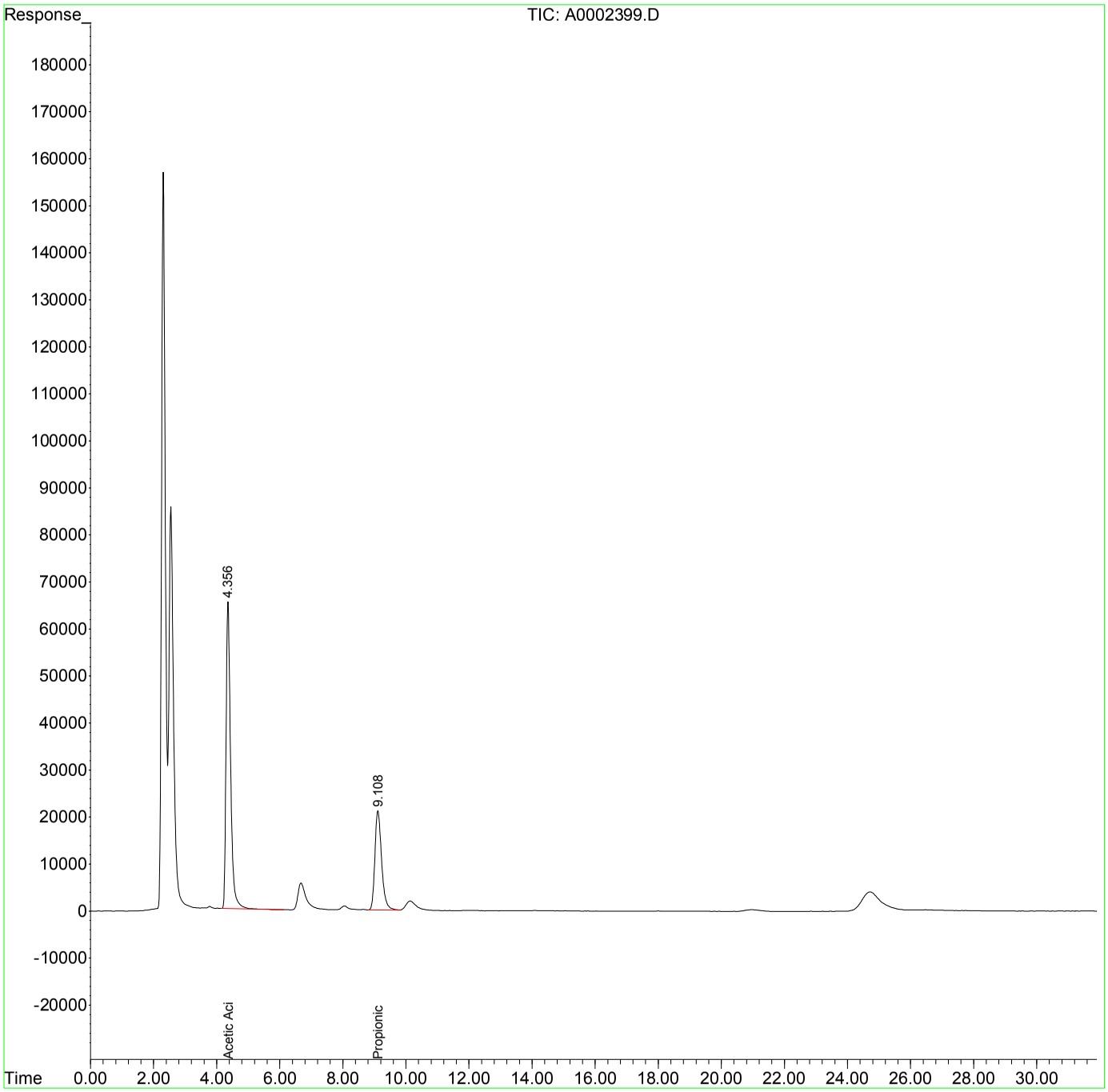
00944257

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002399.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:47:48
Operator : b.allgeier
Sample : r1809393-003|10
Misc :
ALS Vial : 8 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:25 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944258

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002377.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:51:39
Operator : b.allgeier
Sample : met blk
Misc :
ALS Vial : 11 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:27:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units
Target Compounds					
1) t	Formic acid	0.000	0	N.D.	ppm
2) T	Pyruvic acid	0.000	0	N.D.	ppm
3) T	Lactic Acid	0.000	0	N.D.	ppm
4) T	Acetic Acid	0.000	0	N.D.	ppm
5) T	Propionic Acid	0.000	0	N.D.	ppm
6) T	Butyric Acid	0.000	0	N.D.	ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

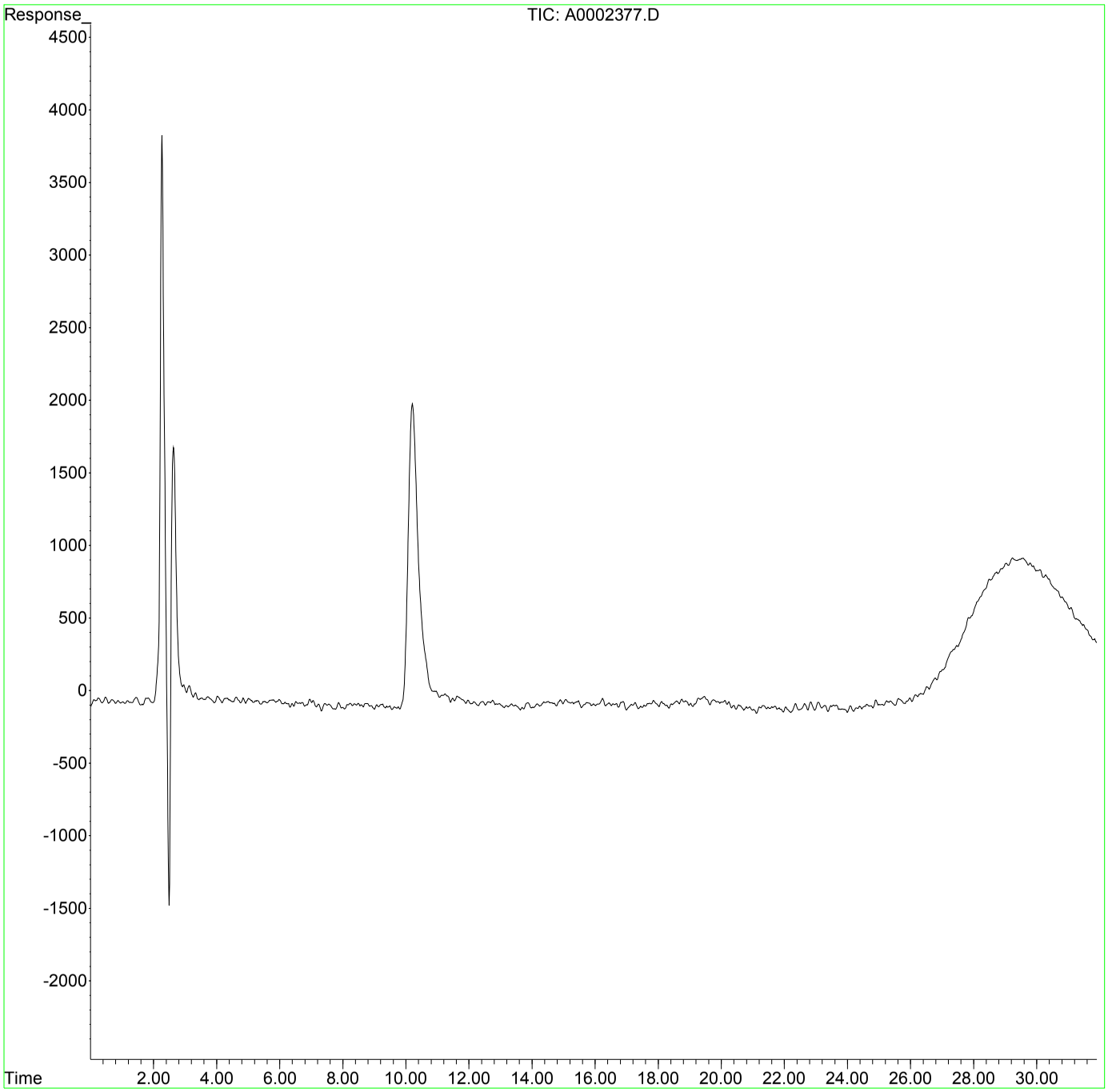
00944259

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002377.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:51:39
Operator : b.allgeier
Sample : met blk
Misc :
ALS Vial : 11 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:27:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944260

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002393.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 11:04:39
Operator : b.allgeier
Sample : met blk
Misc :
ALS Vial : 2 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:11 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units
Target Compounds					
1) t	Formic acid	0.000	0	N.D.	ppm
2) T	Pyruvic acid	0.000	0	N.D.	ppm
3) T	Lactic Acid	0.000	0	N.D.	ppm
4) T	Acetic Acid	0.000	0	N.D.	ppm
5) T	Propionic Acid	0.000	0	N.D.	ppm
6) T	Butyric Acid	0.000	0	N.D.	ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

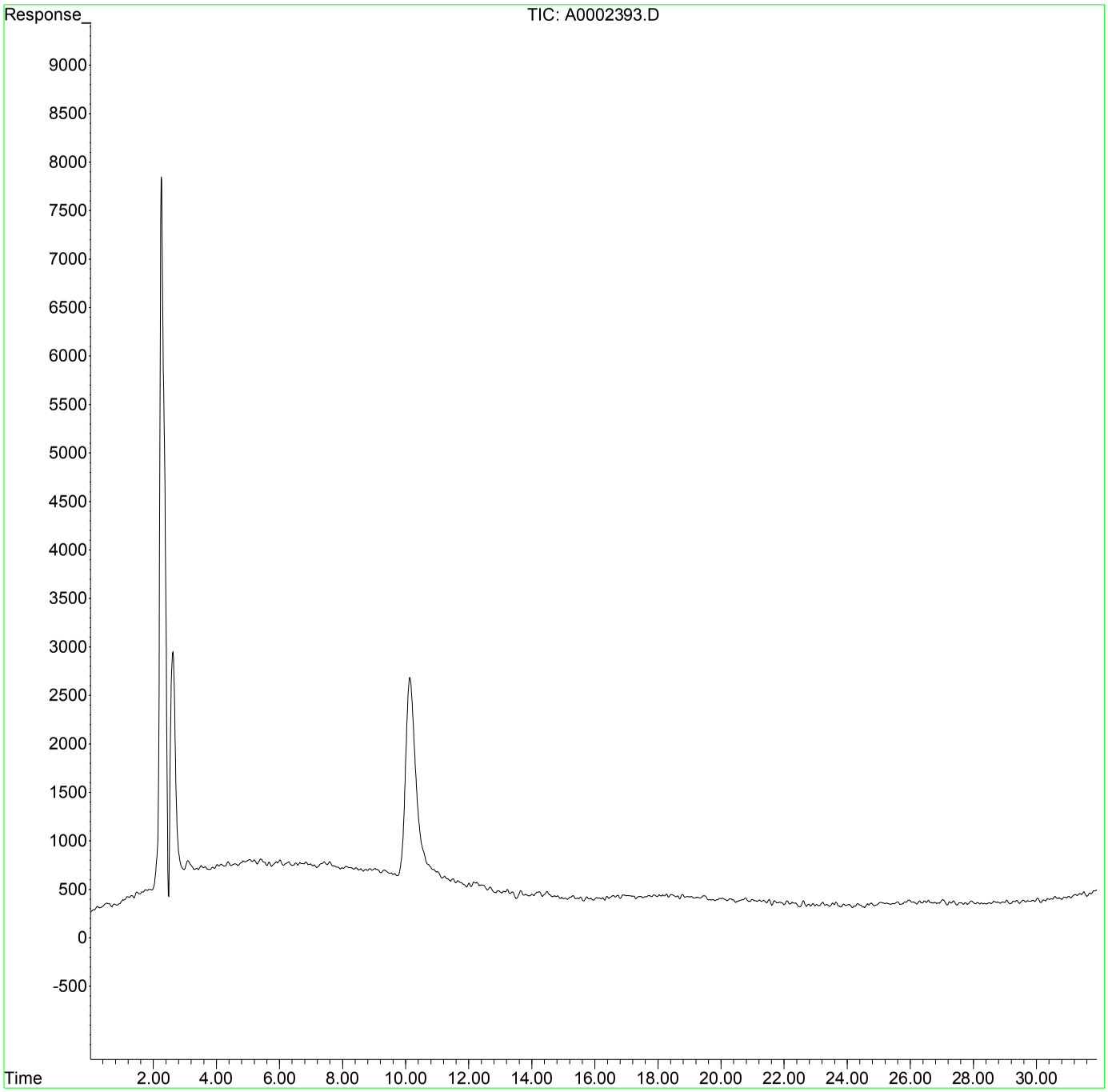
00944261

1st BA 10/08/18
2nd BA 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002393.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 11:04:39
Operator : b.allgeier
Sample : met blk
Misc :
ALS Vial : 2 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:11 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944262

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002378.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 18:26:33
Operator : b.allgeier
Sample : lcs
Misc :
ALS Vial : 12 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:27:59 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc Units
Target Compounds				
1) t	Formic acid	3.133	1888113	19.598 ppm
2) T	Pyruvic acid	3.630	1345992	2.972 ppm
3) T	Lactic Acid	4.055	1088740	20.250 ppm
4) T	Acetic Acid	4.409	1224265	20.691 ppm
5) T	Propionic Acid	9.241	1120055	18.796 ppm
6) T	Butyric Acid	25.078	1146501	18.228 ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

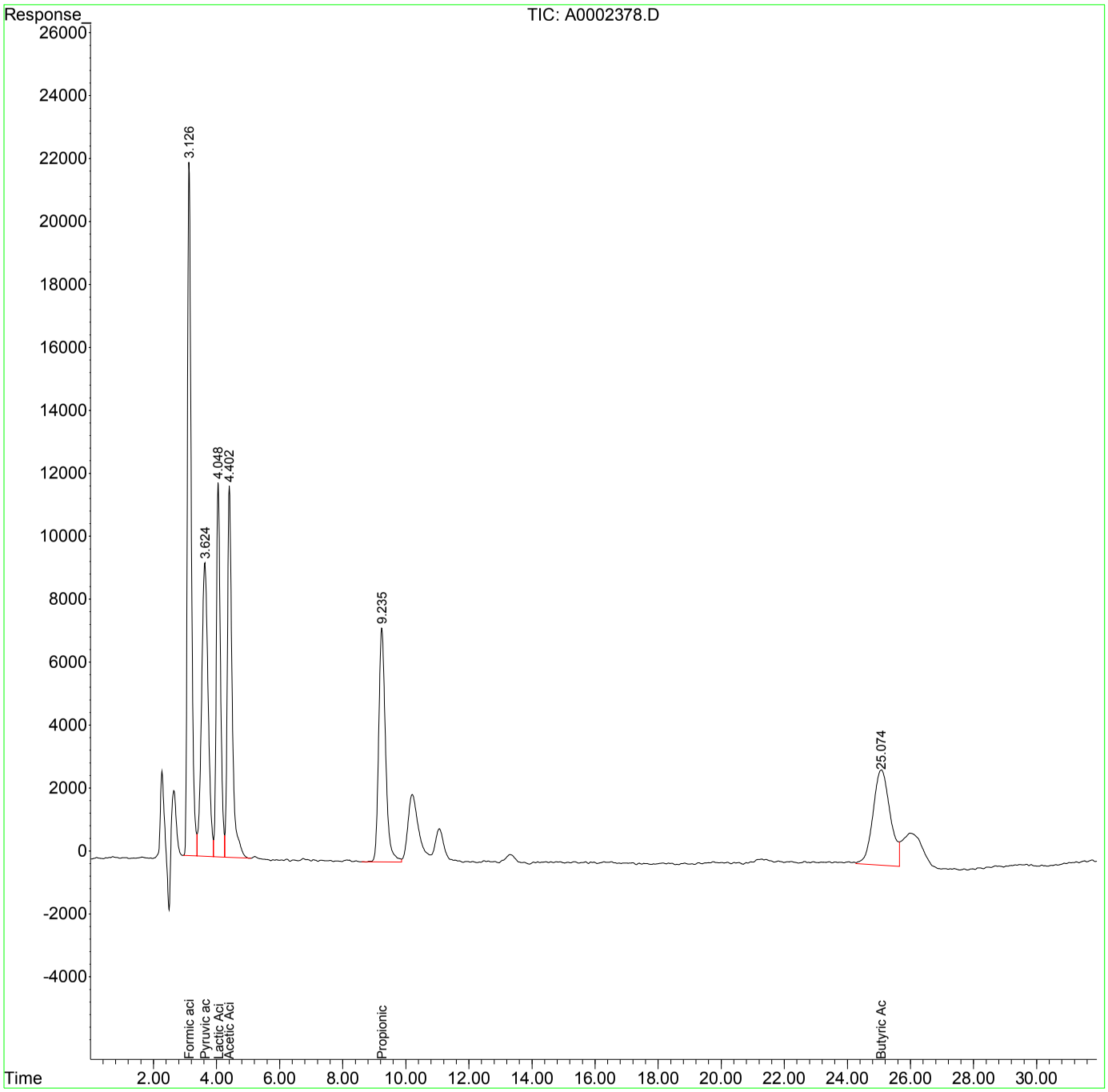
00944263

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002378.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 18:26:33
Operator : b.allgeier
Sample : lcs
Misc :
ALS Vial : 12 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:27:59 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944264

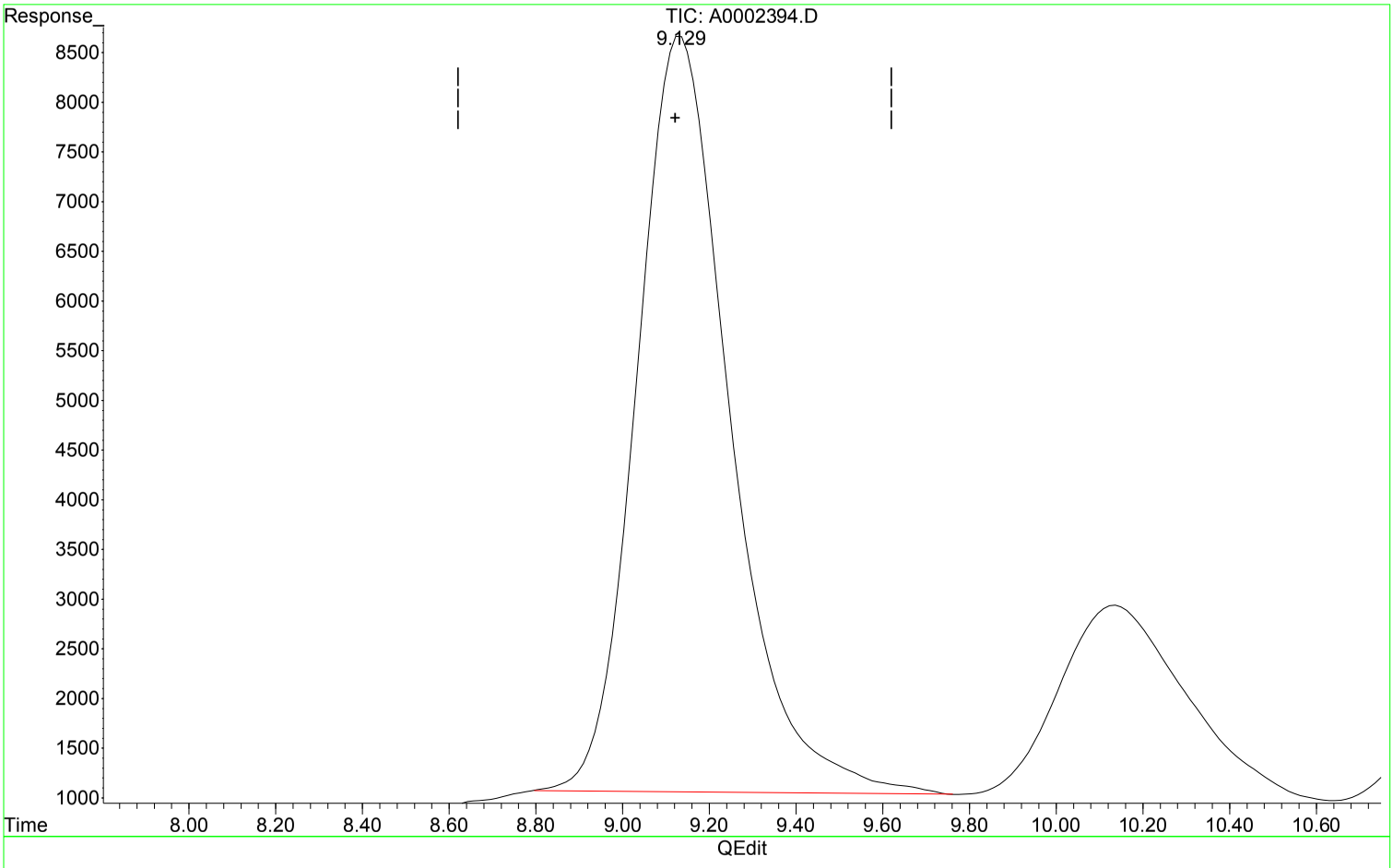
1st BA 10/08/18
2nd BA 10/09/18

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002394.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 11:39:38
Operator : b.allgeier
Sample : lcs
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:13 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.129min 19.053 ppm m

response 1135408

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

MA100418.M Fri Oct 05 15:31:10 2018 Page: 1

00944265

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002394.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 11:39:38
Operator : b.allgeier
Sample : lcs
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:13 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.110	1910564	19.831	ppm	
2) T	Pyruvic acid	3.603	1352094	2.985	ppm	
3) T	Lactic Acid	4.020	1090336	20.280	ppm	
4) T	Acetic Acid	4.369	1227239	20.741	ppm	
5) T	Propionic Acid	9.129	1135408	19.053	ppm	m
6) T	Butyric Acid	24.710	1155592	18.373	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

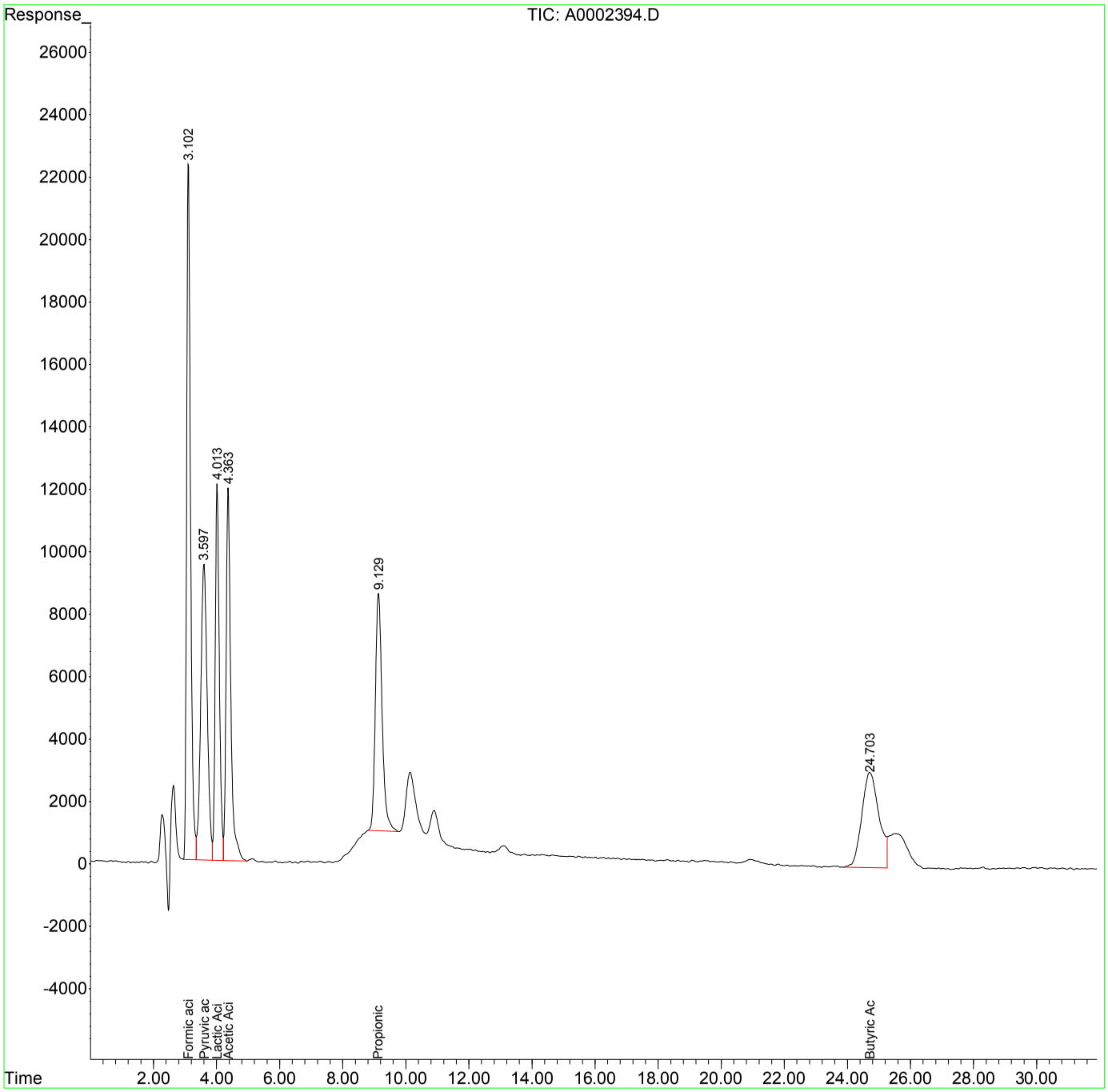
00944266

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002394.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 11:39:38
Operator : b.allgeier
Sample : lcs
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:13 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



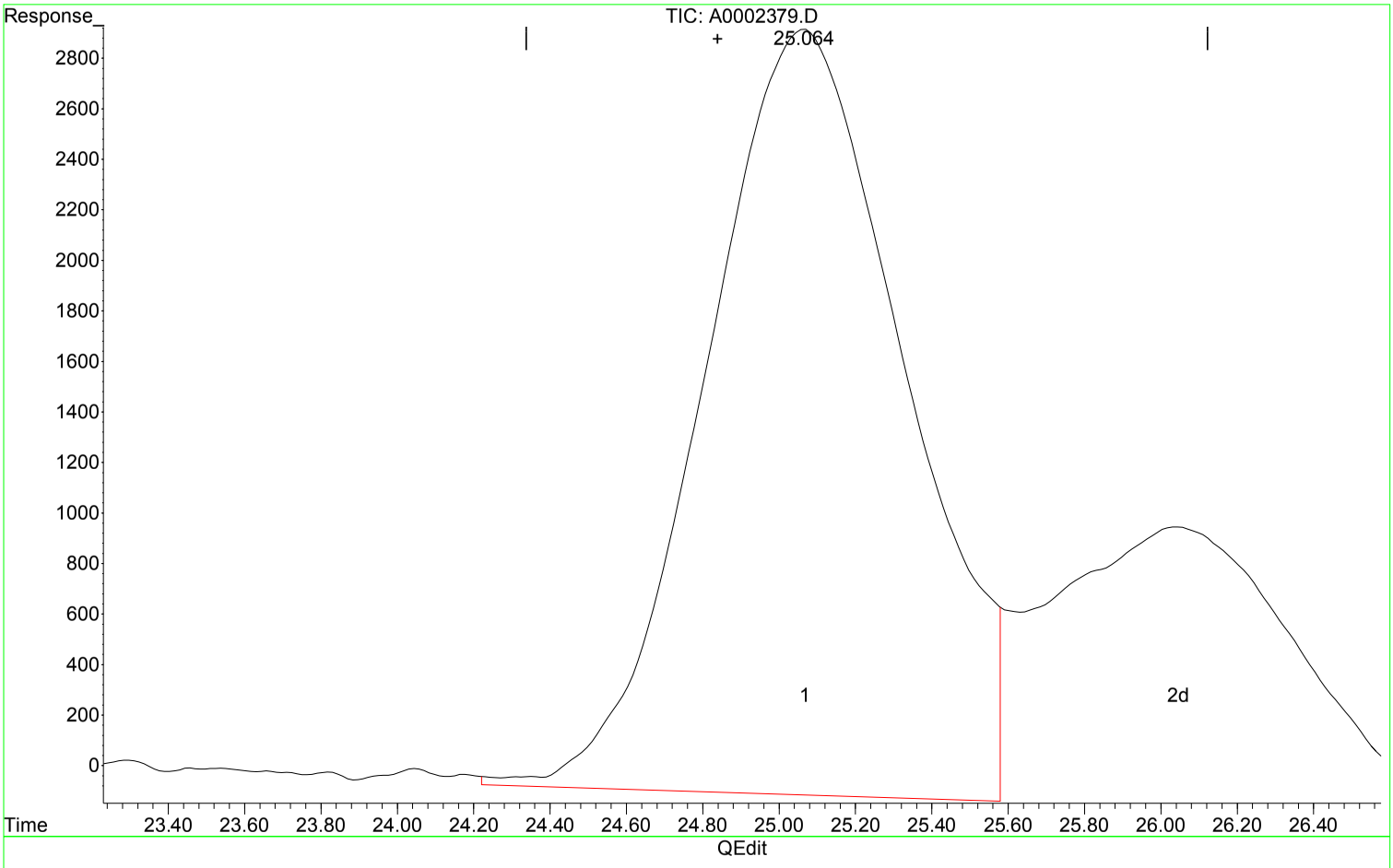
00944267

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002379.D
Signal(s) : dad1A.ch
Acq On : 29-Dec-2000, 23:47:53
Operator : b.allgeier
Sample : lcsd
Misc :
ALS Vial : 13 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:01 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

25.064min 17.514 ppm m

response 1101604

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

1st BA 10/05/18
2nd MP 10/09/18

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002379.D
Signal(s) : dad1A.ch
Acq On : ~~29-Dec-2000, 23:47:53~~ 04-Oct-2018, 19:00:00
Operator : b.allgeier
Sample : lcsd
Misc :
ALS Vial : 13 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:01 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.133	1909074	19.815	ppm	
2) T	Pyruvic acid	3.629	1357464	2.997	ppm	
3) T	Lactic Acid	4.056	1100466	20.468	ppm	
4) T	Acetic Acid	4.411	1236167	20.892	ppm	
5) T	Propionic Acid	9.244	1128333	18.934	ppm	
6) T	Butyric Acid	25.064	1101604	17.514	ppm	m

(f)=RT Delta > 1/2 Window (m)=manual int.

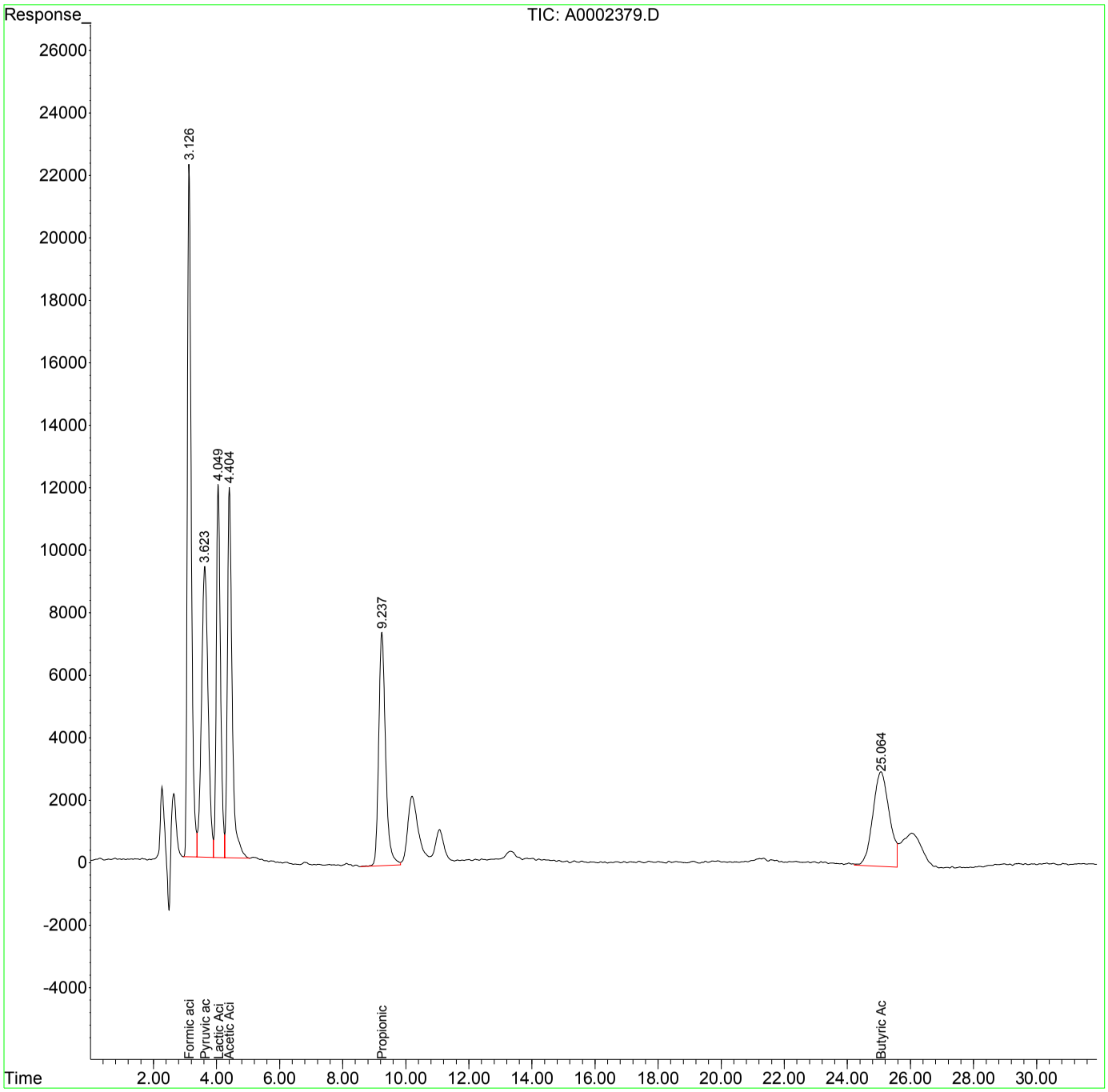
00944269

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002379.D
Signal(s) : dad1A.ch
Acq On : 29-Dec-2000, 23:47:53
Operator : b.allgeier
Sample : lcsd
Misc :
ALS Vial : 13 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:01 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944270

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002395.D
Signal(s) : dad1A.ch
Acq On : ~~29-Dec-2000, 23:18:07~~ 05-Oct-2018, 12:02:00
Operator : b.allgeier
Sample : lcsd
Misc :
ALS Vial : 4 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:15 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc Units
Target Compounds				
1) t	Formic acid	3.109	1891515	19.633 ppm
2) T	Pyruvic acid	3.602	1344844	2.969 ppm
3) T	Lactic Acid	4.019	1087299	20.223 ppm
4) T	Acetic Acid	4.368	1231094	20.806 ppm
5) T	Propionic Acid	9.130	1108903	18.608 ppm
6) T	Butyric Acid	24.712	1120597	17.816 ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

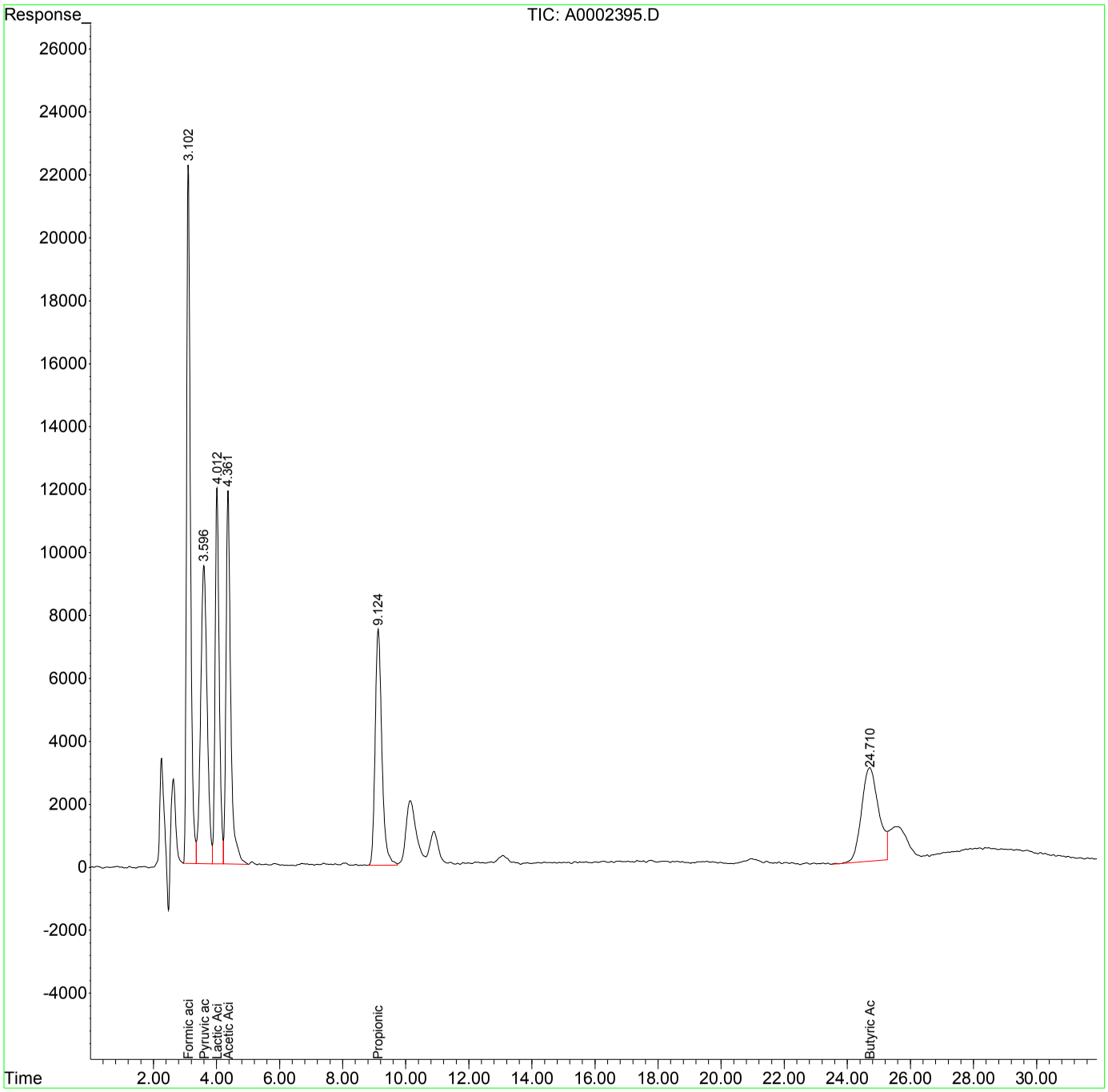
00944271

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002395.D
Signal(s) : dad1A.ch
Acq On : 29-Dec-2000, 23:18:07
Operator : b.allgeier
Sample : lcsd
Misc :
ALS Vial : 4 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:30:15 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



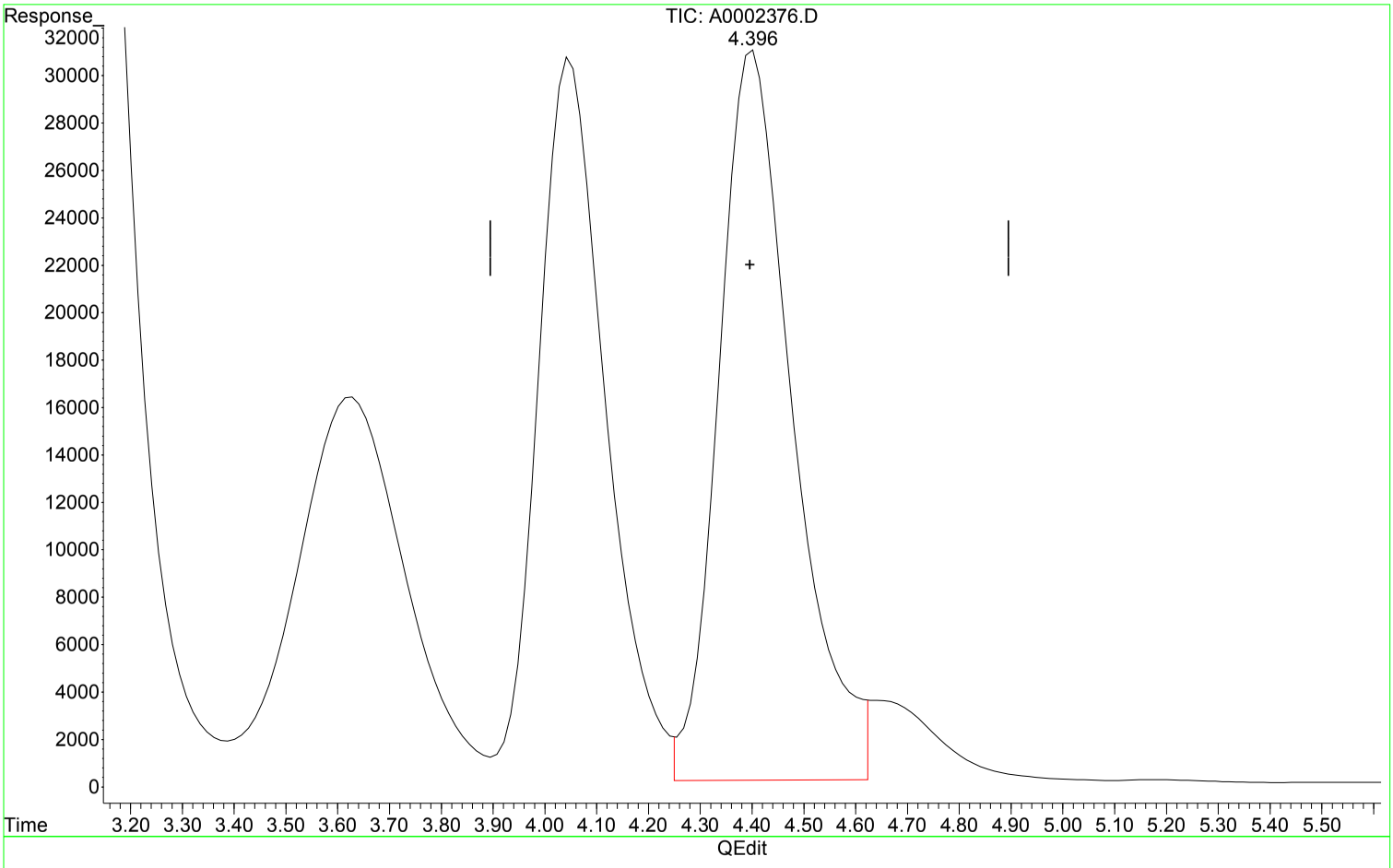
00944272

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002376.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:16:44
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:26:22 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.396min 51.650 ppm m

response 3056109

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

MA100418.M Fri Oct 05 08:26:48 2018 Page: 1

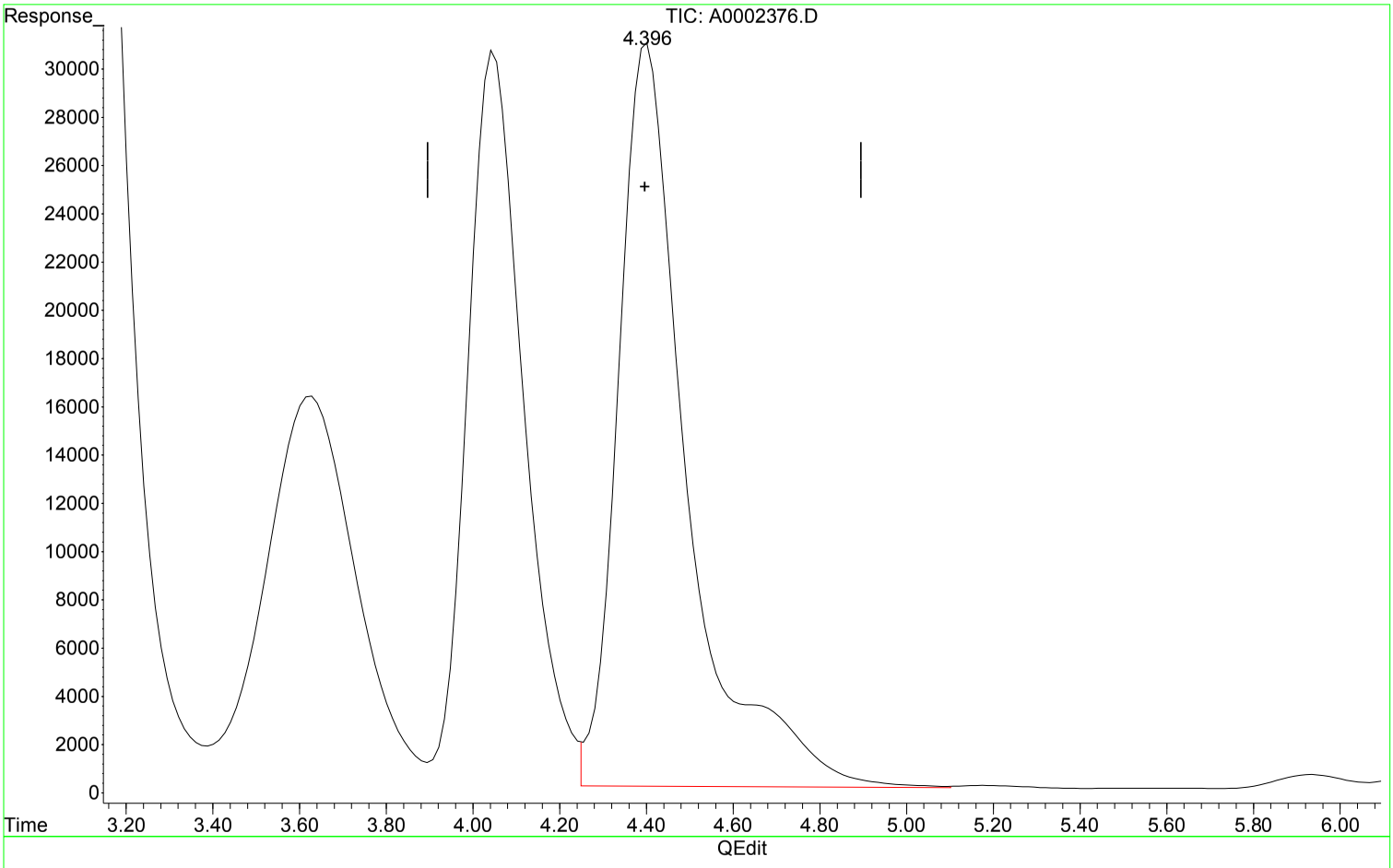
00944273

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002376.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:16:44
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:26:22 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.404min 57.452 ppm

response 3399396

Manual Integration:

Before

10/05/18

(+) = Expected Retention Time

MA100418.M Fri Oct 05 08:26:33 2018 Page: 1

00944274

Evaluate Continuing Calibration Report

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002376.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:16:44
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:26:22 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1 t	Formic acid	96.343	97.119 E3	-0.8	101	0.00
2 T	Pyruvic acid	452.935	463.290 E3	-2.3	101	0.00
3 T	Lactic Acid	53.765	55.006 E3	-2.3	101	0.00
4 T	Acetic Acid	59.169	61.122 E3	-3.3	101	0.00
5 T	Propionic Acid	59.592	58.787 E3	1.4	100	0.02
6 T	Butyric Acid	62.897	57.717 E3	8.2	98	0.10

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

00944275

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002376.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:16:44
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:26:22 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.131	4855945	50.403	ppm	
2) T	Pyruvic acid	3.628	2316452	5.114	ppm	
3) T	Lactic Acid	4.051	2750282	51.154	ppm	
4) T	Acetic Acid	4.396	3056109	51.650	ppm	m
5) T	Propionic Acid	9.209	2939344	49.325	ppm	
6) T	Butyric Acid	24.941	2885862	45.882	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

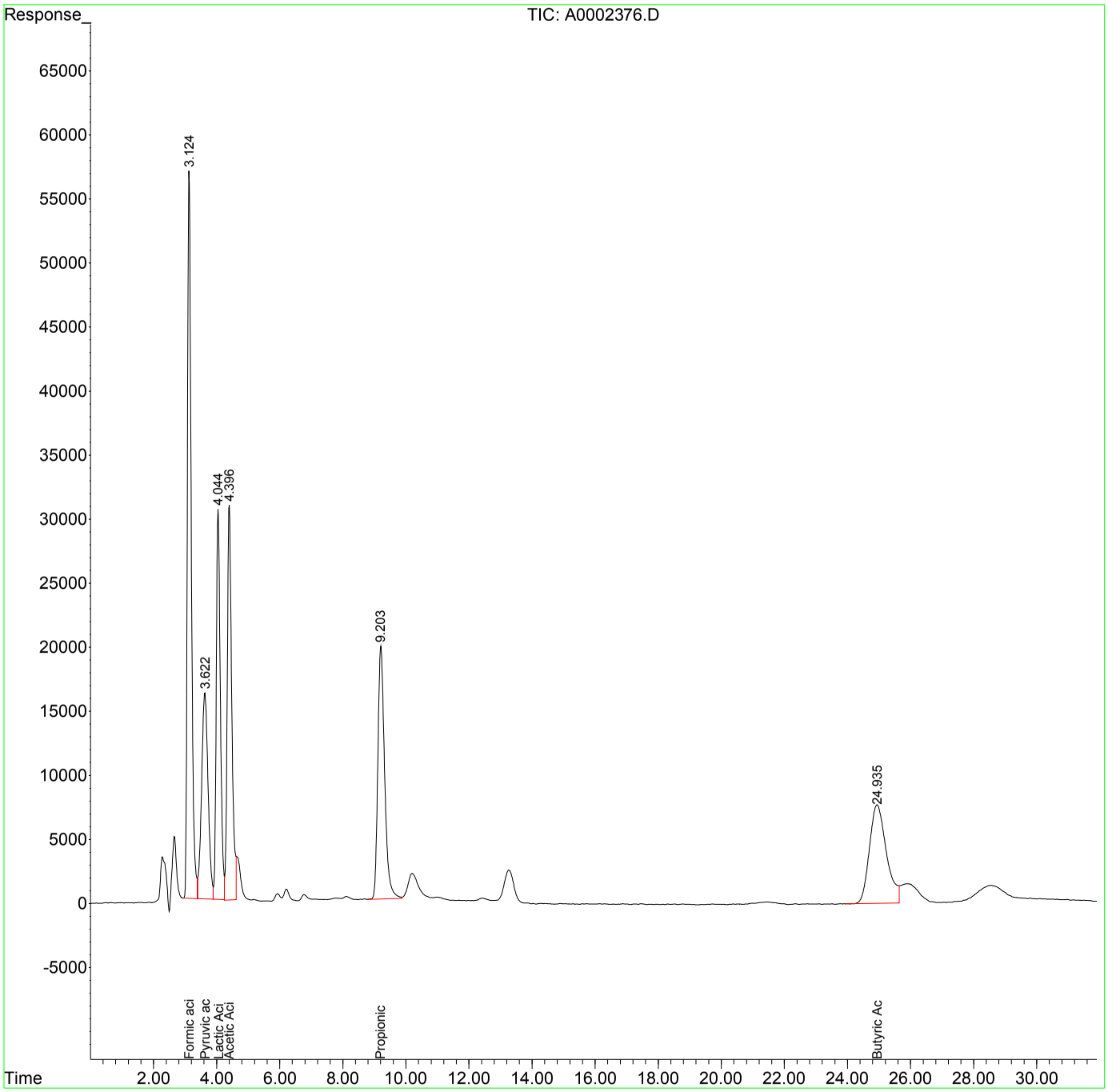
00944276

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002376.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 17:16:44
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:26:22 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



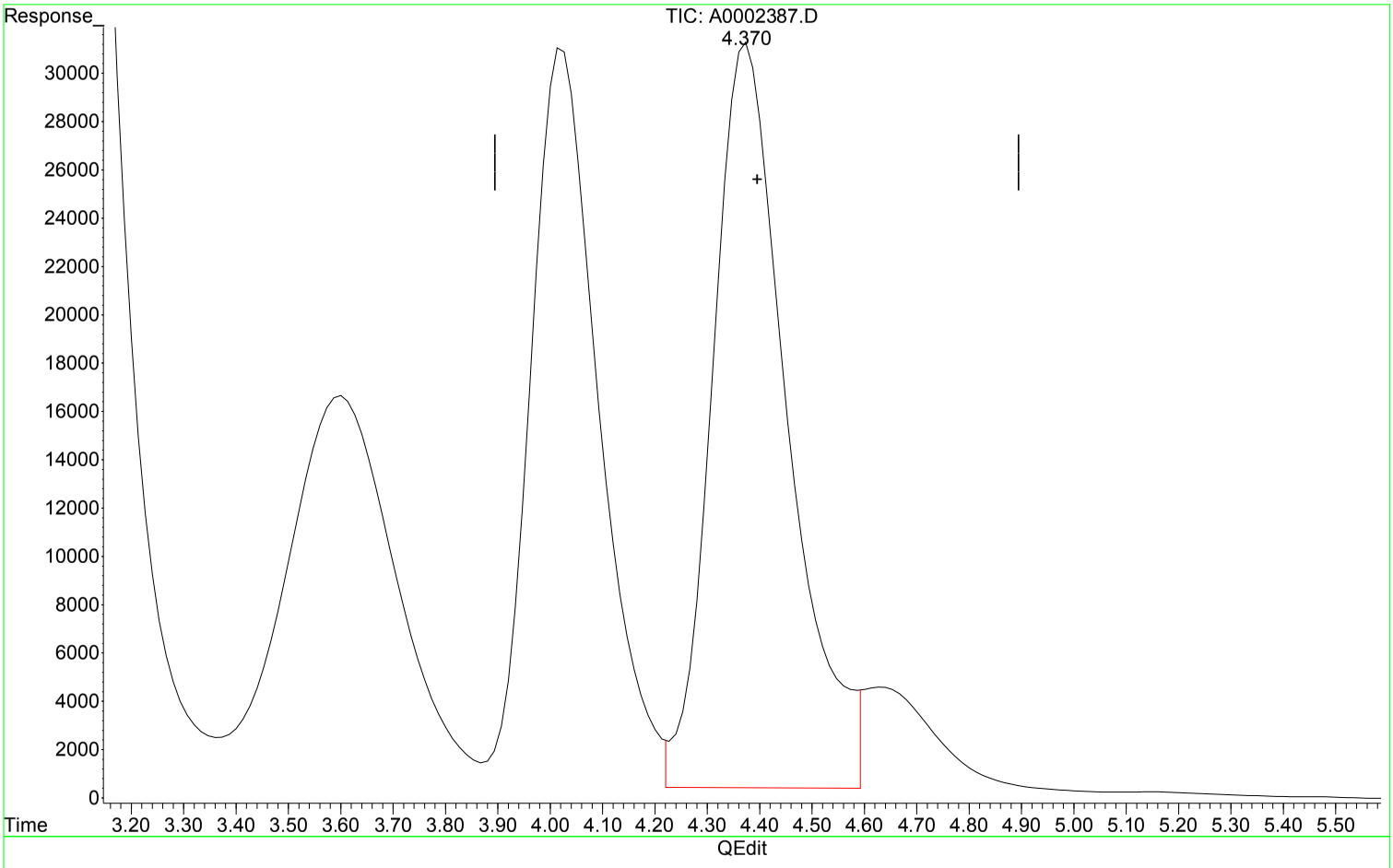
00944277

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002387.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 23:40:52
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:17 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.370min 52.246 ppm m

response 3091378

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

MA100418.M Fri Oct 05 08:33:48 2018 Page: 1

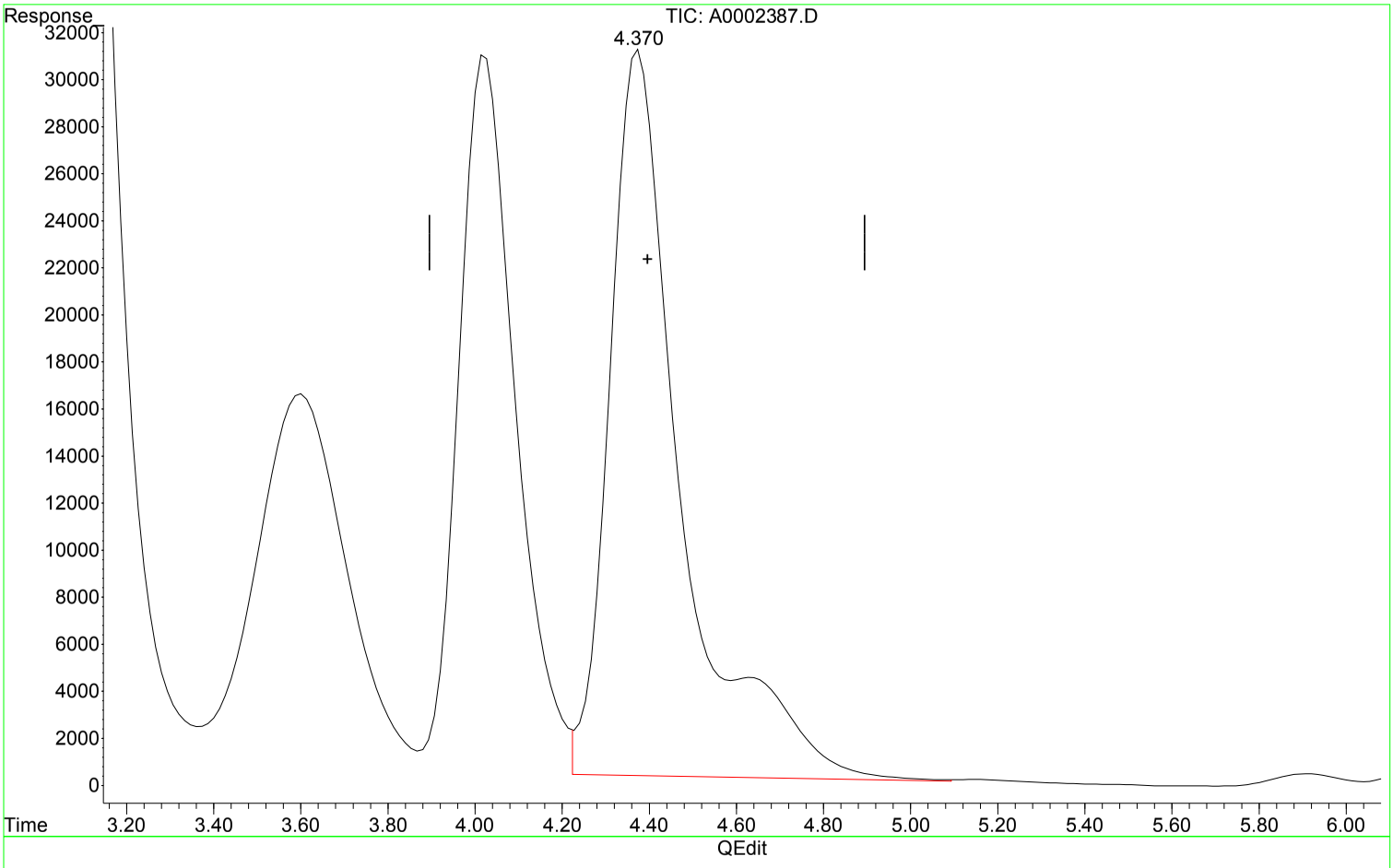
00944278

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002387.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 23:40:52
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:17 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.378min 59.424 ppm

response 3516056

Manual Integration:

Before

10/05/18

(+) = Expected Retention Time

MA100418.M Fri Oct 05 08:33:41 2018 Page: 1

00944279

Evaluate Continuing Calibration Report

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002387.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 23:40:52
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:17 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1 t	Formic acid	96.343	96.897 E3	-0.6	101	-0.02
2 T	Pyruvic acid	452.935	460.392 E3	-1.6	100	-0.03
3 T	Lactic Acid	53.765	55.156 E3	-2.6	102	-0.02
4 T	Acetic Acid	59.169	61.828 E3	-4.5	102	-0.03
5 T	Propionic Acid	59.592	58.777 E3	1.4	100	-0.03
6 T	Butyric Acid	62.897	58.758 E3	6.6	100	-0.03

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

00944280

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002387.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 23:40:52
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:17 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.111	4844848	50.287	ppm	
2) T	Pyruvic acid	3.603	2301960	5.082	ppm	
3) T	Lactic Acid	4.026	2757824	51.294	ppm	
4) T	Acetic Acid	4.370	3091378	52.246	ppm	m
5) T	Propionic Acid	9.162	2938838	49.316	ppm	
6) T	Butyric Acid	24.810	2937908	46.710	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

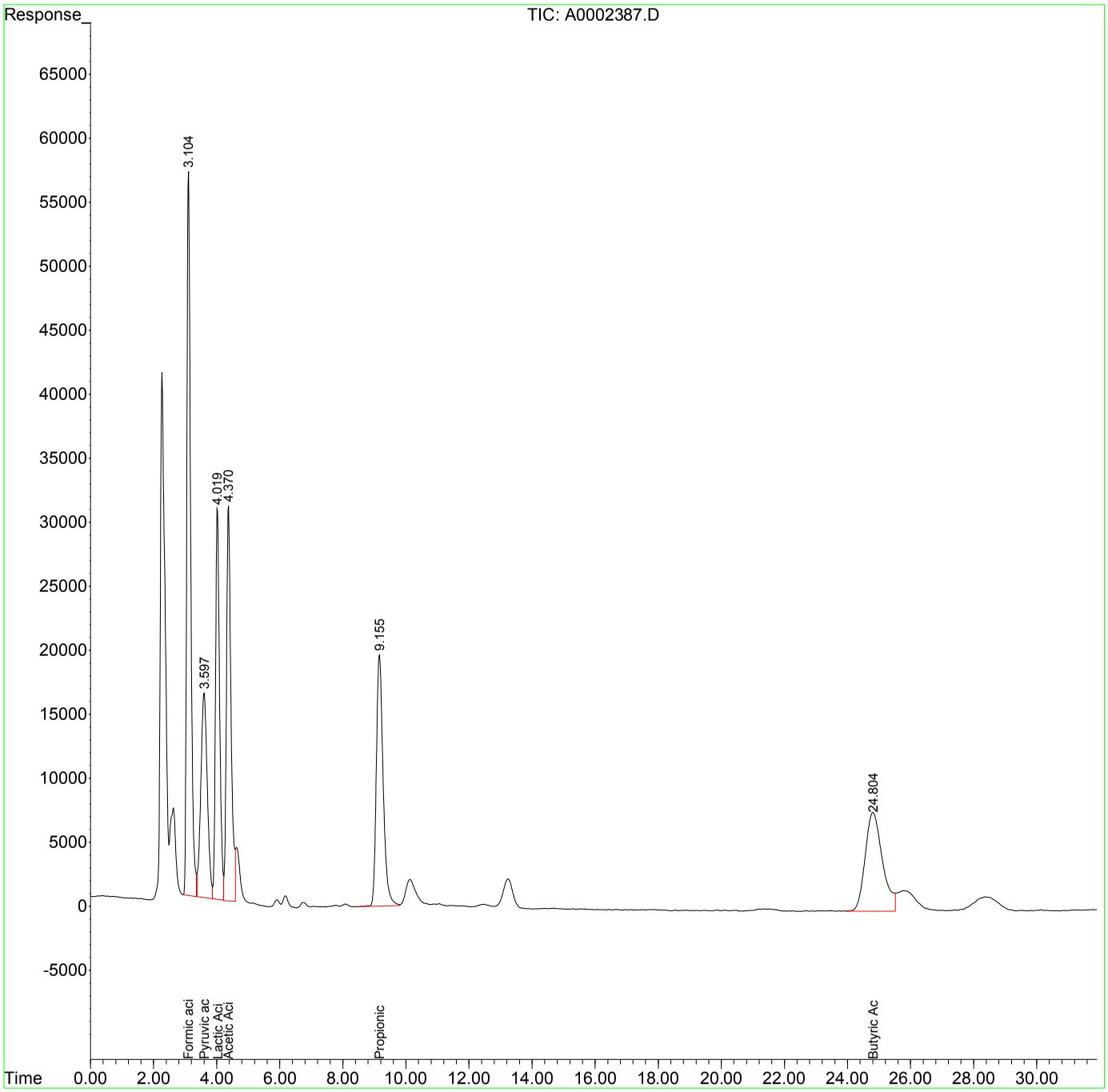
00944281

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002387.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 23:40:52
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:17 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



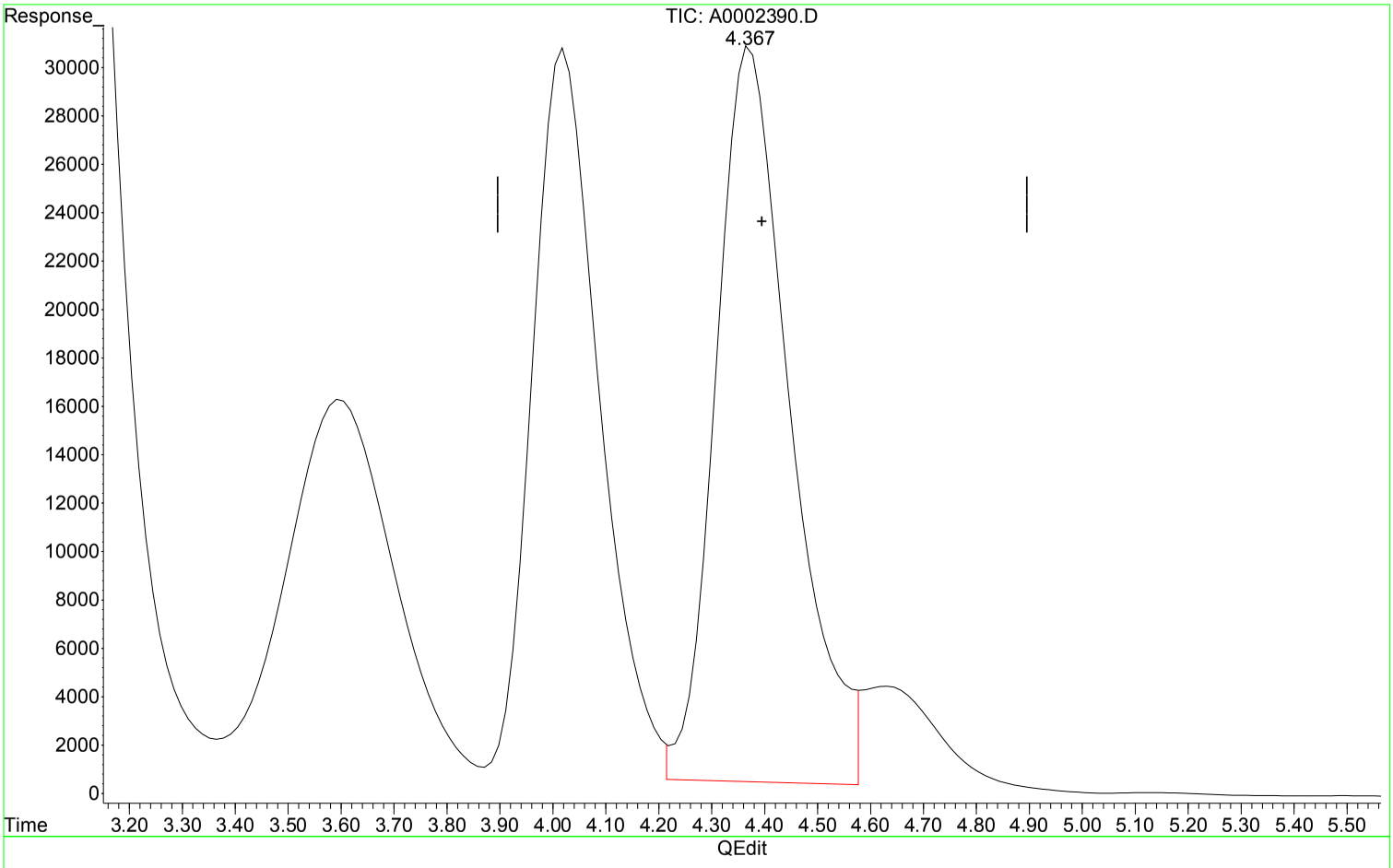
00944282

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.367min 49.784 ppm m

response 2945690

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

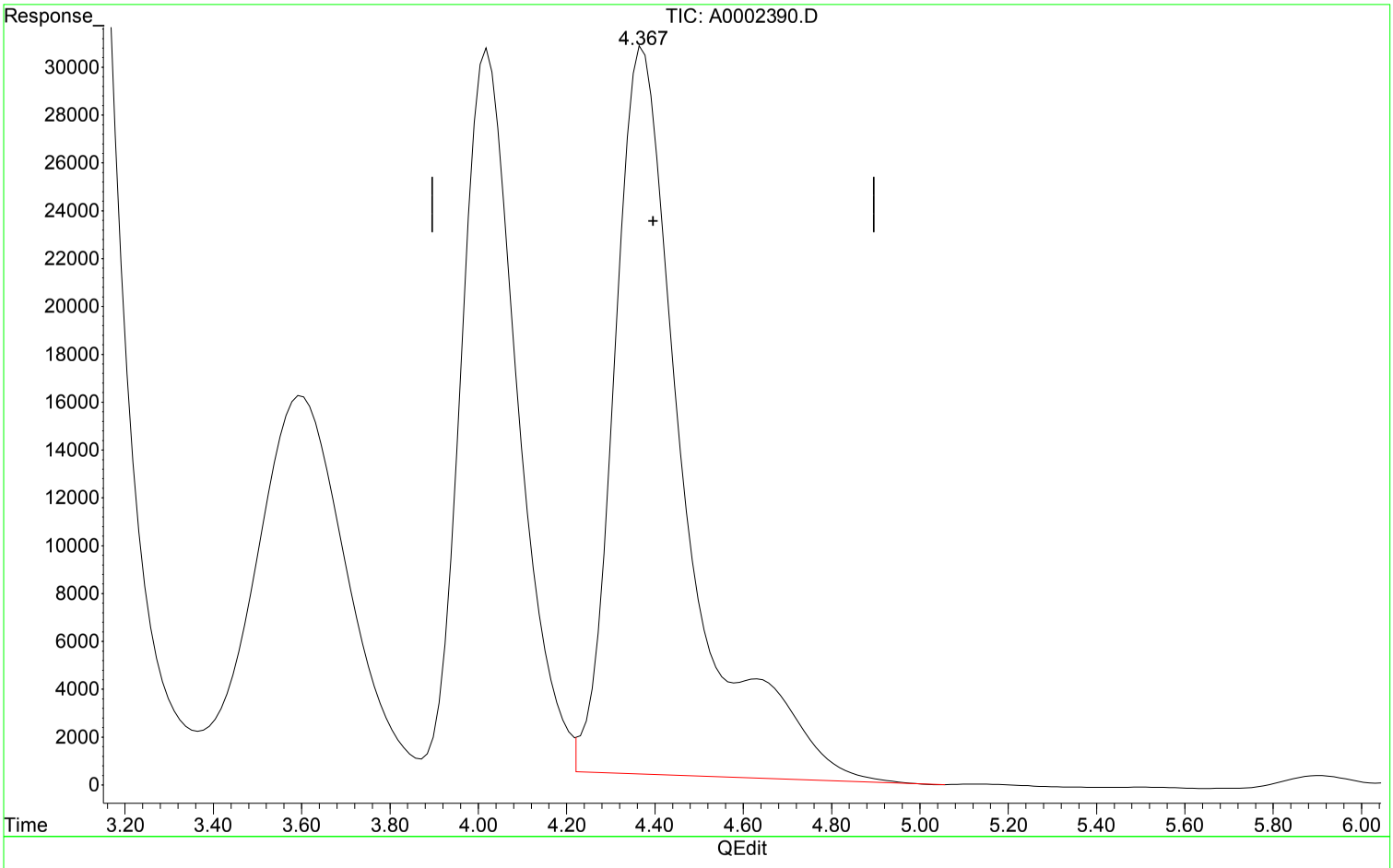
00944283

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.375min 57.500 ppm

response 3402228

Manual Integration:

Before

10/05/18

(+) = Expected Retention Time

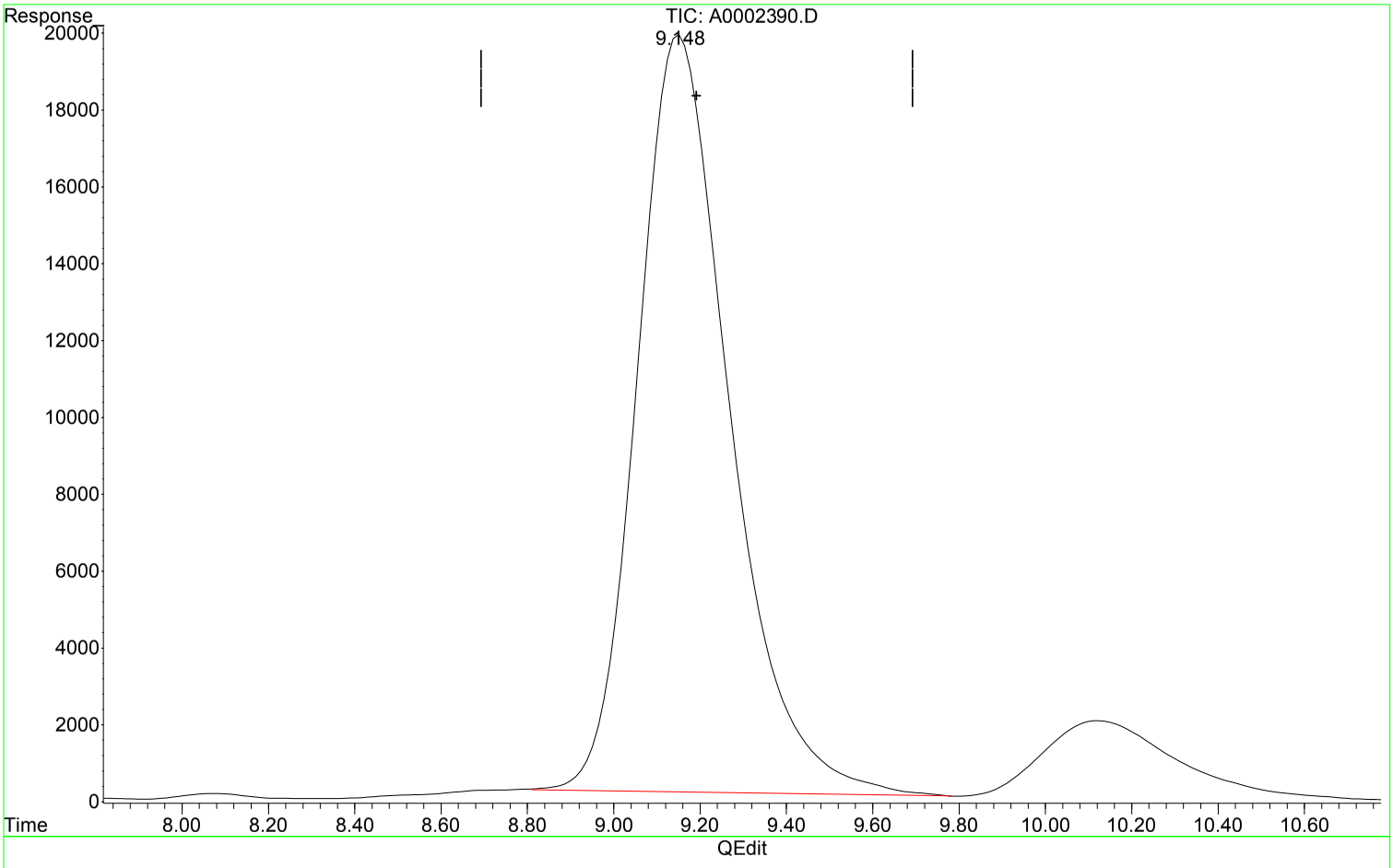
00944284

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.148min 49.189 ppm m

response 2931268

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

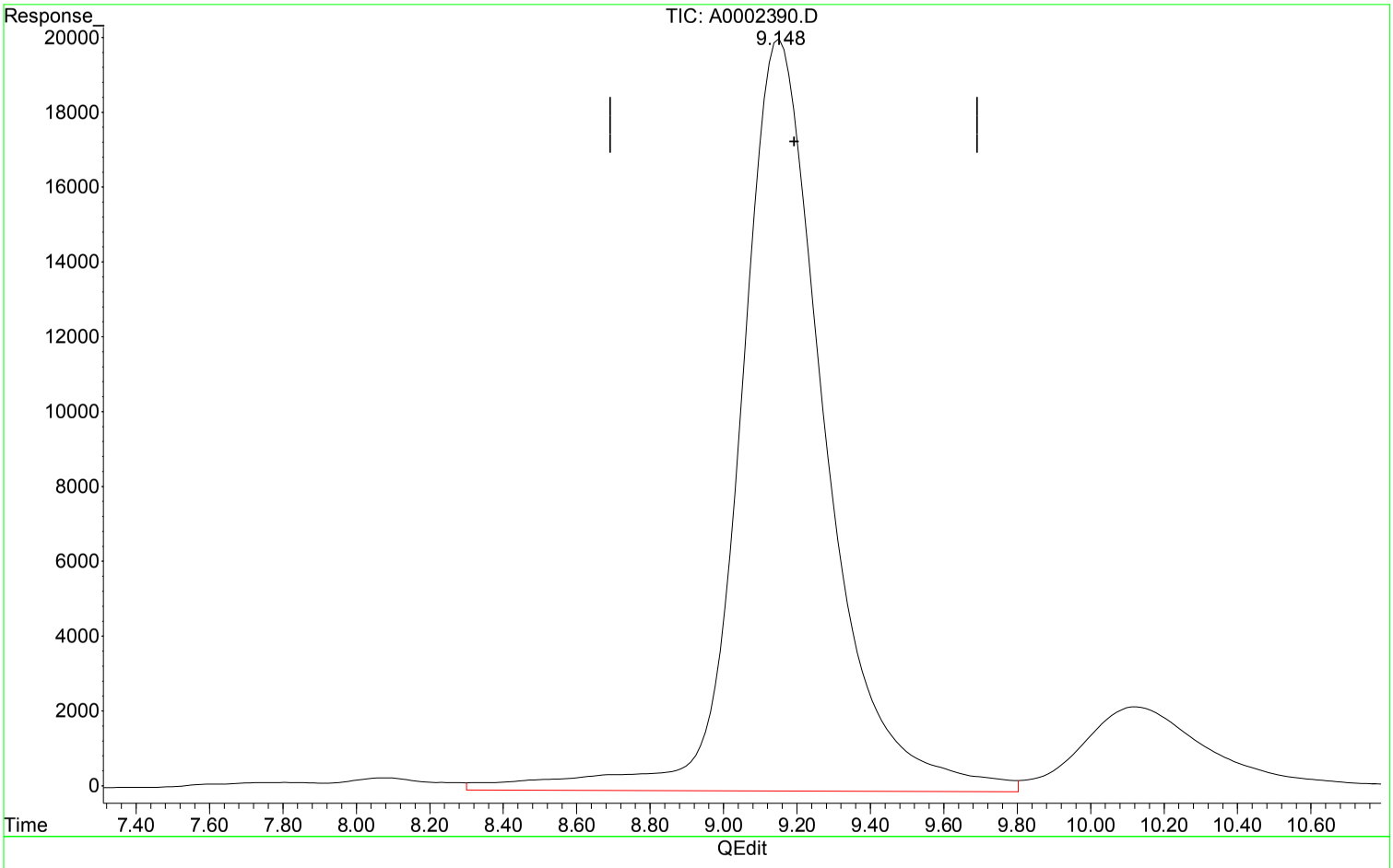
00944285

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.154min 54.569 ppm

response 3251832

Manual Integration:

Before

10/05/18

(+) = Expected Retention Time

MA100418.M Fri Oct 05 08:35:45 2018 Page: 1

00944286

Evaluate Continuing Calibration Report

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1 t	Formic acid	96.343	95.630 E3	0.7	99	-0.02
2 T	Pyruvic acid	452.935	422.410 E3	6.7	92	-0.03
3 T	Lactic Acid	53.765	53.004 E3	1.4	98	-0.03
4 T	Acetic Acid	59.169	58.914 E3	0.4	97	-0.03
5 T	Propionic Acid	59.592	58.625 E3	1.6	99	-0.04
6 T	Butyric Acid	62.897	57.833 E3	8.1	99	-0.05

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

00944287

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.109	4781519	49.630	ppm	
2) T	Pyruvic acid	3.601	2112050	4.663	ppm	
3) T	Lactic Acid	4.024	2650211	49.293	ppm	
4) T	Acetic Acid	4.367	2945690	49.784	ppm	m
5) T	Propionic Acid	9.148	2931268	49.189	ppm	m
6) T	Butyric Acid	24.791	2891658	45.974	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

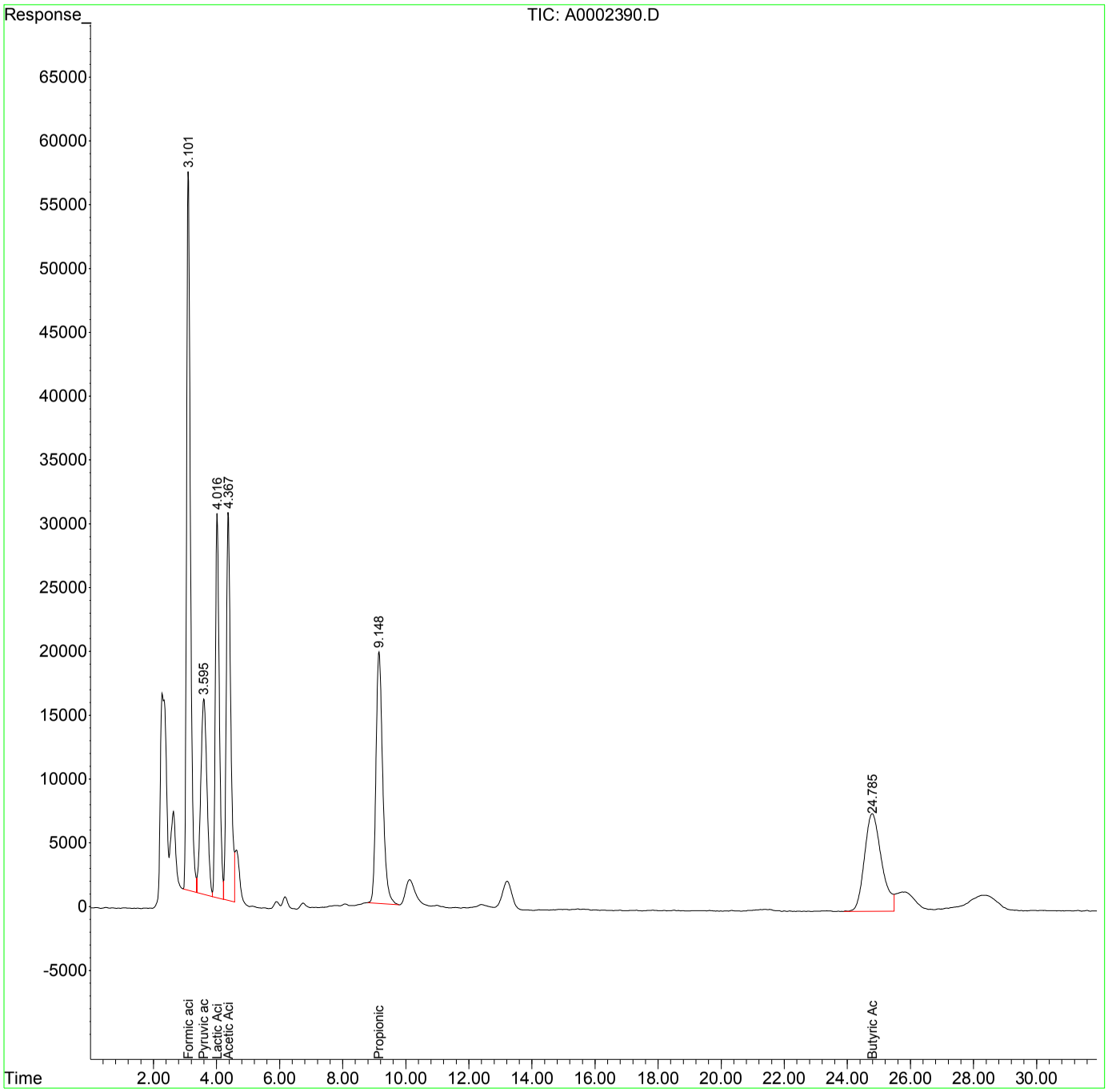
00944288

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002390.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 01:25:46
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:28:23 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944289

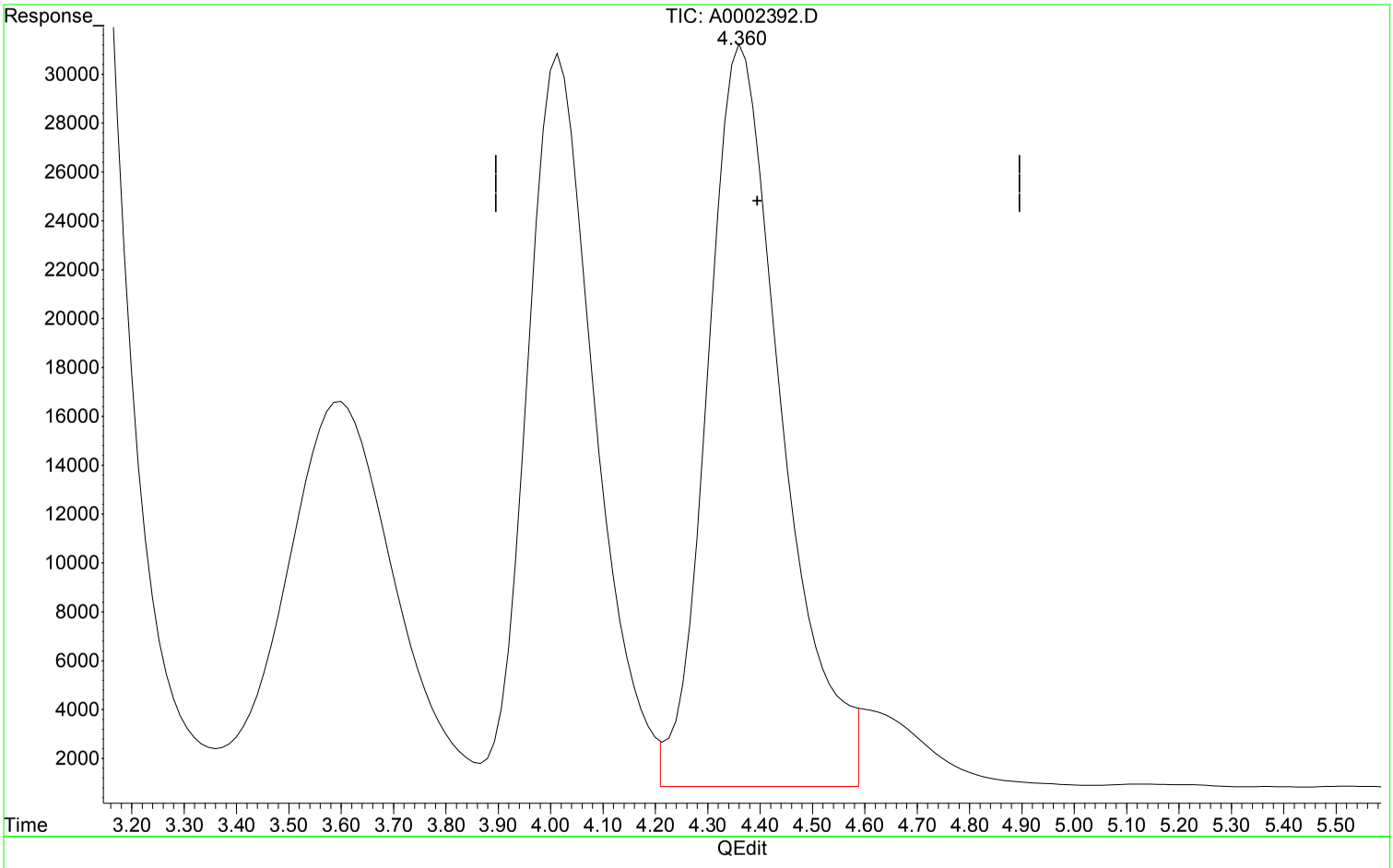
1st BA 10/08/18
2nd BA 10/09/18

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002392.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 10:29:40
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:14:43 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.360min 51.179 ppm m

response 3028258

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

MA100418.M Fri Oct 05 15:15:32 2018 Page: 1

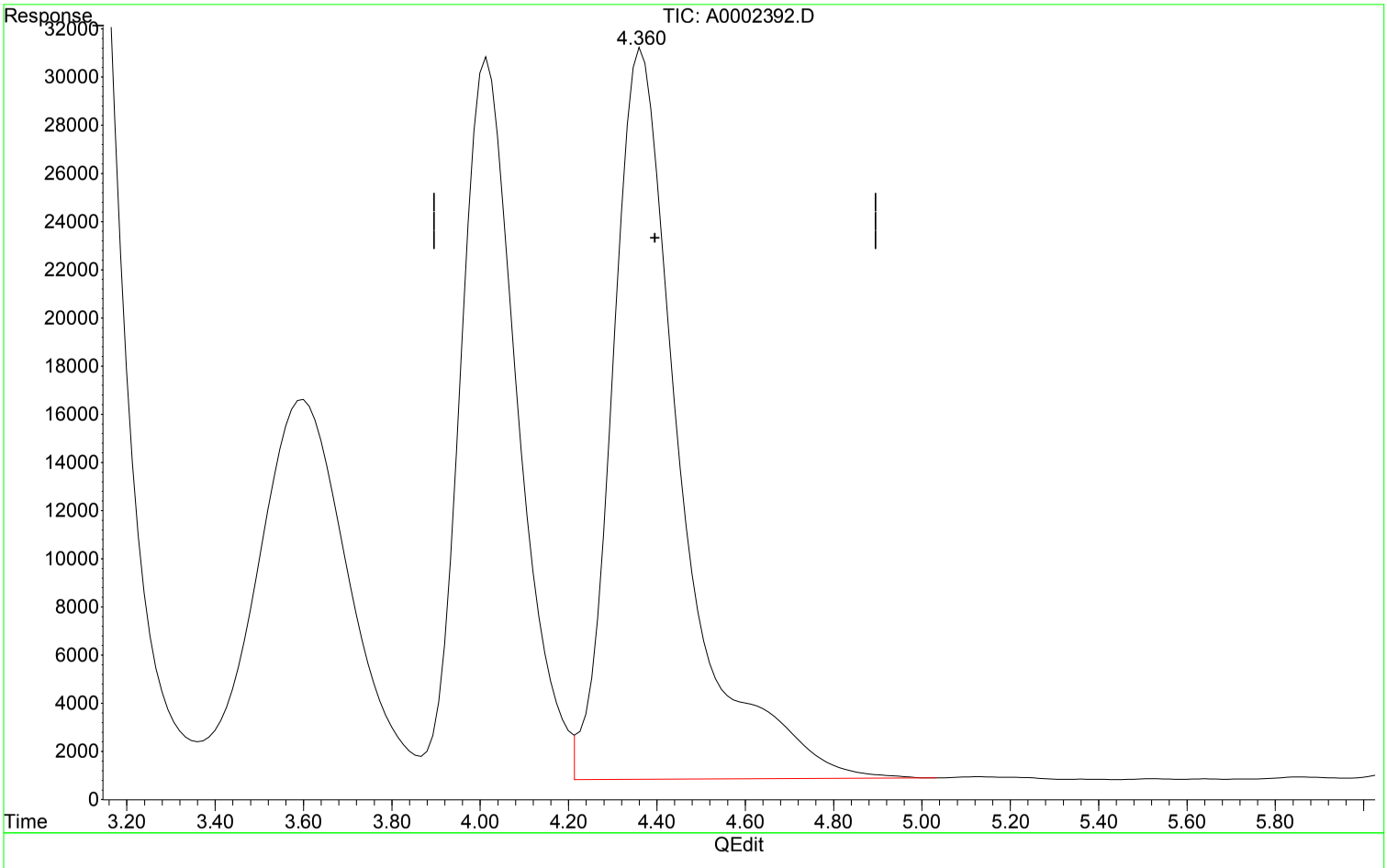
00944290

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002392.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 10:29:40
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:14:43 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.367min 55.649 ppm

response 3292693

Manual Integration:

Before

10/05/18

(+) = Expected Retention Time

MA100418.M Fri Oct 05 15:15:25 2018 Page: 1

00944291

1st BA 10/08/18
2nd BA 10/09/18

Evaluate Continuing Calibration Report

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002392.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 10:29:40
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:14:43 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1 t	Formic acid	96.343	95.645 E3	0.7	99	0.00
2 T	Pyruvic acid	452.935	453.885 E3	-0.2	99	0.00
3 T	Lactic Acid	53.765	54.021 E3	-0.5	100	0.00
4 T	Acetic Acid	59.169	60.565 E3	-2.4	100	0.00
5 T	Propionic Acid	59.592	58.178 E3	2.4	99	0.00
6 T	Butyric Acid	62.897	58.755 E3	6.6	100	0.00

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

00944292

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002392.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 10:29:40
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:14:43 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.108	4782273	49.638	ppm	
2) T	Pyruvic acid	3.600	2269427	5.010	ppm	
3) T	Lactic Acid	4.018	2701047	50.238	ppm	
4) T	Acetic Acid	4.360	3028258	51.179	ppm	m
5) T	Propionic Acid	9.121	2908885	48.814	ppm	
6) T	Butyric Acid	24.655	2937738	46.707	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

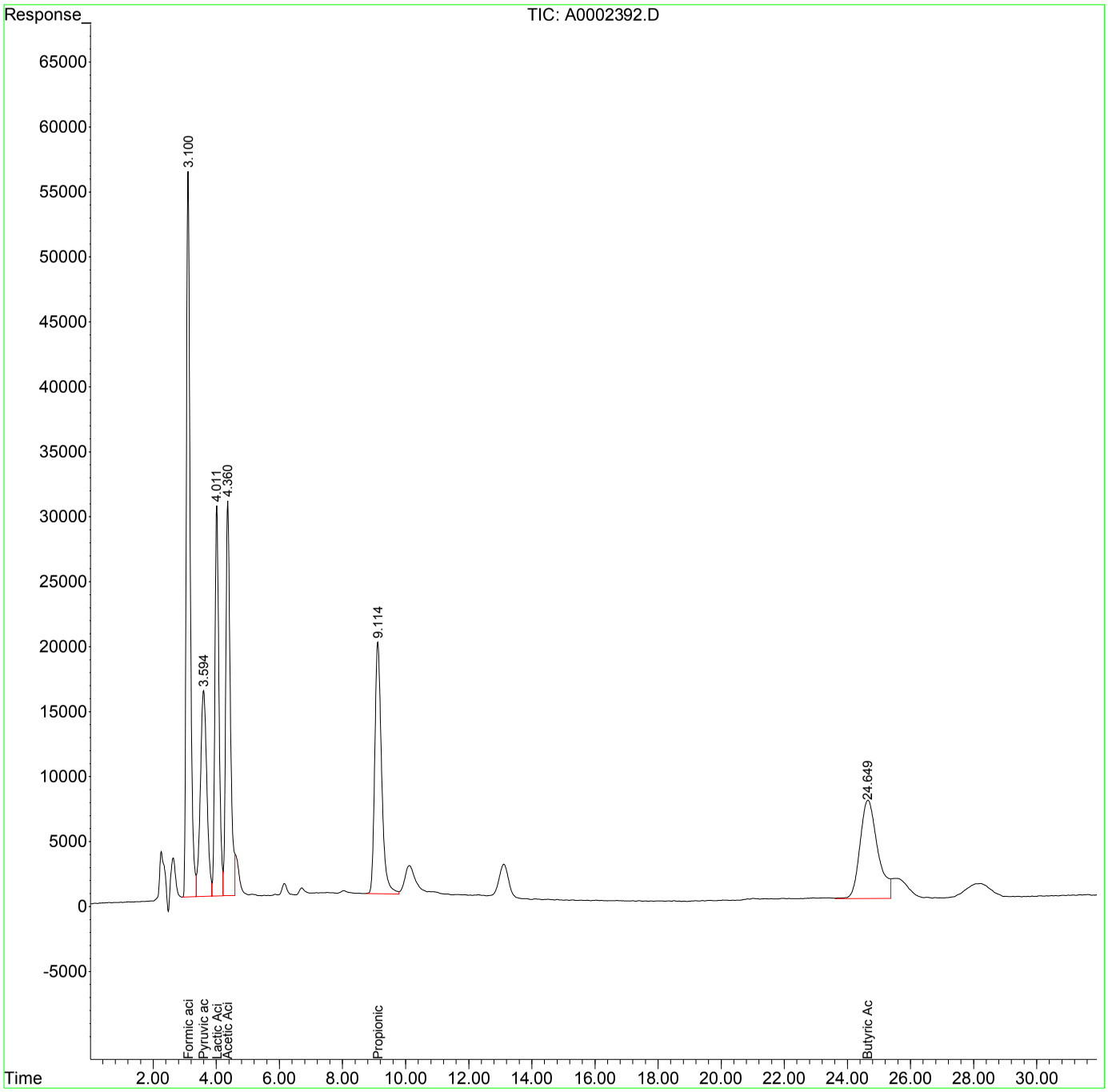
00944293

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002392.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 10:29:40
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 15:14:43 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



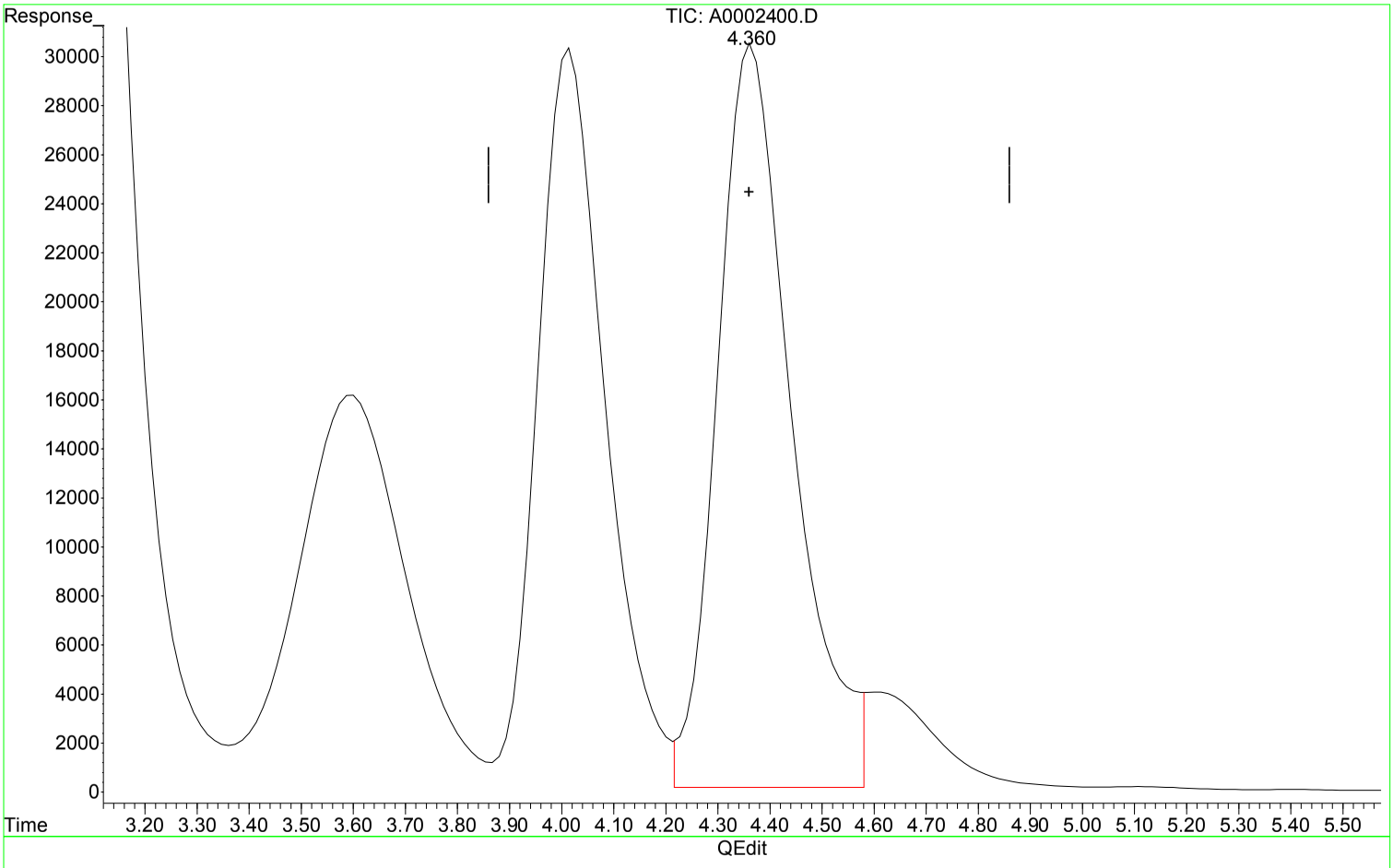
00944294

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002400.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 15:09:20
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 16:07:05 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.360min 50.833 ppm m

response 3007786

Manual Integration:

After

Poor integration.

10/05/18

(+) = Expected Retention Time

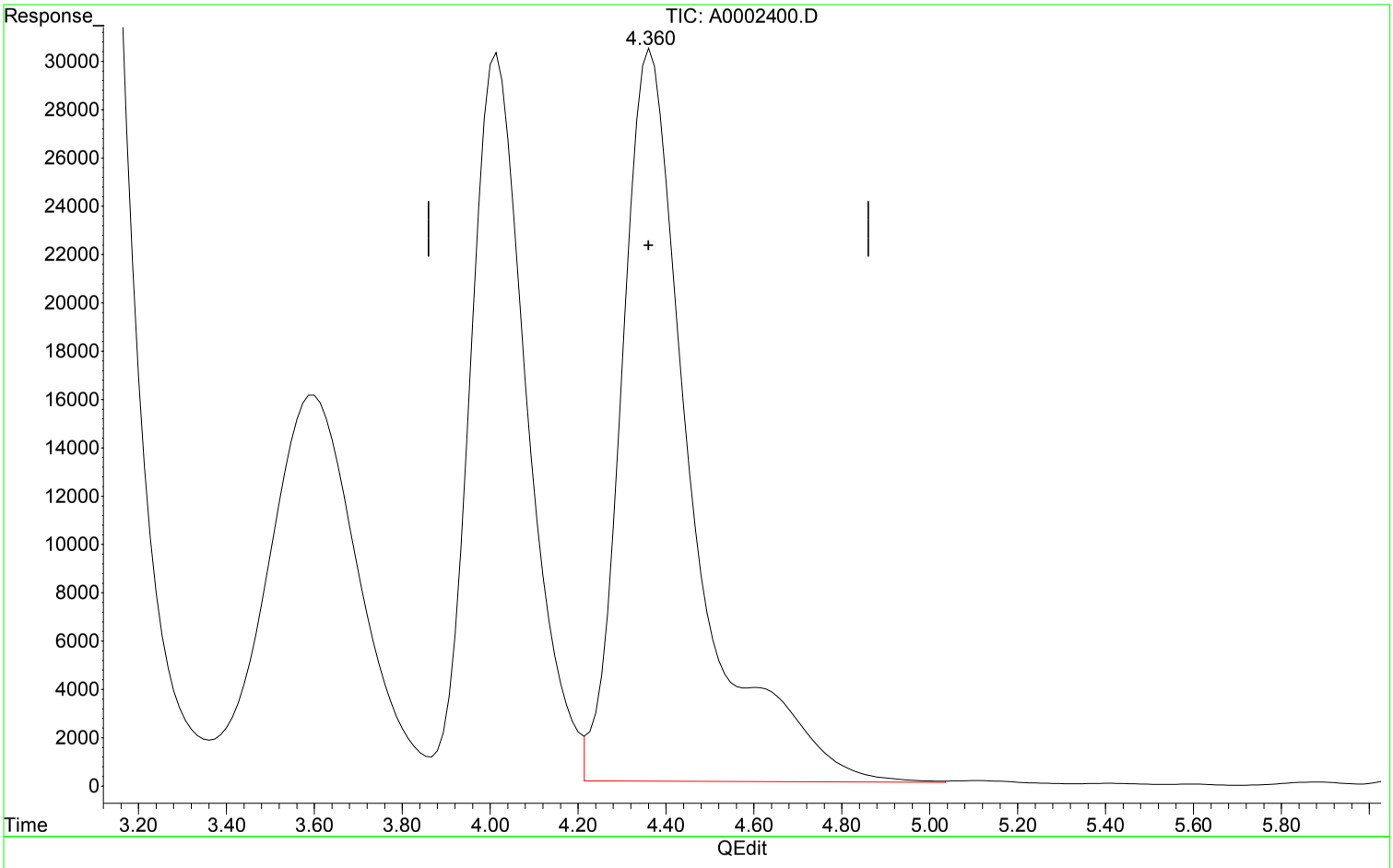
00944295

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002400.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 15:09:20
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 16:07:05 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.367min 57.265 ppm

response 3388325

Manual Integration:

Before

10/05/18

(+) = Expected Retention Time

MA100418.M Fri Oct 05 16:07:17 2018 Page: 1

00944296

Evaluate Continuing Calibration Report

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002400.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 15:09:20
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 16:07:05 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1 t	Formic acid	96.343	95.077 E3	1.3	99	0.00
2 T	Pyruvic acid	452.935	456.790 E3	-0.9	100	0.00
3 T	Lactic Acid	53.765	54.332 E3	-1.1	100	0.00
4 T	Acetic Acid	59.169	60.156 E3	-1.7	99	0.00
5 T	Propionic Acid	59.592	57.295 E3	3.9	97	0.00
6 T	Butyric Acid	62.897	58.521 E3	7.0	100	0.03

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

00944297

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002400.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 15:09:20
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 16:07:05 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.107	4753865	49.343	ppm	
2) T	Pyruvic acid	3.599	2283950	5.043	ppm	
3) T	Lactic Acid	4.018	2716598	50.527	ppm	
4) T	Acetic Acid	4.360	3007786	50.833	ppm	m
5) T	Propionic Acid	9.123	2864749	48.073	ppm	
6) T	Butyric Acid	24.681	2926070	46.521	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

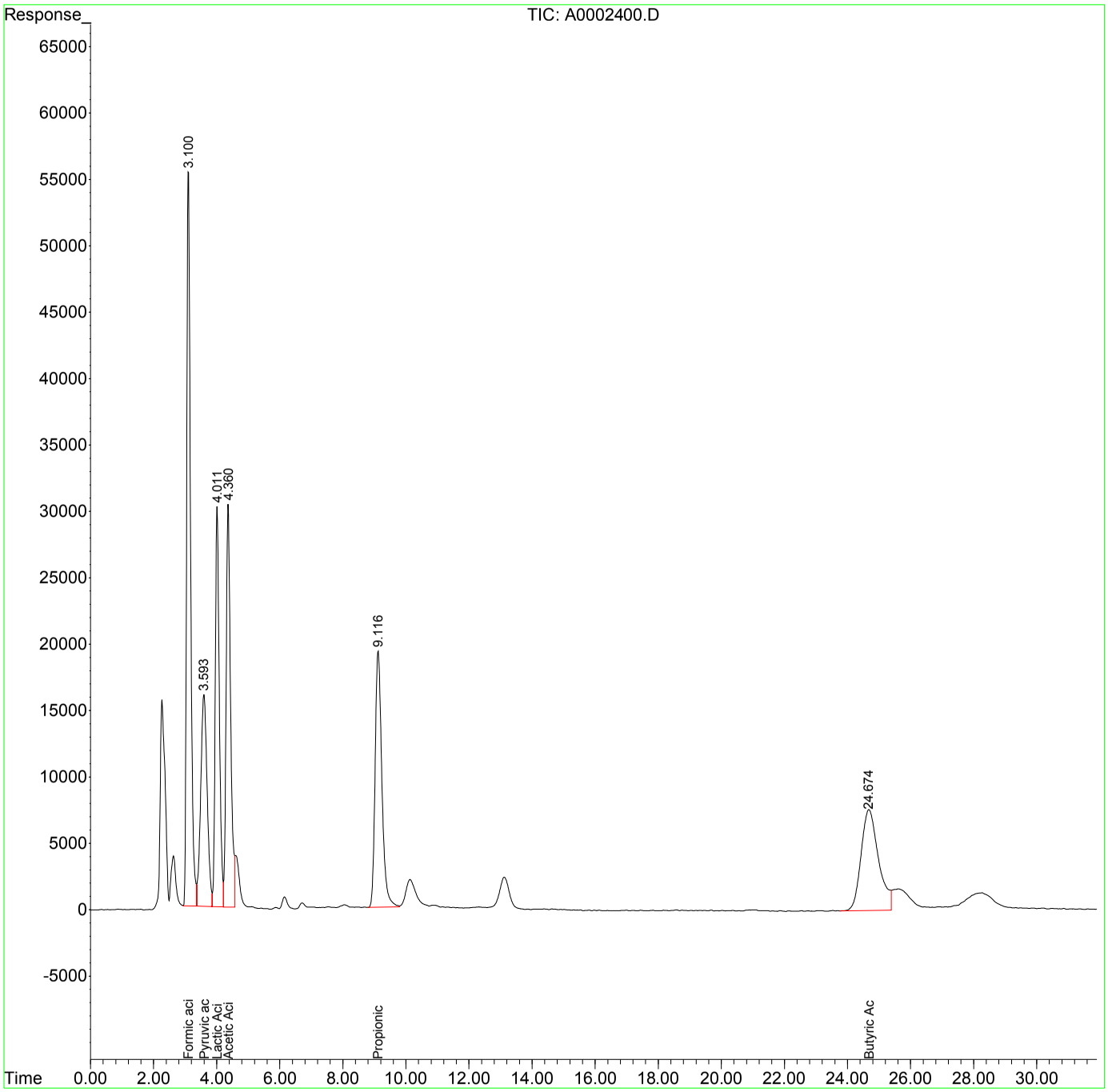
00944298

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100518\
Data File : A0002400.D
Signal(s) : dad1A.ch
Acq On : 05-Oct-2018, 15:09:20
Operator : b.allgeier
Sample : ccv
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 16:07:05 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Fri Oct 05 15:29:58 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944299

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002375.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : icv
Misc :
ALS Vial : 10 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:21:24 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc Units
Target Compounds				
1) t	Formic acid	3.131	1896636	19.686 ppm
2) T	Pyruvic acid	3.628	1357394	2.997 ppm
3) T	Lactic Acid	4.052	1086883	20.215 ppm
4) T	Acetic Acid	4.405	1218452	20.593 ppm
5) T	Propionic Acid	9.222	1146657	19.242 ppm
6) T	Butyric Acid	25.002	1138865	18.107 ppm

(f)=RT Delta > 1/2 Window (m)=manual int.

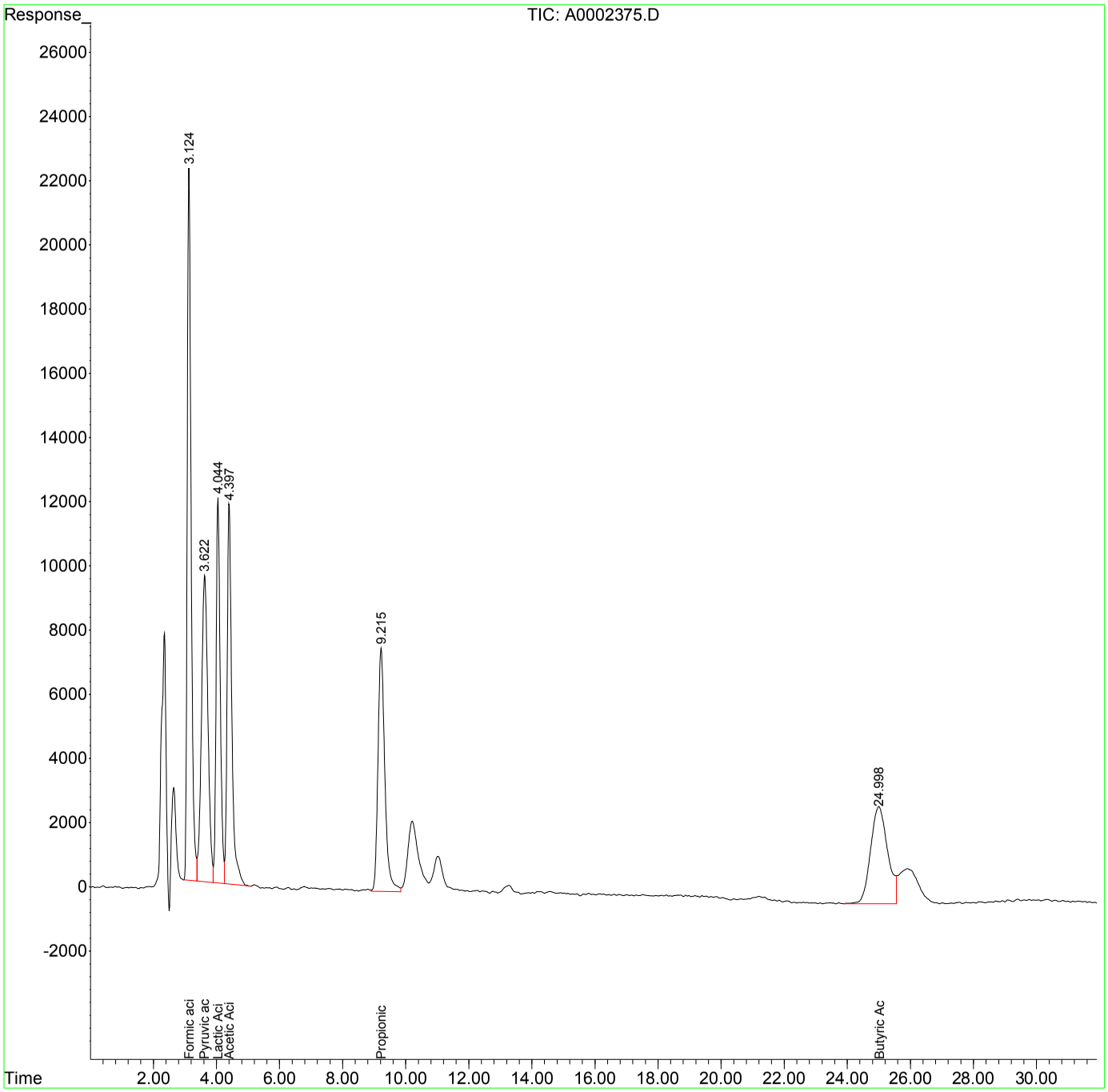
00944300

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002375.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : icv
Misc :
ALS Vial : 10 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:21:24 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944301

Evaluate Continuing Calibration Report

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002375.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : icv
Misc :
ALS Vial : 10 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 05 08:21:24 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

	Compound	AvgRF	CCRF	%Dev	Area%	Dev(Min)
1 t	Formic acid	96.343	94.832 E3	1.6	100	0.00
2 T	Pyruvic acid	452.935	678.697 E3	-49.8#	160#	0.00
3 T	Lactic Acid	53.765	54.344 E3	-1.1	108	0.00
4 T	Acetic Acid	59.169	60.923 E3	-3.0	111	0.00
5 T	Propionic Acid	59.592	57.333 E3	3.8	101	0.03
6 T	Butyric Acid	62.897	56.943 E3	9.5	94	0.16

Evaluate Continuing Calibration Report - Not Founds

(#) = Out of Range SPCC's out = 0 CCC's out = 0

00944302

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002374.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : 20.0-200.0ppm
Misc :
ALS Vial : 9 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:41:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:11:30 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.129	18870917	195.296	ppm	
2) T	Pyruvic acid	3.625	9170882	20.284	ppm	
3) T	Lactic Acid	4.045	10741636	199.759	ppm	
4) T	Acetic Acid	4.387	11865318	200.607	ppm	m
5) T	Propionic Acid	9.141	11451173	191.091	ppm	
6) T	Butyric Acid	24.580	12106071	191.444	ppm	m

(f)=RT Delta > 1/2 Window (m)=manual int.

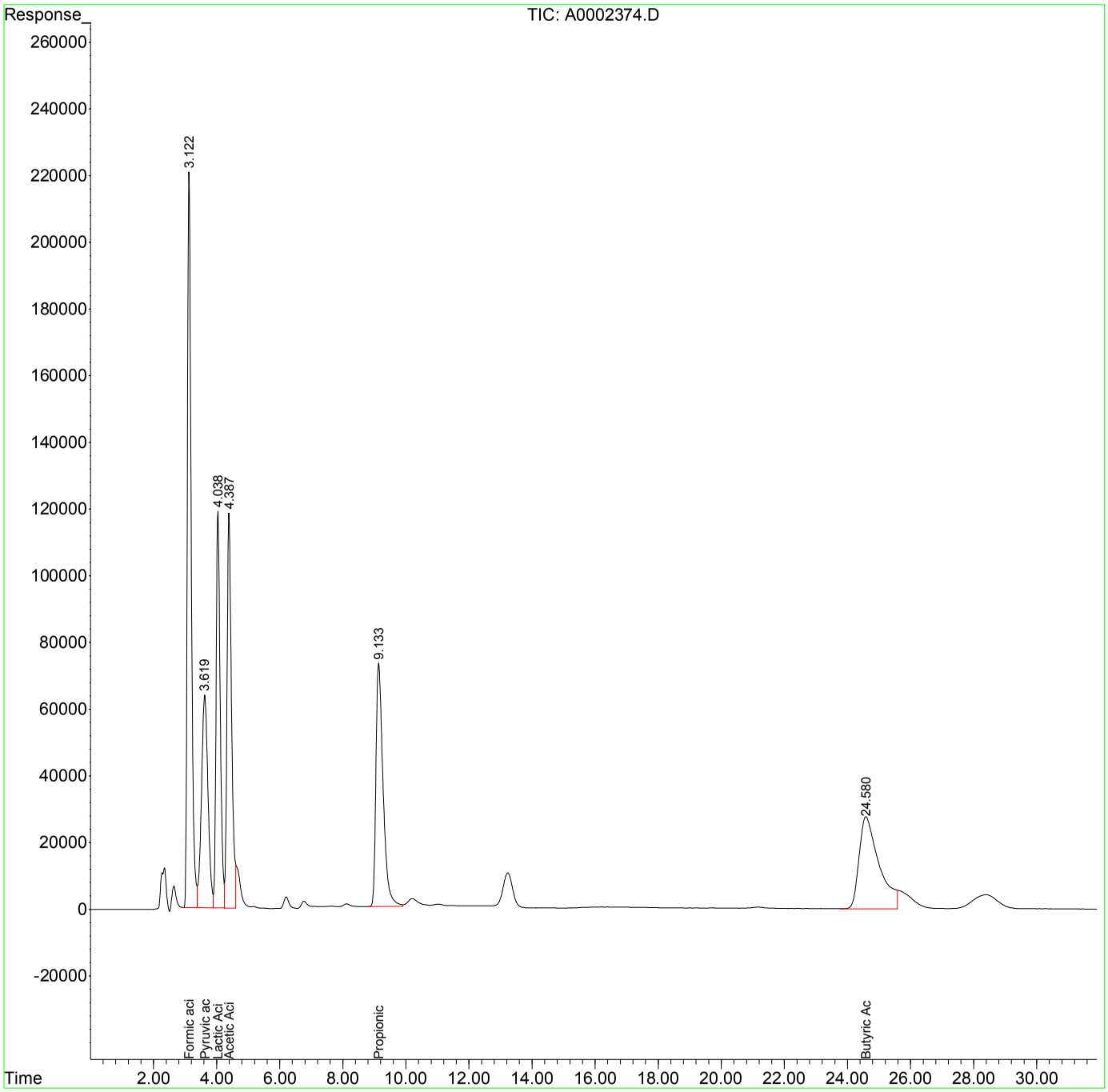
00944303

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002374.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : 20.0-200.0ppm
Misc :
ALS Vial : 9 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:41:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:11:30 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



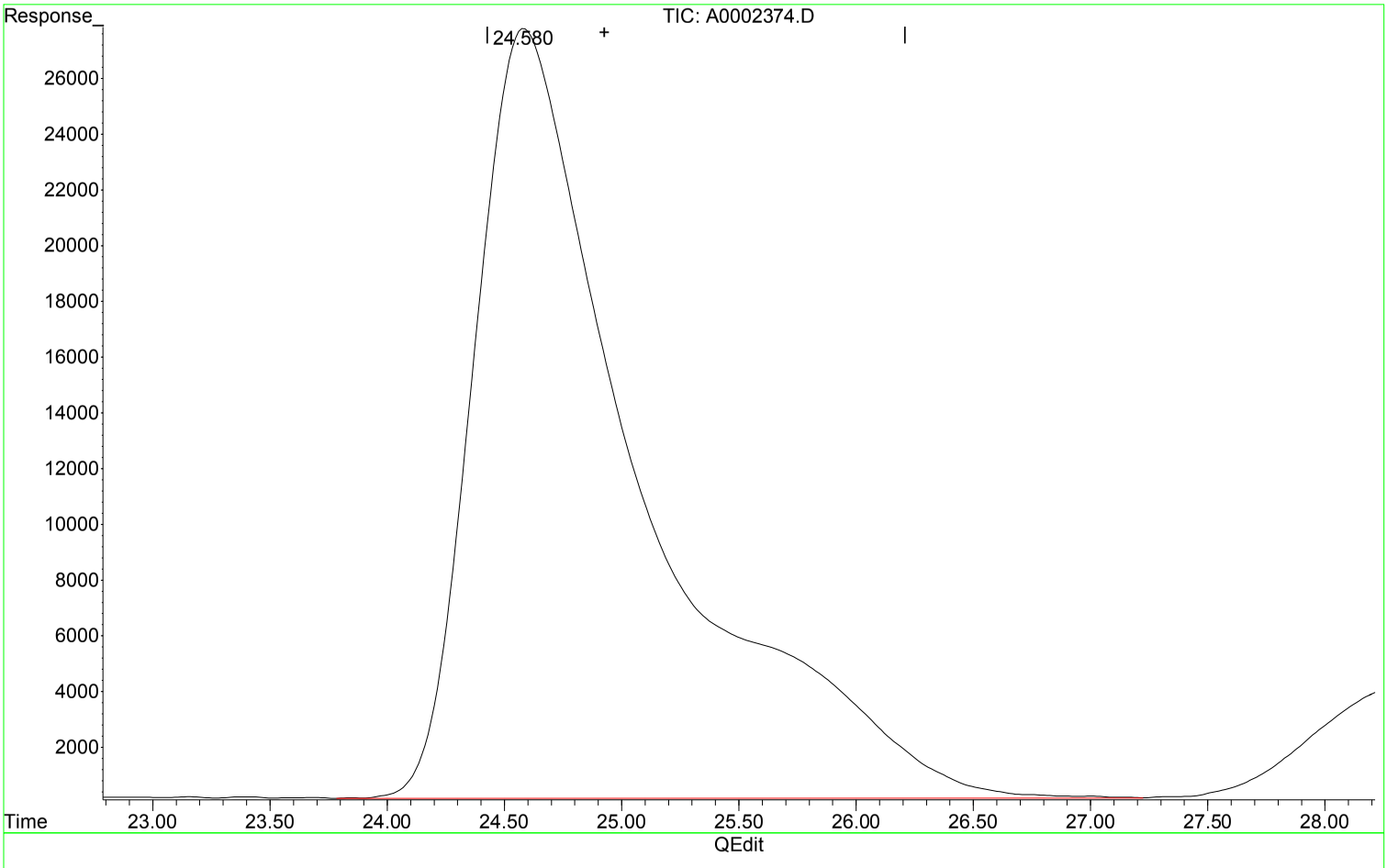
00944304

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002374.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : 20.0-200.0ppm
Misc :
ALS Vial : 9 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:41:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:11:30 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.587min 217.586 ppm

response 13759140

Manual Integration:

Before

10/04/18

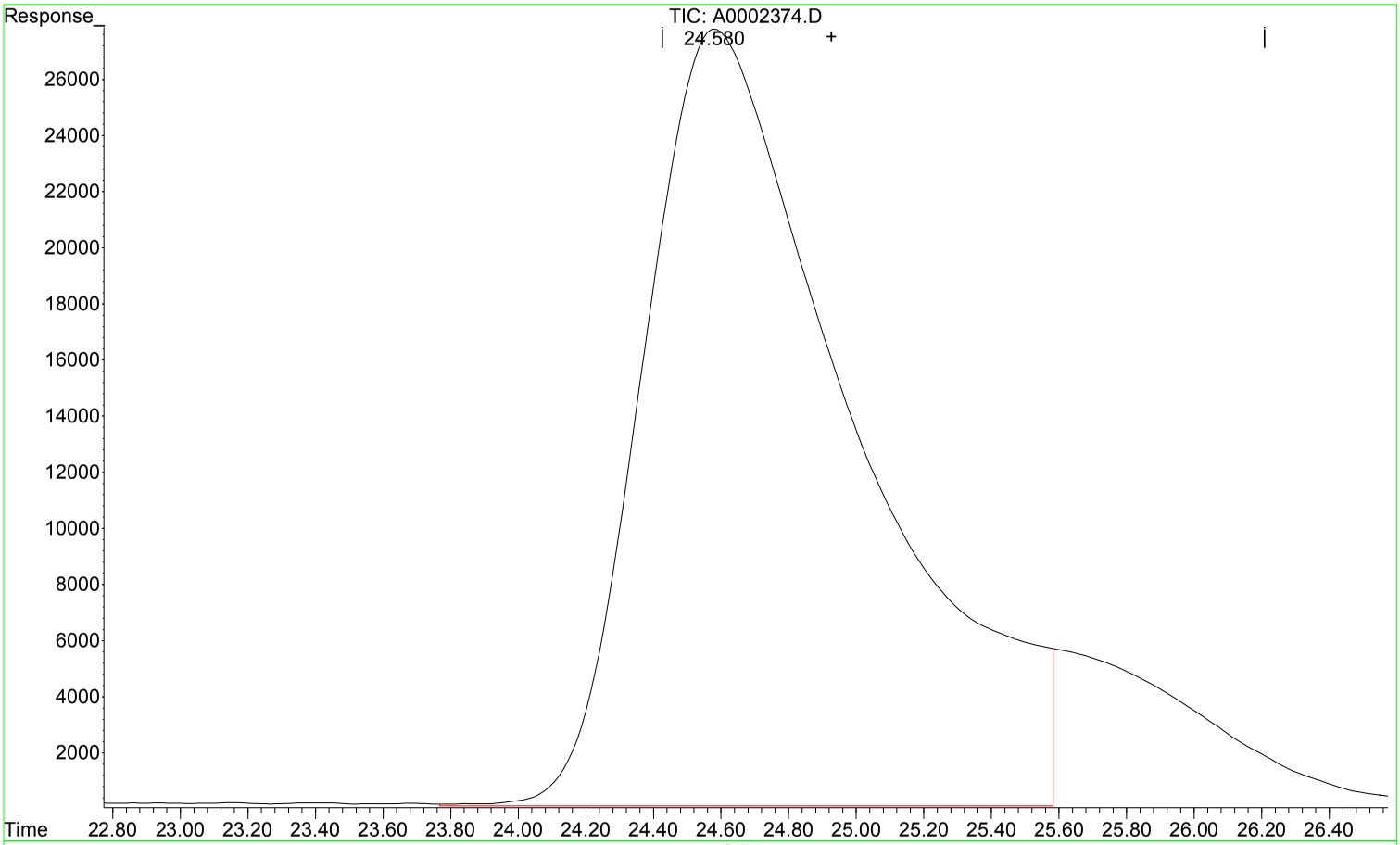
(+) = Expected Retention Time

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002374.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : 20.0-200.0ppm
Misc :
ALS Vial : 9 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:41:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:11:30 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.580min 191.444 ppm m

response 12106071

Manual Integration:

After

Poor integration.

10/04/18

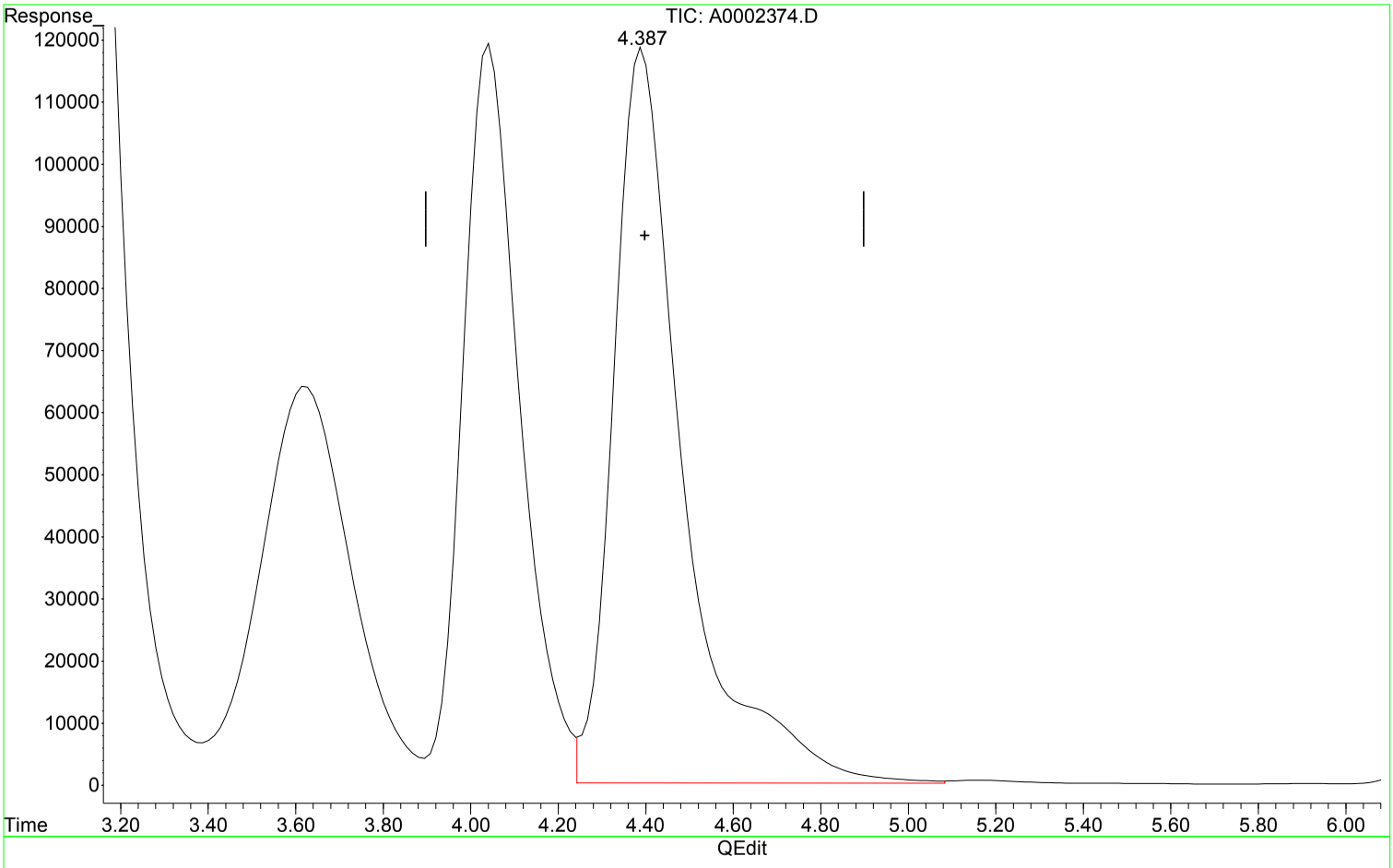
(+) = Expected Retention Time

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002374.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : 20.0-200.0ppm
Misc :
ALS Vial : 9 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:41:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:11:30 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.394min 222.004 ppm

response 13130885

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

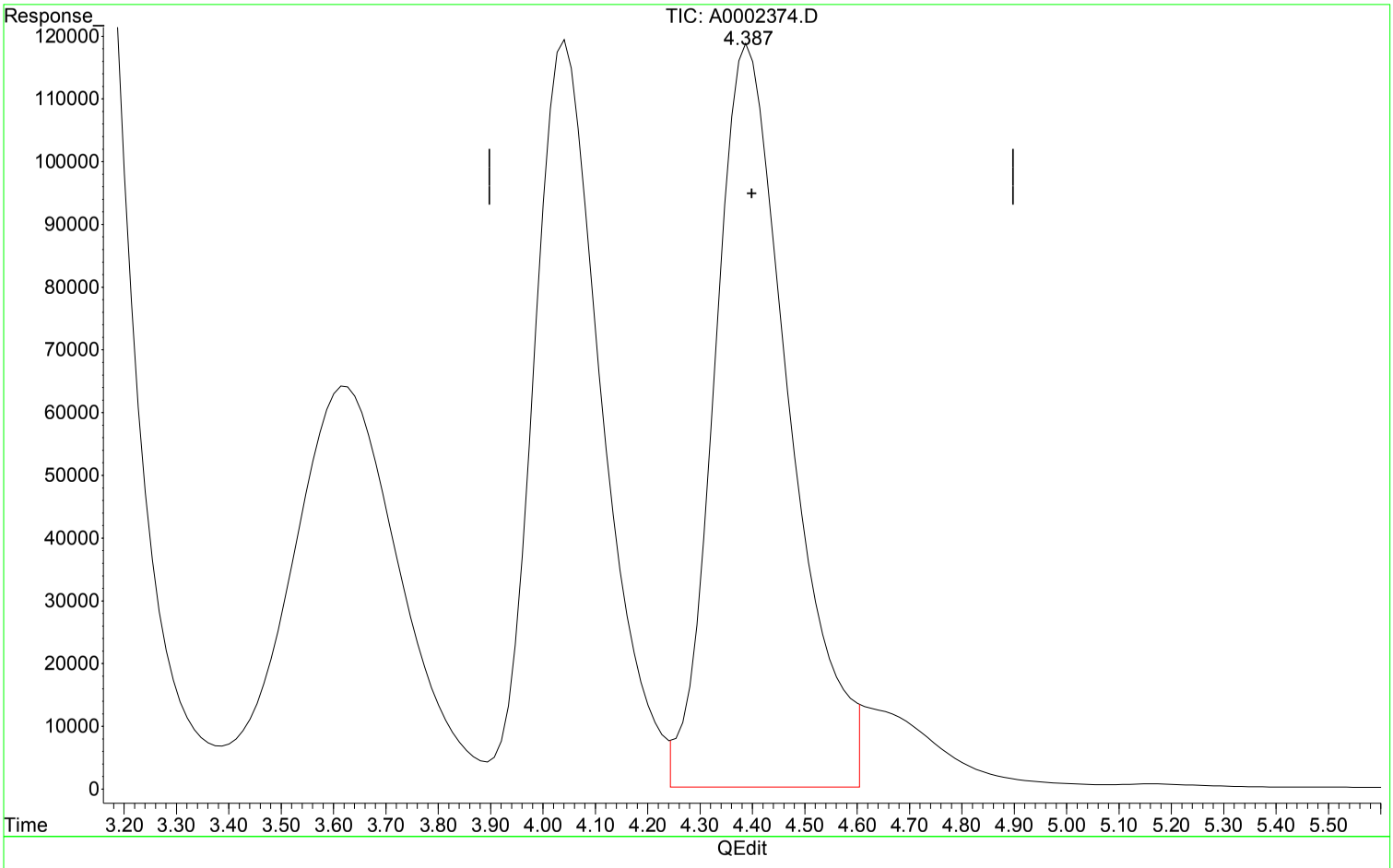
00944307

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002374.D
Signal(s) : dad1A.ch
Acq On : 31-Dec-2000, 02:48:10
Operator : b.allgeier
Sample : 20.0-200.0ppm
Misc :
ALS Vial : 9 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:41:56 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:11:30 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.387min 200.607 ppm m

response 11865318

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

00944308

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002373.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 15:31:47
Operator : b.allgeier
Sample : 10.0-100.0ppm
Misc :
ALS Vial : 8 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:10:46 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.132	9131569	96.958	ppm	
2) T	Pyruvic acid	3.629	4430352	9.849	ppm	
3) T	Lactic Acid	4.052	5216101	98.587	ppm	
4) T	Acetic Acid	4.397	5725459	96.715	ppm	m
5) T	Propionic Acid	9.203	5508012	93.403	ppm	
6) T	Butyric Acid	24.847	5510917	91.221	ppm	m

(f)=RT Delta > 1/2 Window (m)=manual int.

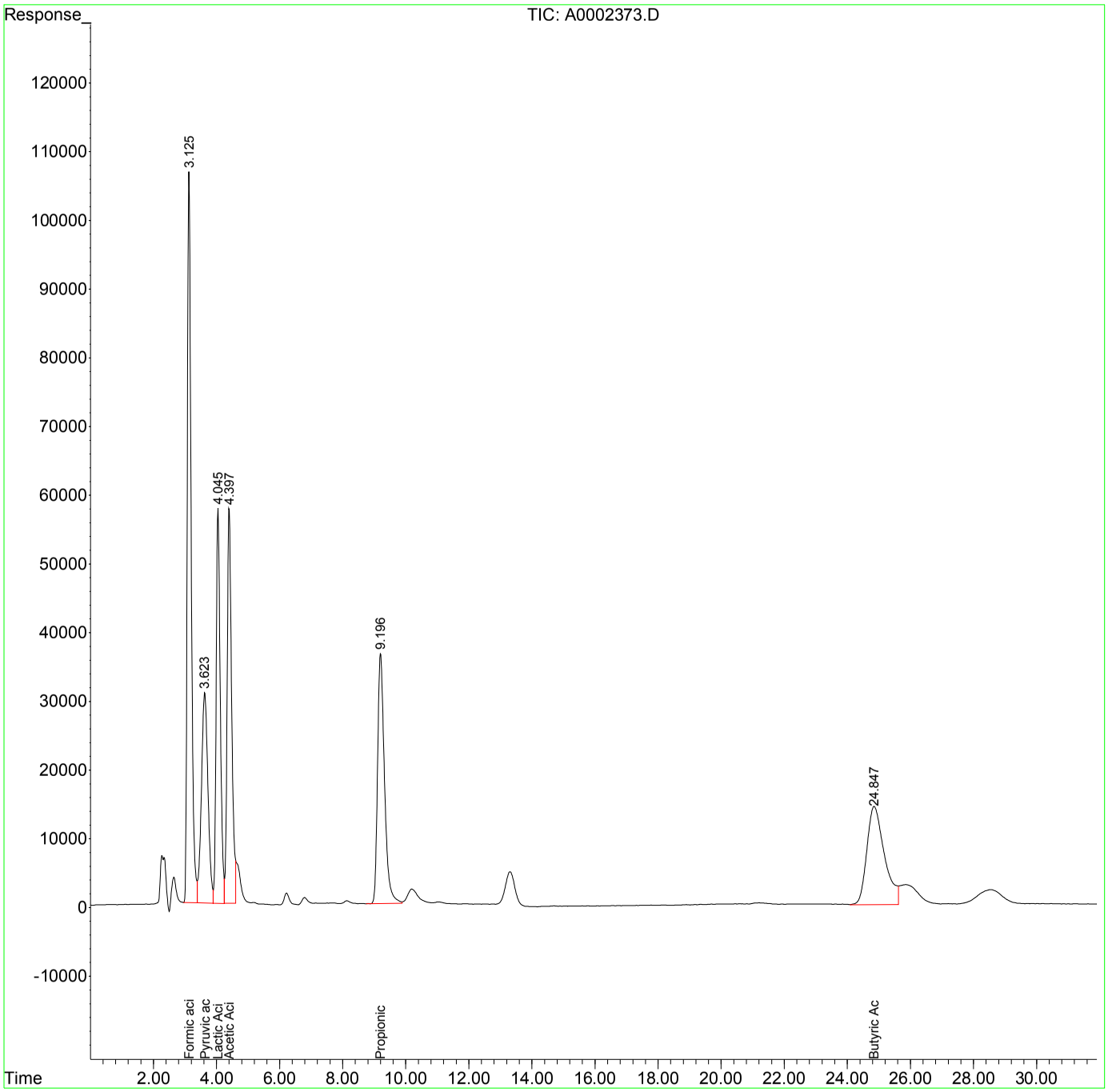
00944309

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002373.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 15:31:47
Operator : b.allgeier
Sample : 10.0-100.0ppm
Misc :
ALS Vial : 8 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:10:46 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



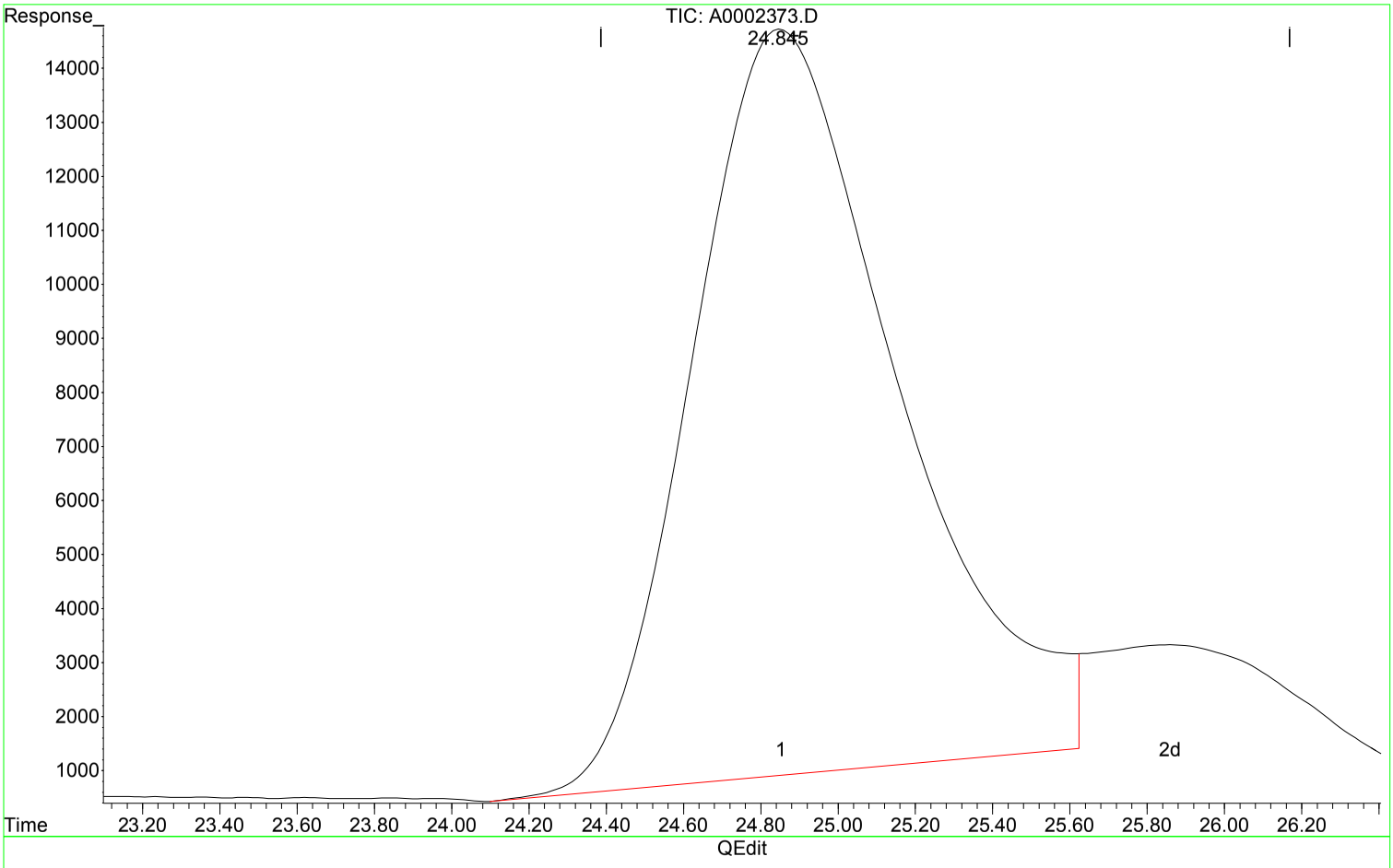
00944310

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002373.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 15:31:47
Operator : b.allgeier
Sample : 10.0-100.0ppm
Misc :
ALS Vial : 8 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:10:46 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.853min 84.188 ppm

response 5086048

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

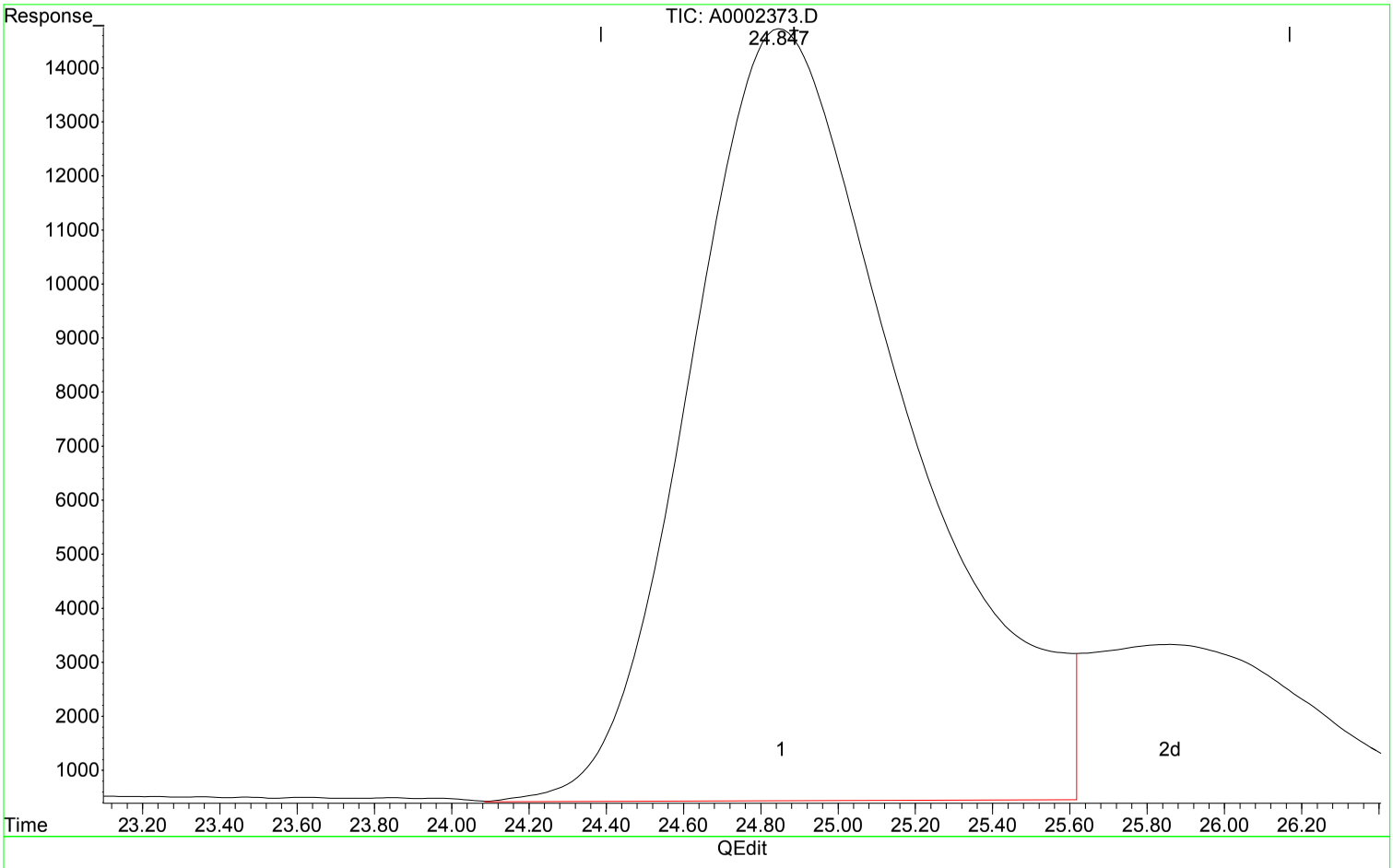
00944311

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002373.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 15:31:47
Operator : b.allgeier
Sample : 10.0-100.0ppm
Misc :
ALS Vial : 8 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:10:46 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.847min 91.221 ppm m

response 5510917

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

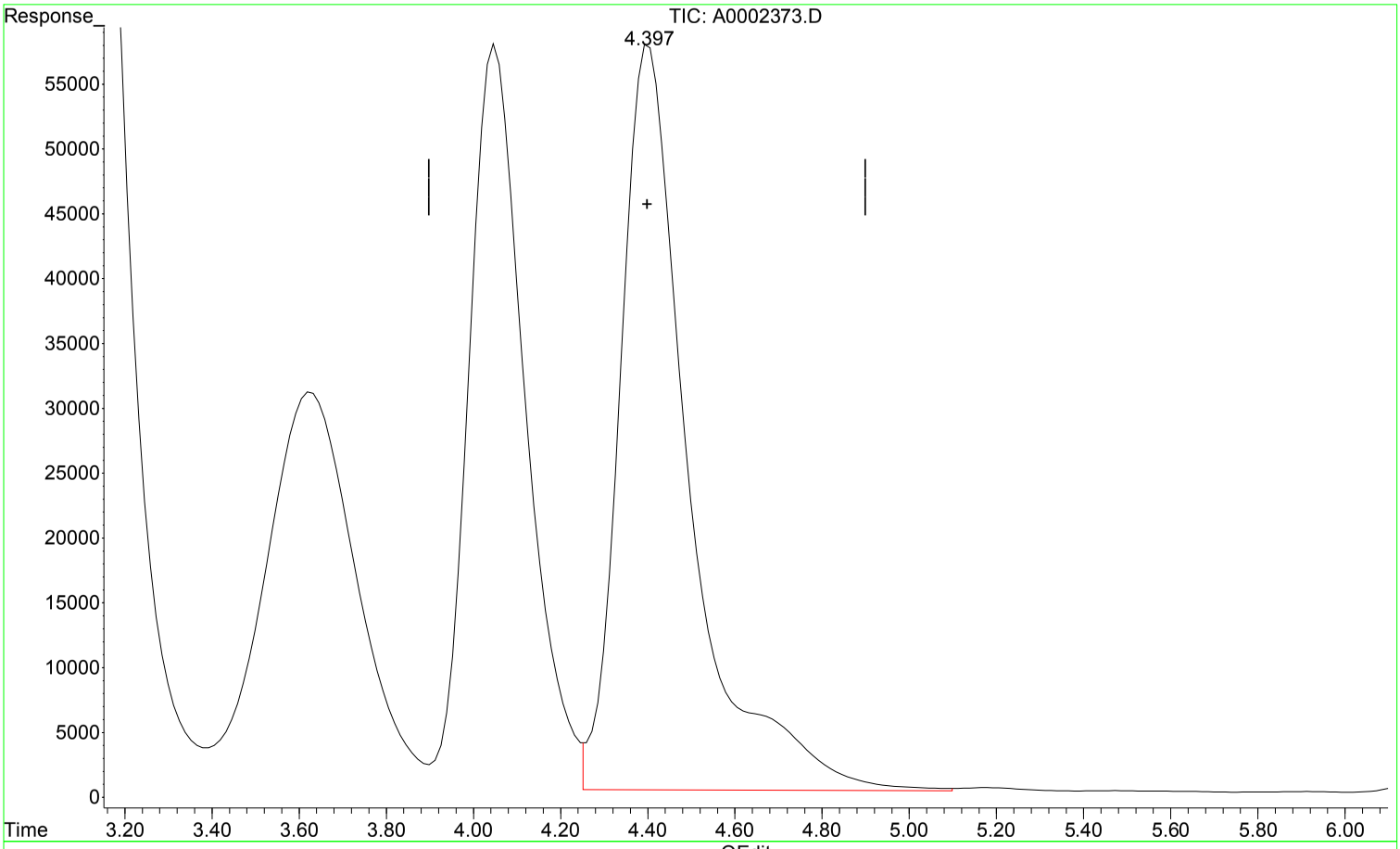
00944312

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002373.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 15:31:47
Operator : b.allgeier
Sample : 10.0-100.0ppm
Misc :
ALS Vial : 8 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:10:46 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.405min 107.446 ppm

response 6360712

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

MA100418.M Thu Oct 04 16:10:56 2018 Page: 1

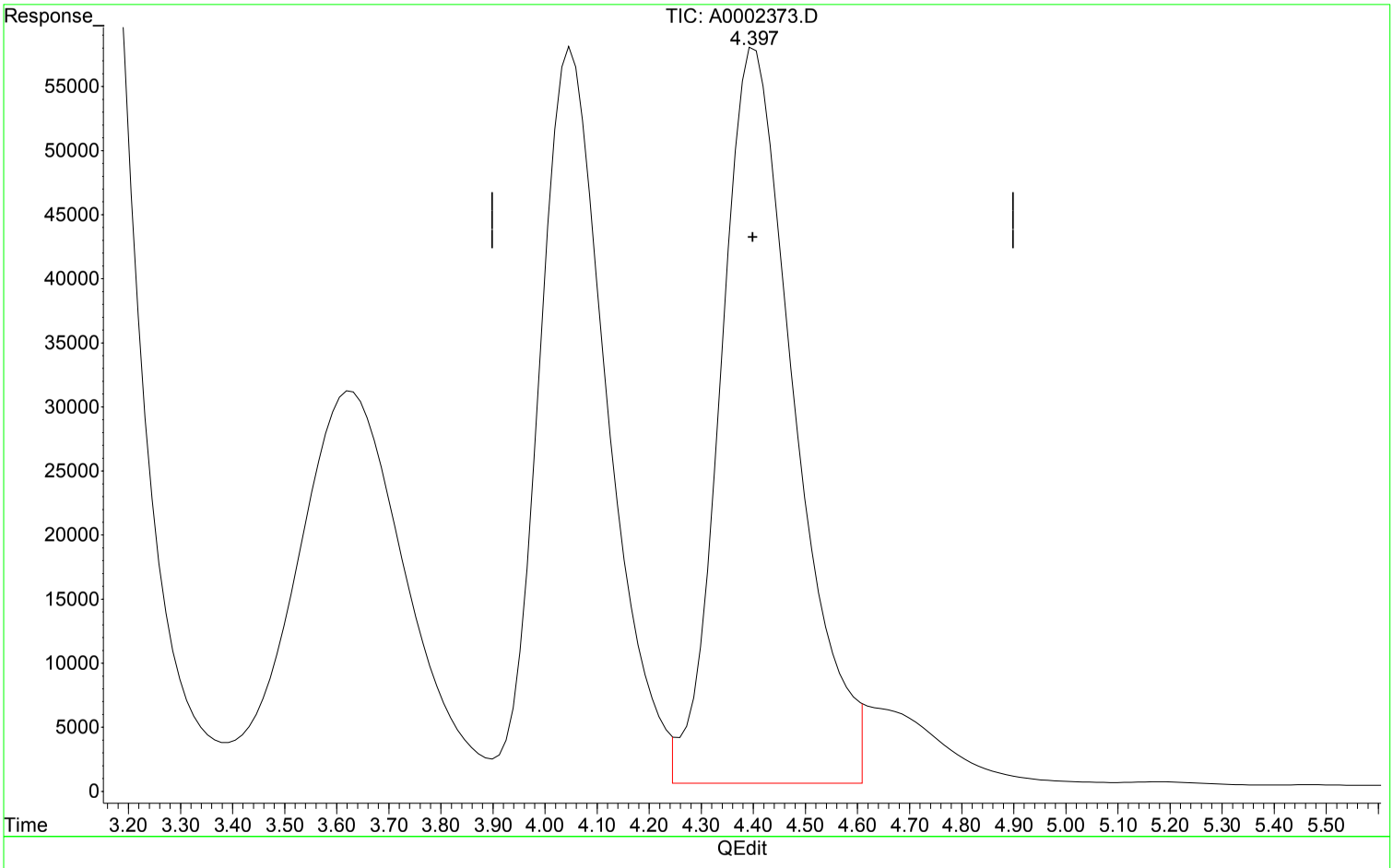
00944313

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002373.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 15:31:47
Operator : b.allgeier
Sample : 10.0-100.0ppm
Misc :
ALS Vial : 8 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:10:46 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.397min 96.715 ppm m

response 5725459

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

00944314

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002372.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:56:43
Operator : b.allgeier
Sample : 5.0-50.0ppm
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:10:03 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.133	4817586	51.153	ppm	
2) T	Pyruvic acid	3.630	2294161	5.100	ppm	
3) T	Lactic Acid	4.053	2711599	51.251	ppm	
4) T	Acetic Acid	4.398	3026497	51.124	ppm	m
5) T	Propionic Acid	9.212	2949938	50.024	ppm	
6) T	Butyric Acid	24.928	2932273	48.537	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

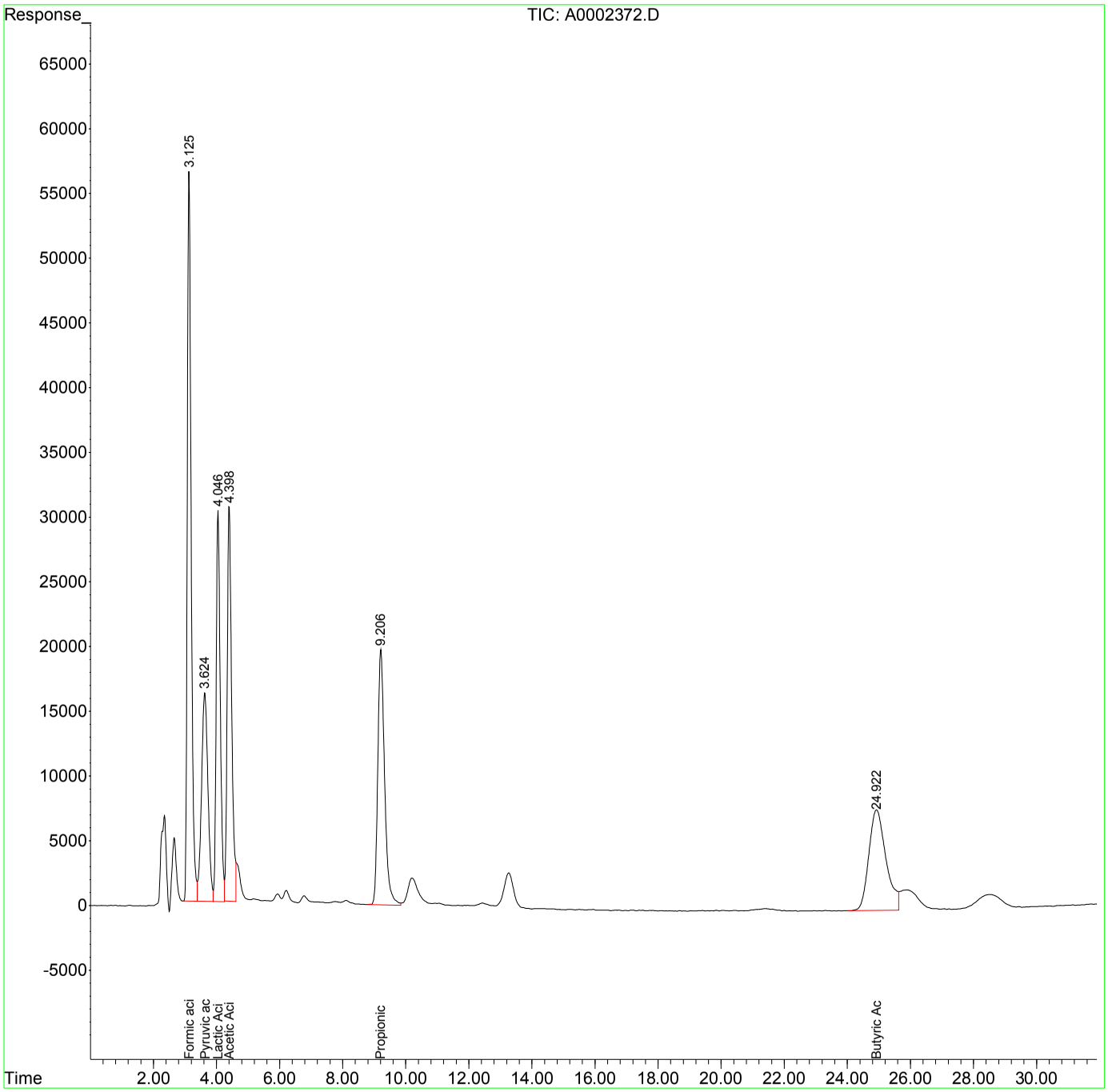
00944315

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002372.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:56:43
Operator : b.allgeier
Sample : 5.0-50.0ppm
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:10:03 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



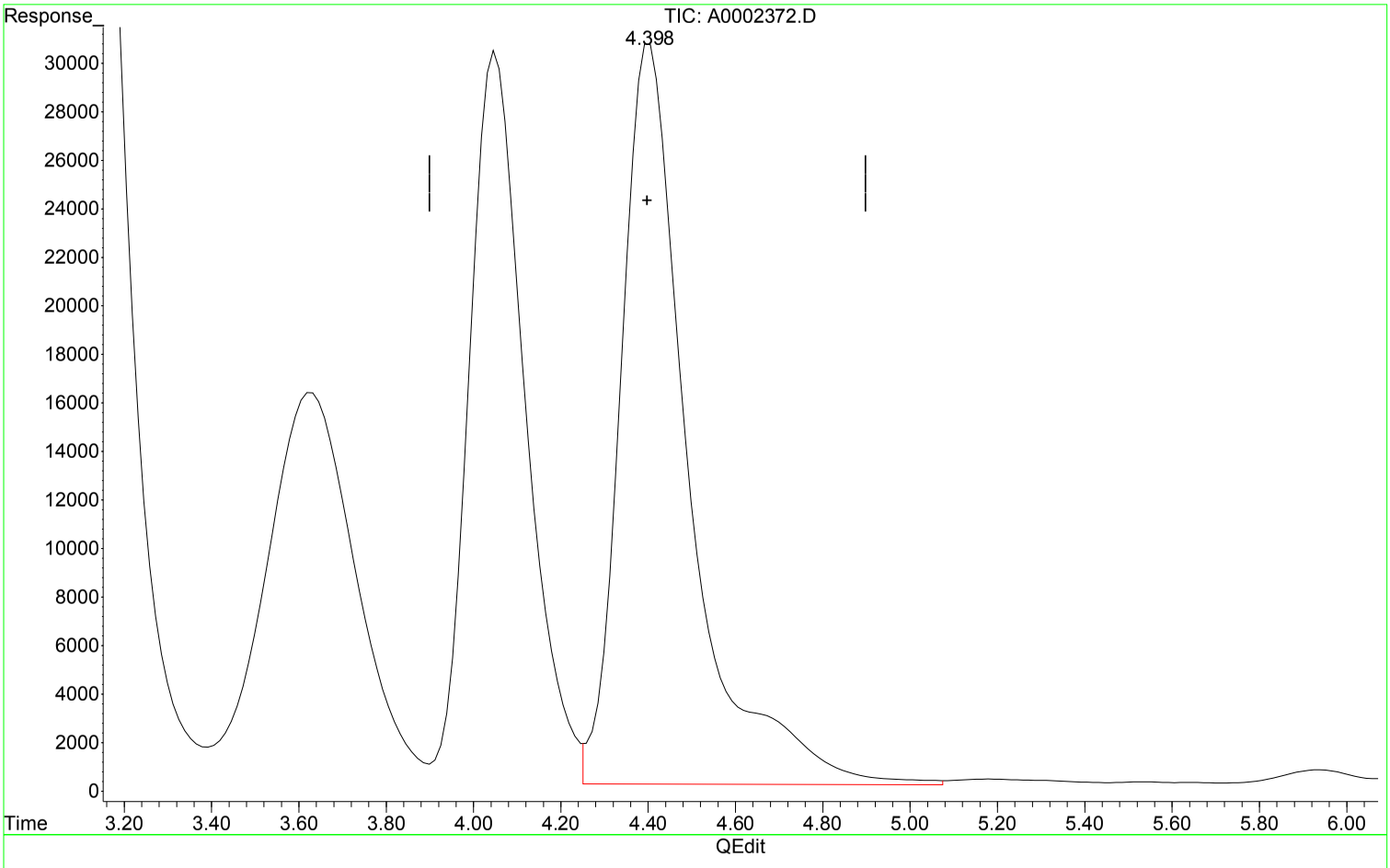
00944316

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002372.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:56:43
Operator : b.allgeier
Sample : 5.0-50.0ppm
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:10:03 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.406min 56.131 ppm

response 3322912

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

MA100418.M Thu Oct 04 16:10:16 2018 Page: 1

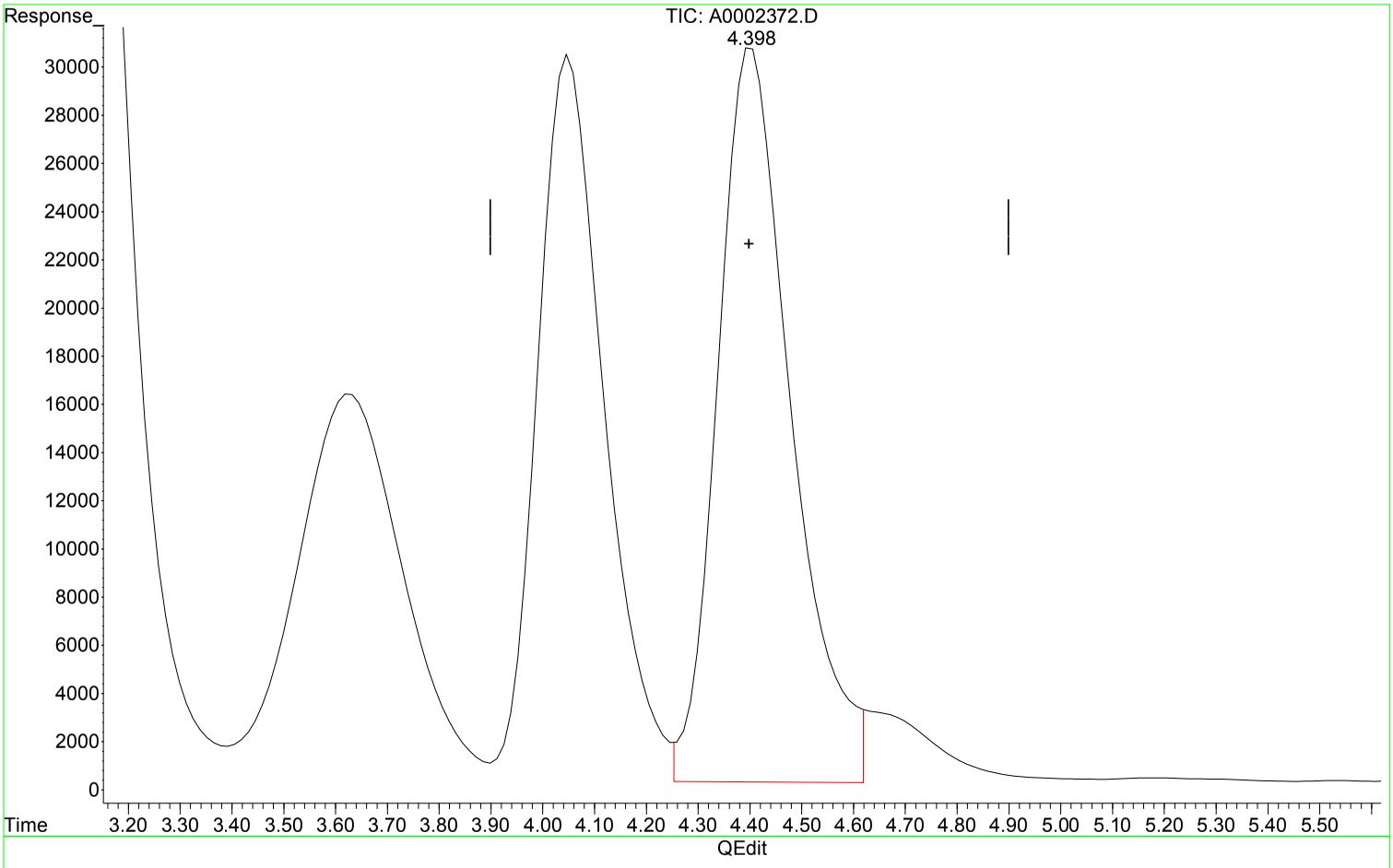
00944317

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002372.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:56:43
Operator : b.allgeier
Sample : 5.0-50.0ppm
Misc :
ALS Vial : 7 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:10:03 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.398min 51.124 ppm m

response 3026497

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

MA100418.M Thu Oct 04 16:10:25 2018 Page: 1

00944318

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002371.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:21:46
Operator : b.allgeier
Sample : 2.0-20.0ppm
Misc :
ALS Vial : 6 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:09:14 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.131	1890077	20.069	ppm	
2) T	Pyruvic acid	3.629	850051	1.890	ppm	
3) T	Lactic Acid	4.051	1003444	18.966	ppm	
4) T	Acetic Acid	4.397	1096677	18.525	ppm	m
5) T	Propionic Acid	9.206	1140510	19.340	ppm	m
6) T	Butyric Acid	24.960	1207082	19.981	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

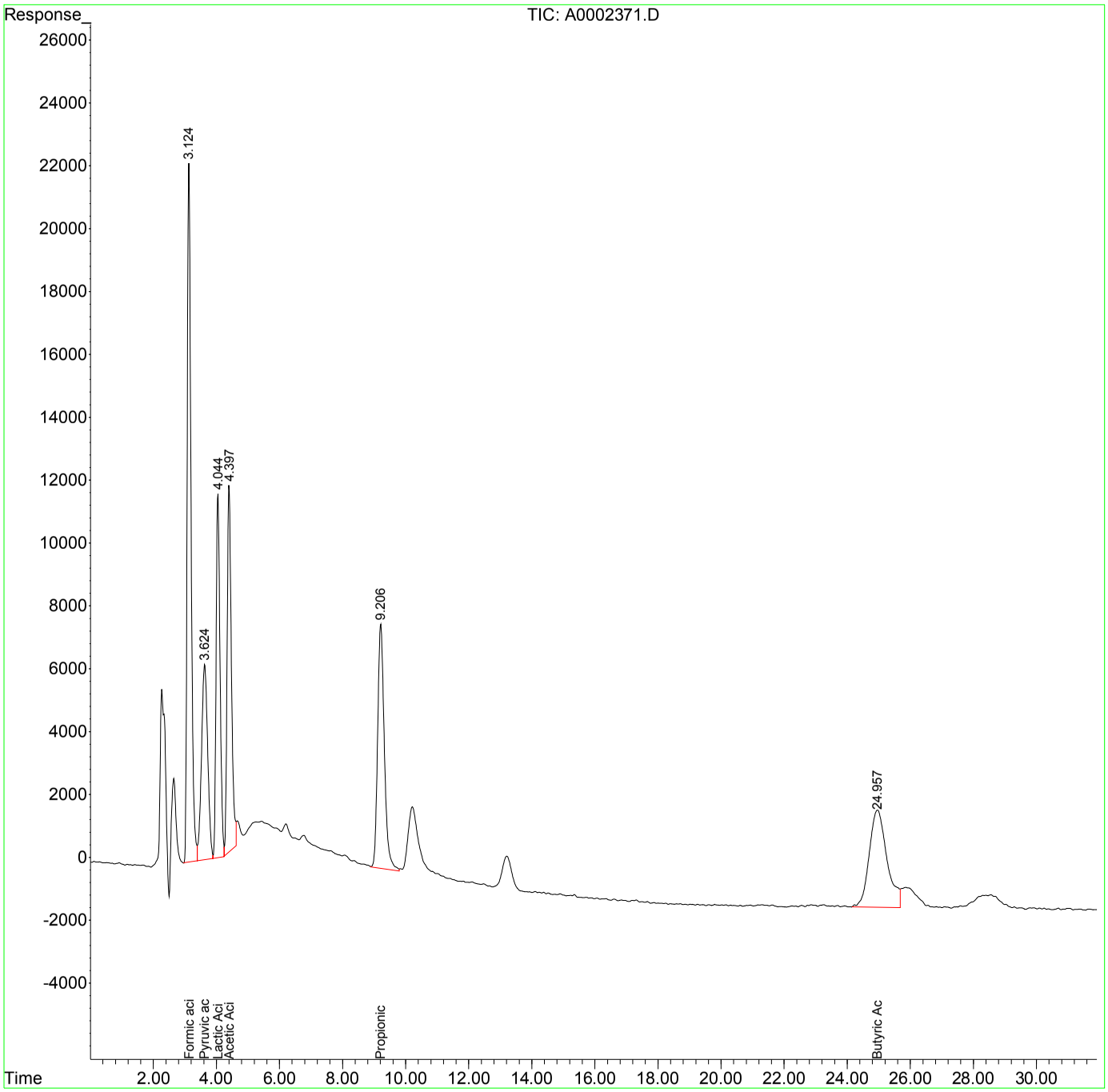
00944319

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002371.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:21:46
Operator : b.allgeier
Sample : 2.0-20.0ppm
Misc :
ALS Vial : 6 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:09:14 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



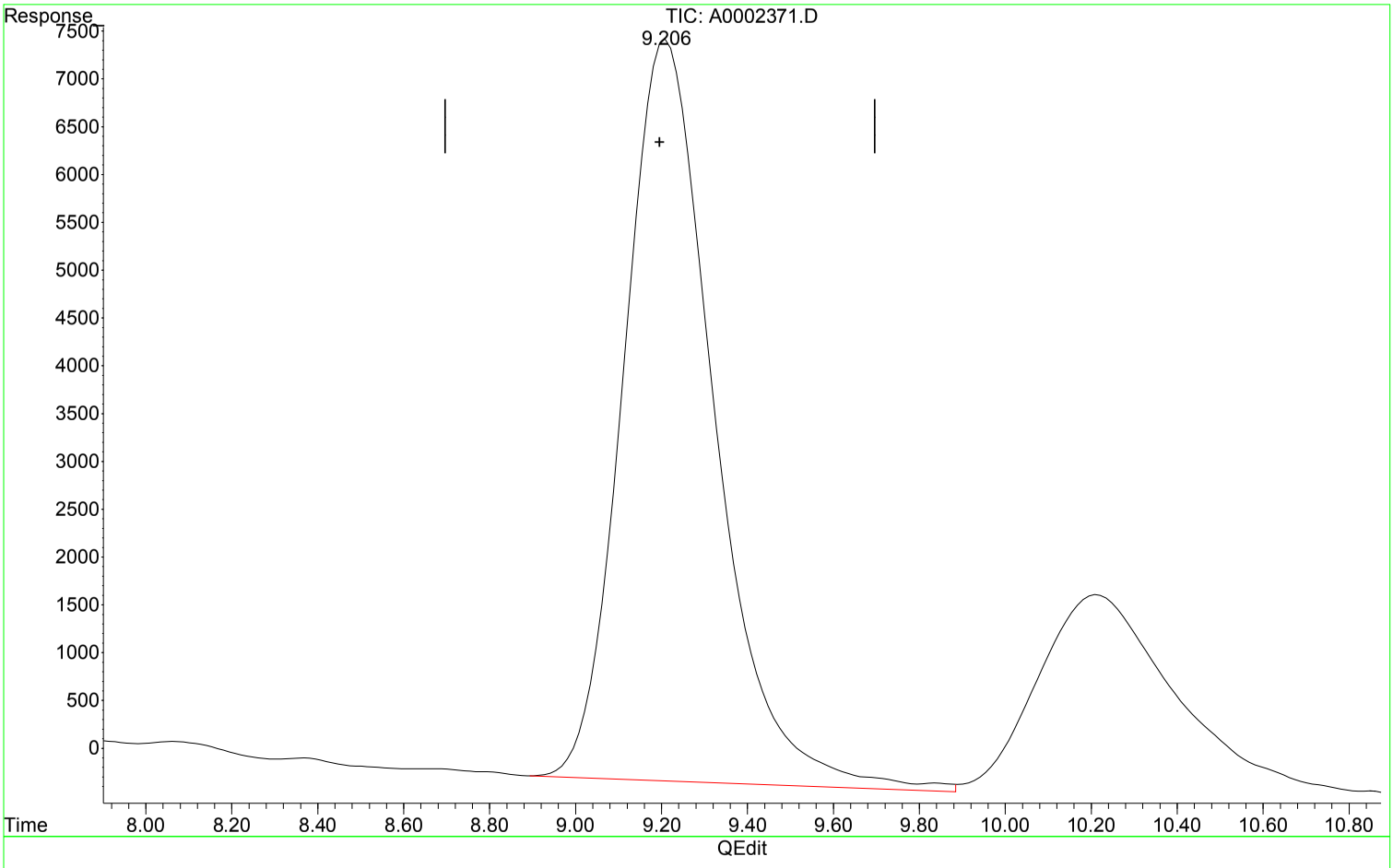
00944320

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002371.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:21:46
Operator : b.allgeier
Sample : 2.0-20.0ppm
Misc :
ALS Vial : 6 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:09:14 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.212min 19.380 ppm

response 1142822

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

MA100418.M Thu Oct 04 16:09:40 2018 Page: 1

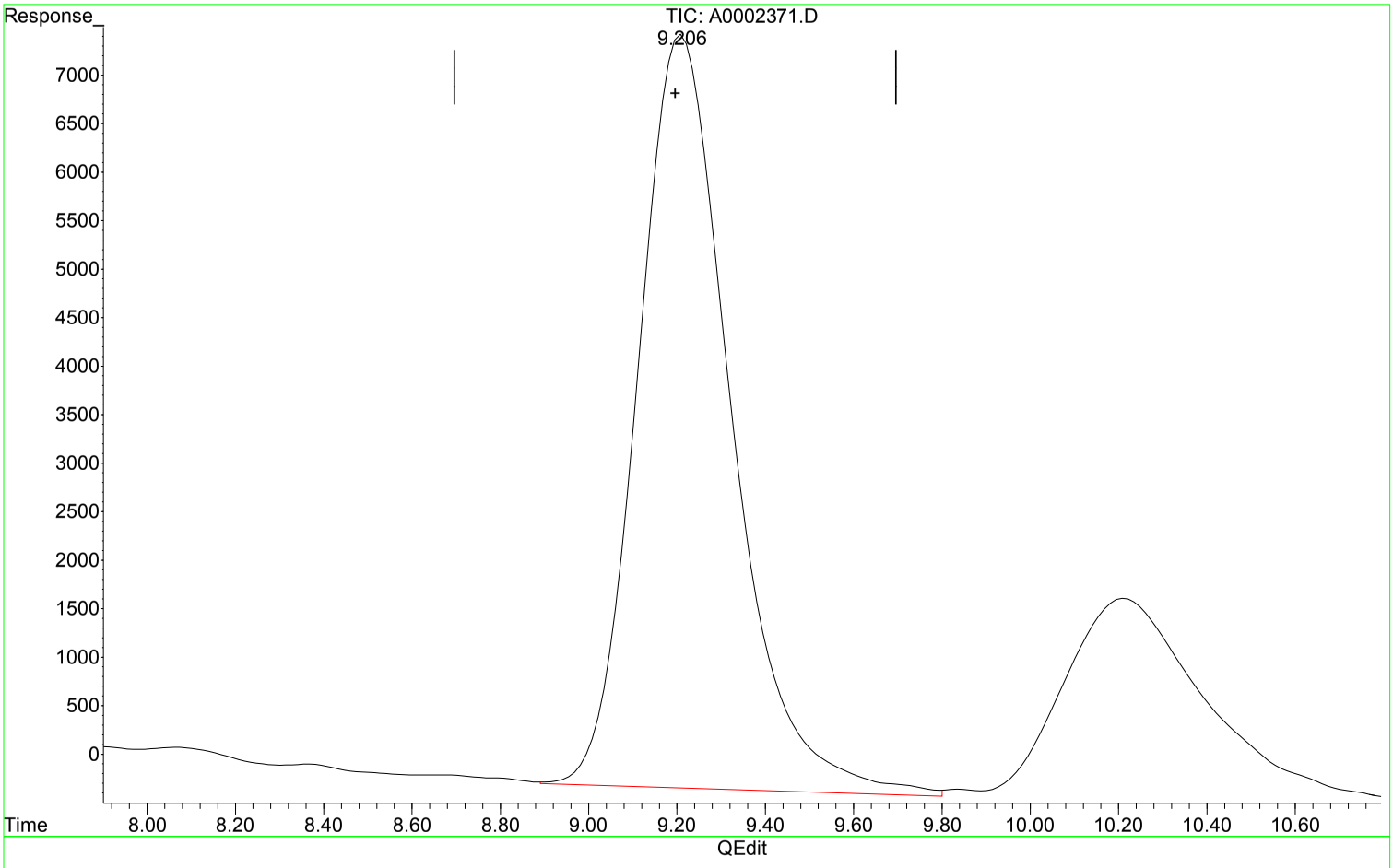
00944321

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002371.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:21:46
Operator : b.allgeier
Sample : 2.0-20.0ppm
Misc :
ALS Vial : 6 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:09:14 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.206min 19.340 ppm m

response 1140510

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

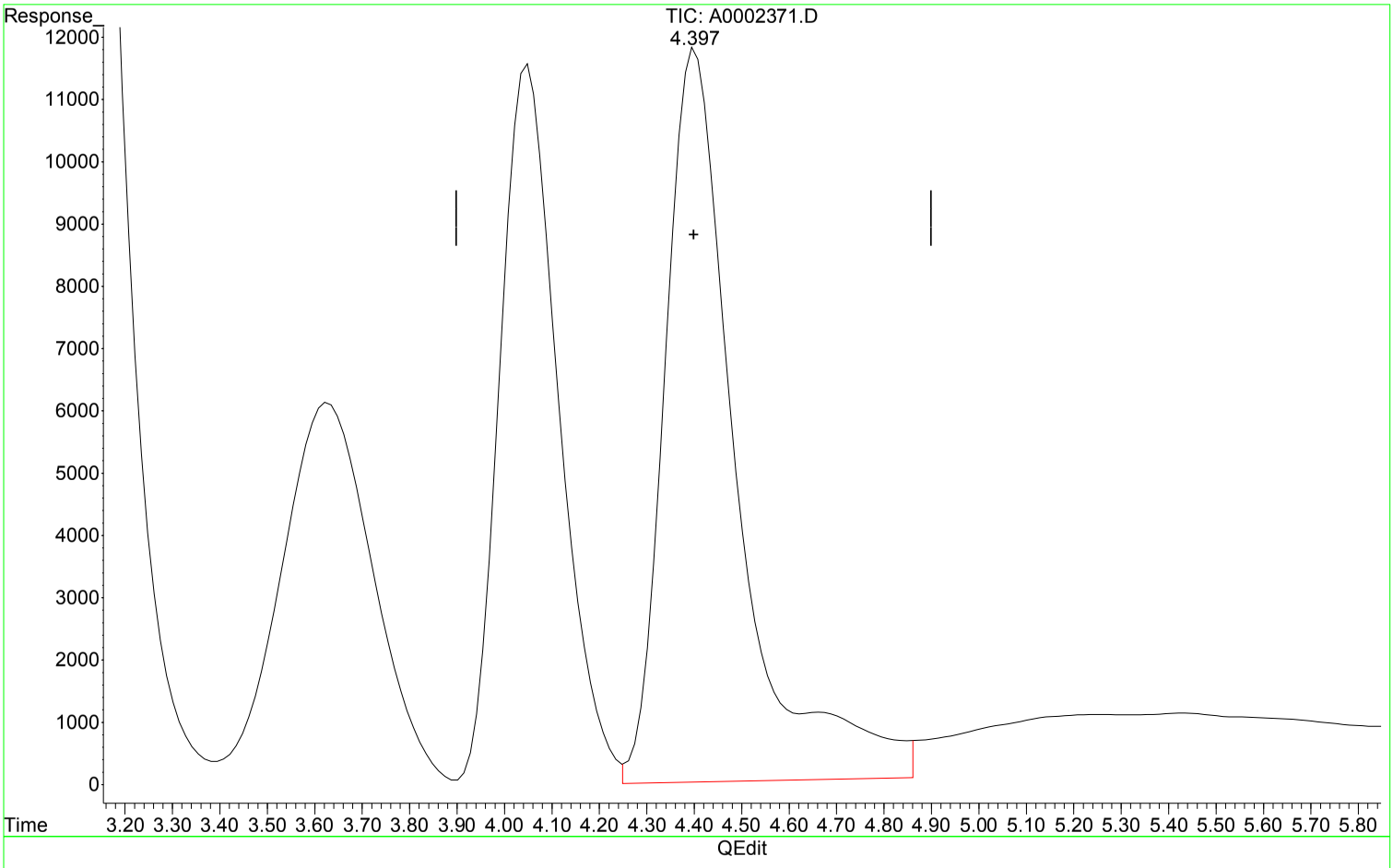
00944322

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002371.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:21:46
Operator : b.allgeier
Sample : 2.0-20.0ppm
Misc :
ALS Vial : 6 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:09:14 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.404min 21.093 ppm

response 1248683

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

MA100418.M Thu Oct 04 16:09:26 2018 Page: 1

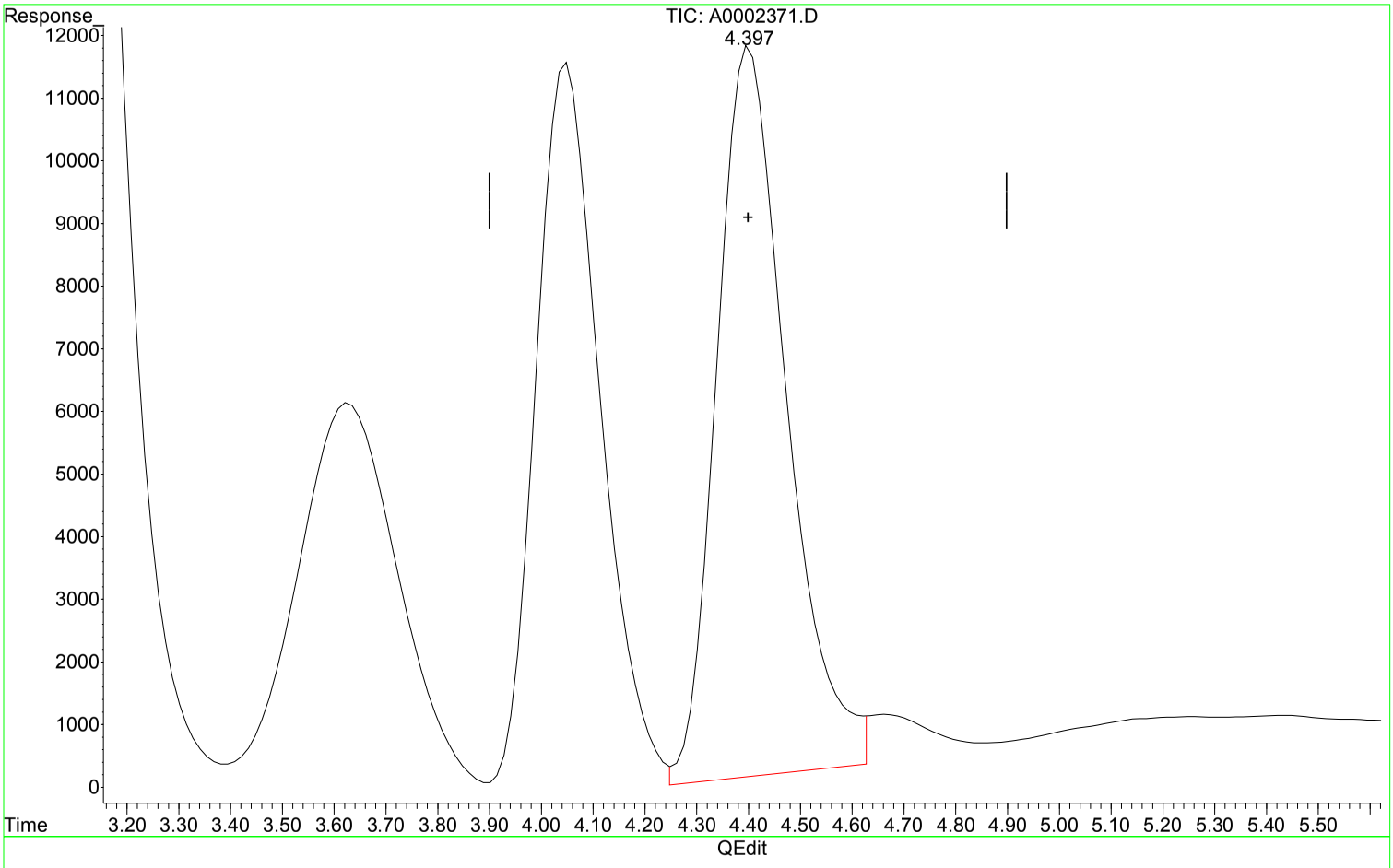
00944323

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002371.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 14:21:46
Operator : b.allgeier
Sample : 2.0-20.0ppm
Misc :
ALS Vial : 6 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:09:14 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.397min 18.525 ppm m

response 1096677

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

MA100418.M Thu Oct 04 16:09:33 2018 Page: 1

00944324

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002370.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:19
Operator : b.allgeier
Sample : 1.0-10.0ppm
Misc :
ALS Vial : 5 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:08:41 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.133	942238	10.005	ppm	
2) T	Pyruvic acid	3.631	448113	0.996	ppm	
3) T	Lactic Acid	4.053	528635	9.991	ppm	
4) T	Acetic Acid	4.399	585881	9.897	ppm	m
5) T	Propionic Acid	9.226	585985	9.937	ppm	
6) T	Butyric Acid	25.010	602088	9.966	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

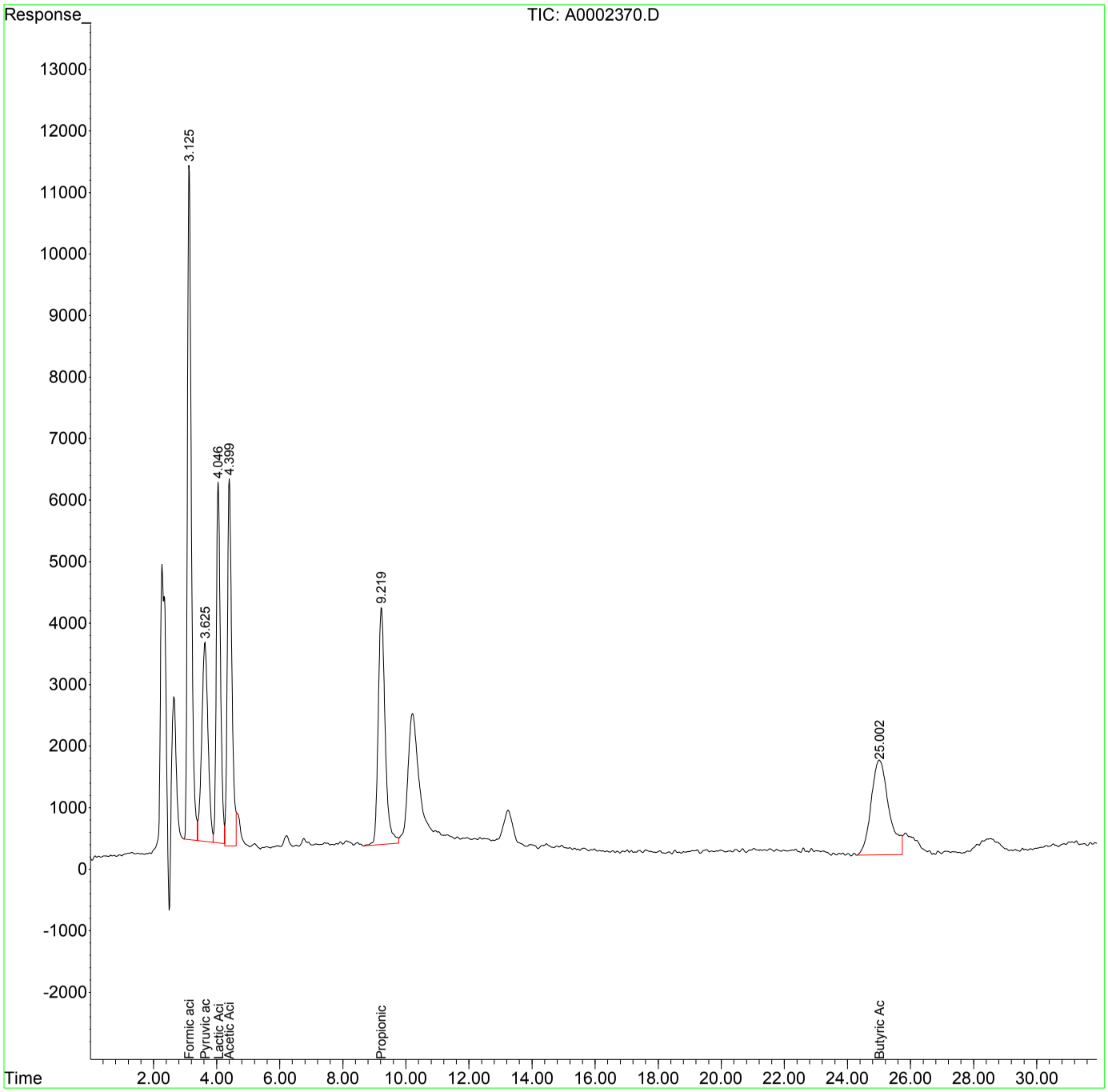
00944325

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002370.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:19
Operator : b.allgeier
Sample : 1.0-10.0ppm
Misc :
ALS Vial : 5 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:08:41 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



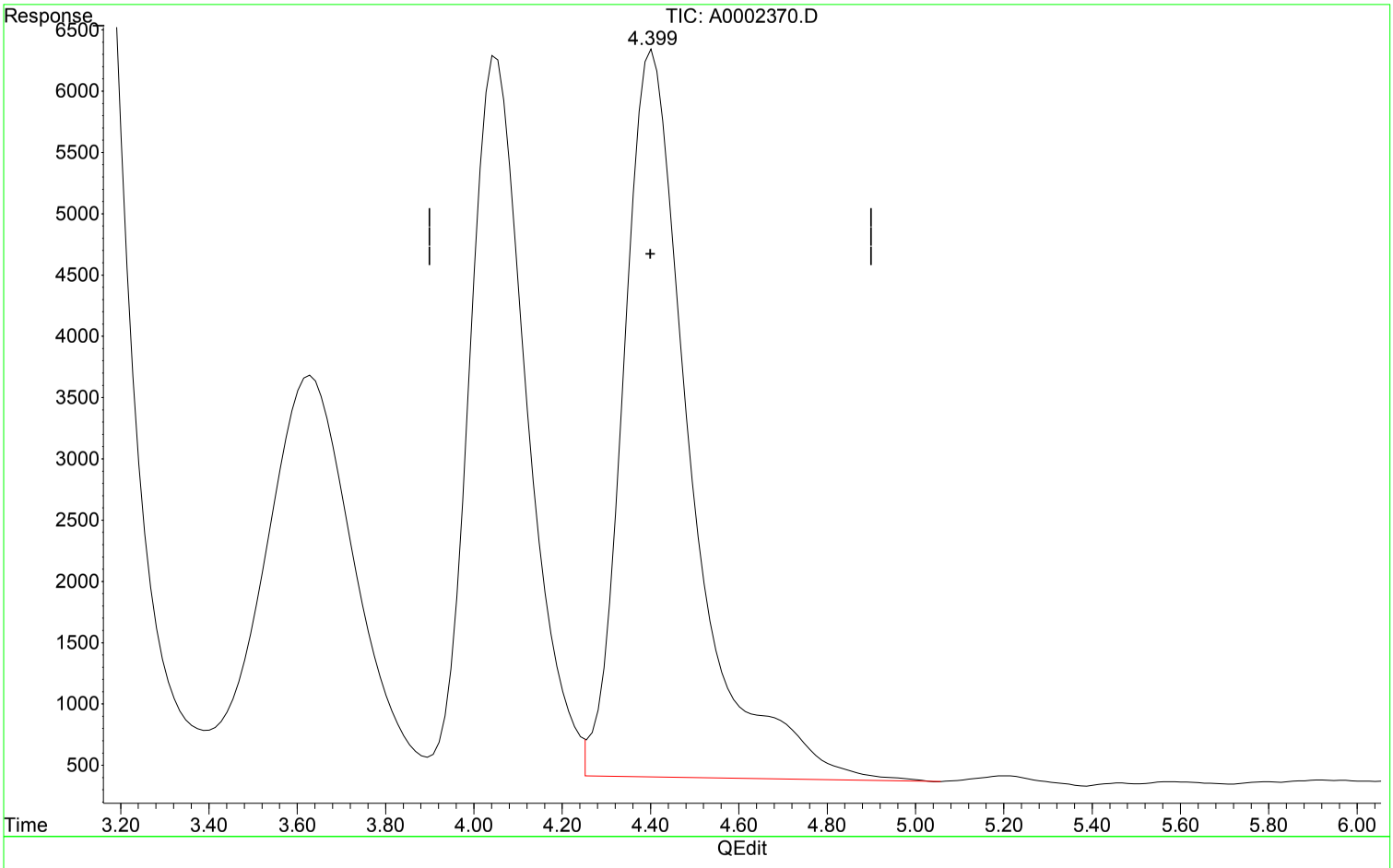
00944326

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002370.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:19
Operator : b.allgeier
Sample : 1.0-10.0ppm
Misc :
ALS Vial : 5 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:08:41 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.406min 10.646 ppm

response 630261

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

MA100418.M Thu Oct 04 16:08:50 2018 Page: 1

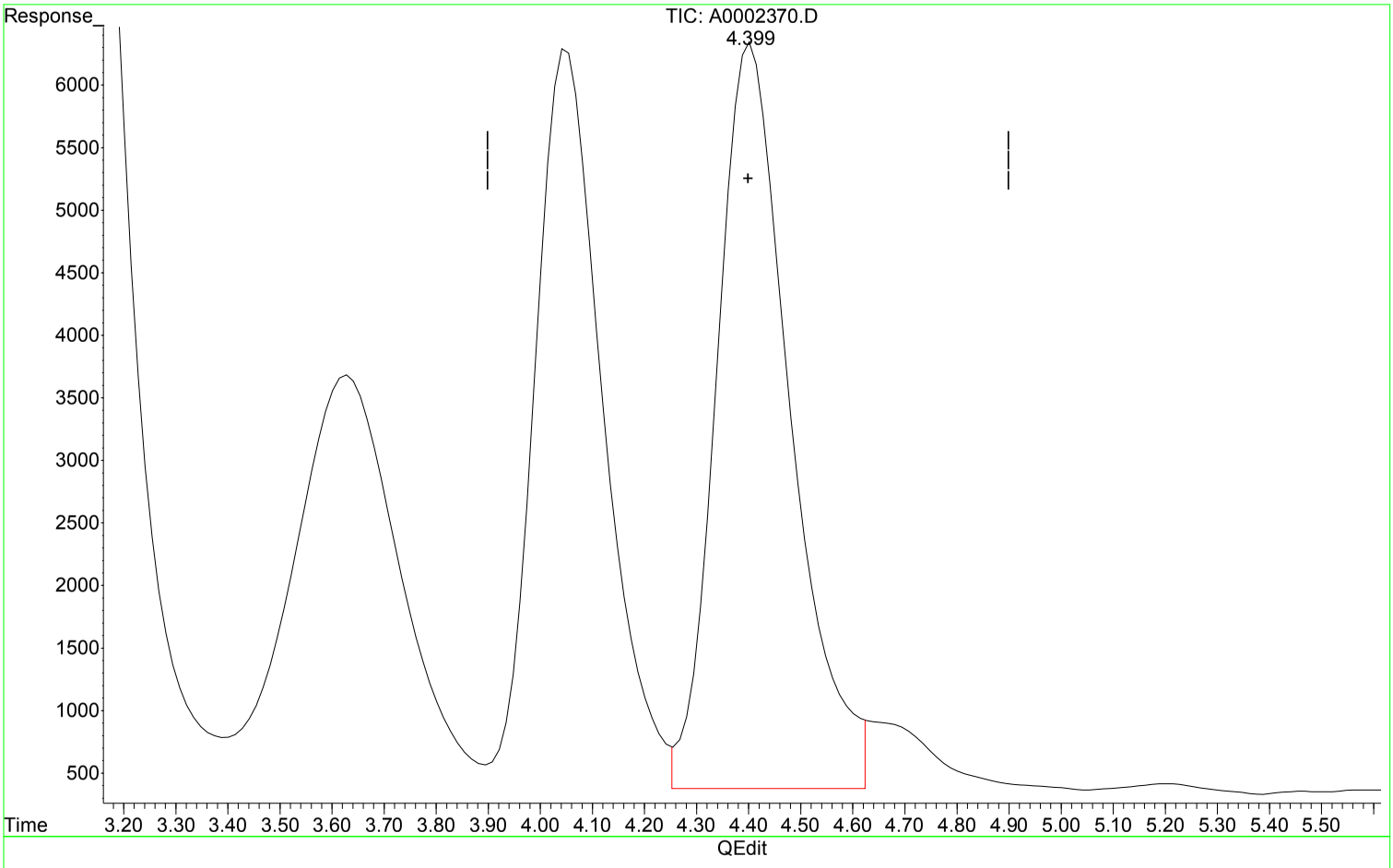
00944327

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002370.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:19
Operator : b.allgeier
Sample : 1.0-10.0ppm
Misc :
ALS Vial : 5 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:08:41 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.399min 9.897 ppm m

response 585881

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

00944328

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.133	497049	5.278	ppm	
2) T	Pyruvic acid	3.631	227620	0.506	ppm	
3) T	Lactic Acid	4.053	269401	5.092	ppm	
4) T	Acetic Acid	4.399	309471	5.228	ppm	m
5) T	Propionic Acid	9.220	306395	5.196	ppm	m
6) T	Butyric Acid	25.001	310758	5.144	ppm	m

(f)=RT Delta > 1/2 Window (m)=manual int.

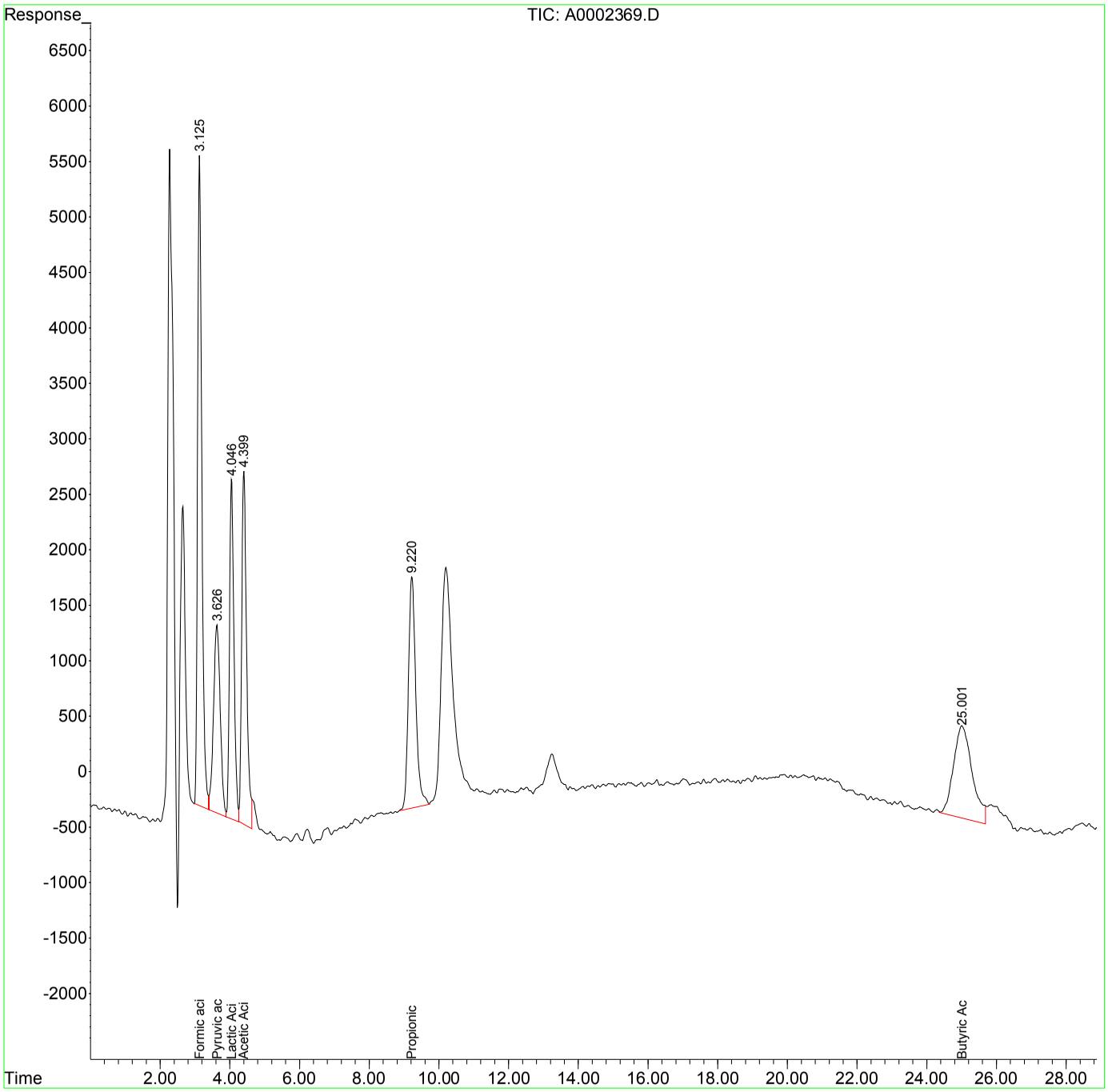
00944329

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



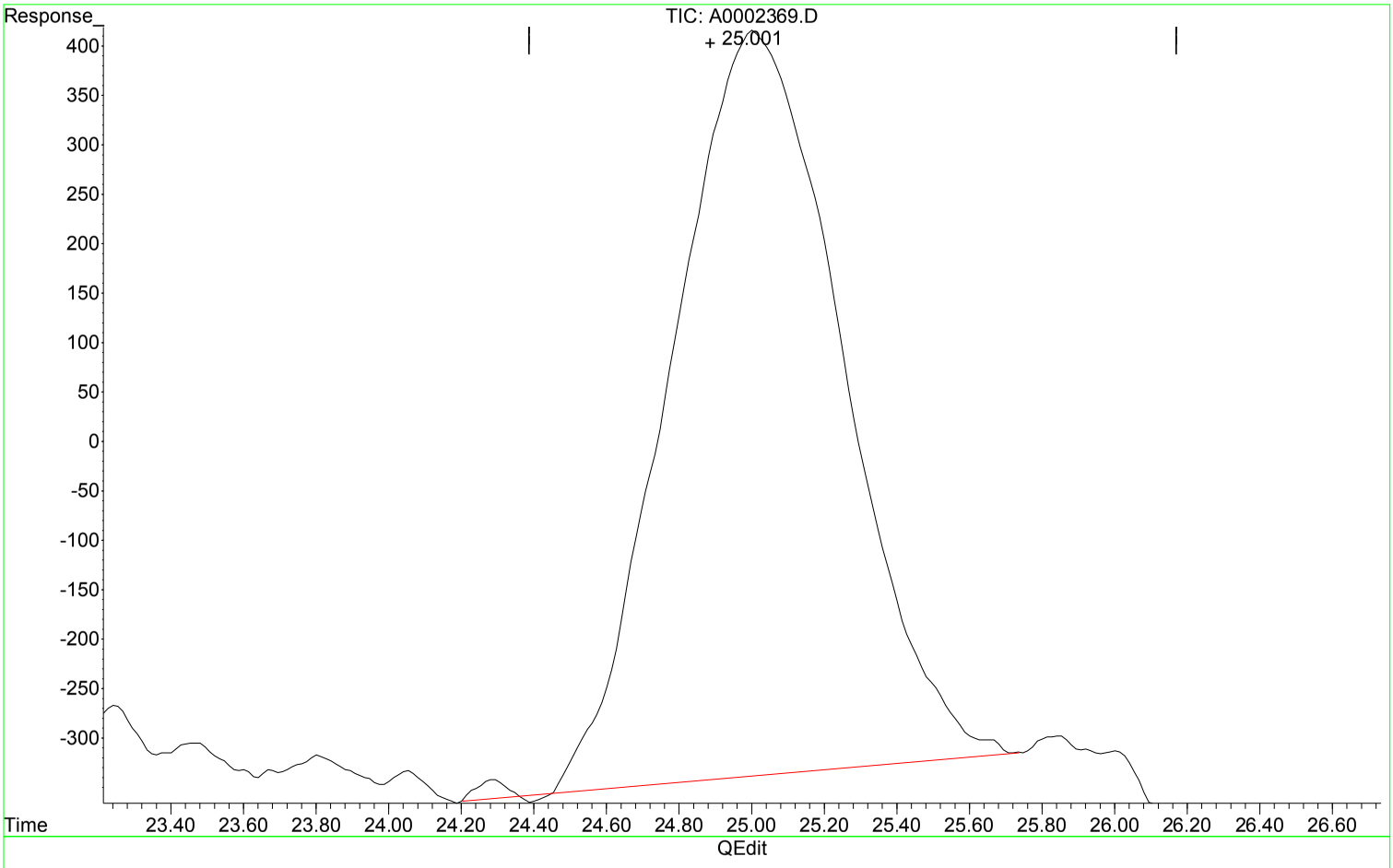
00944330

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

25.009min 4.071 ppm

response 245954

Manual Integration:

Before

10/04/18

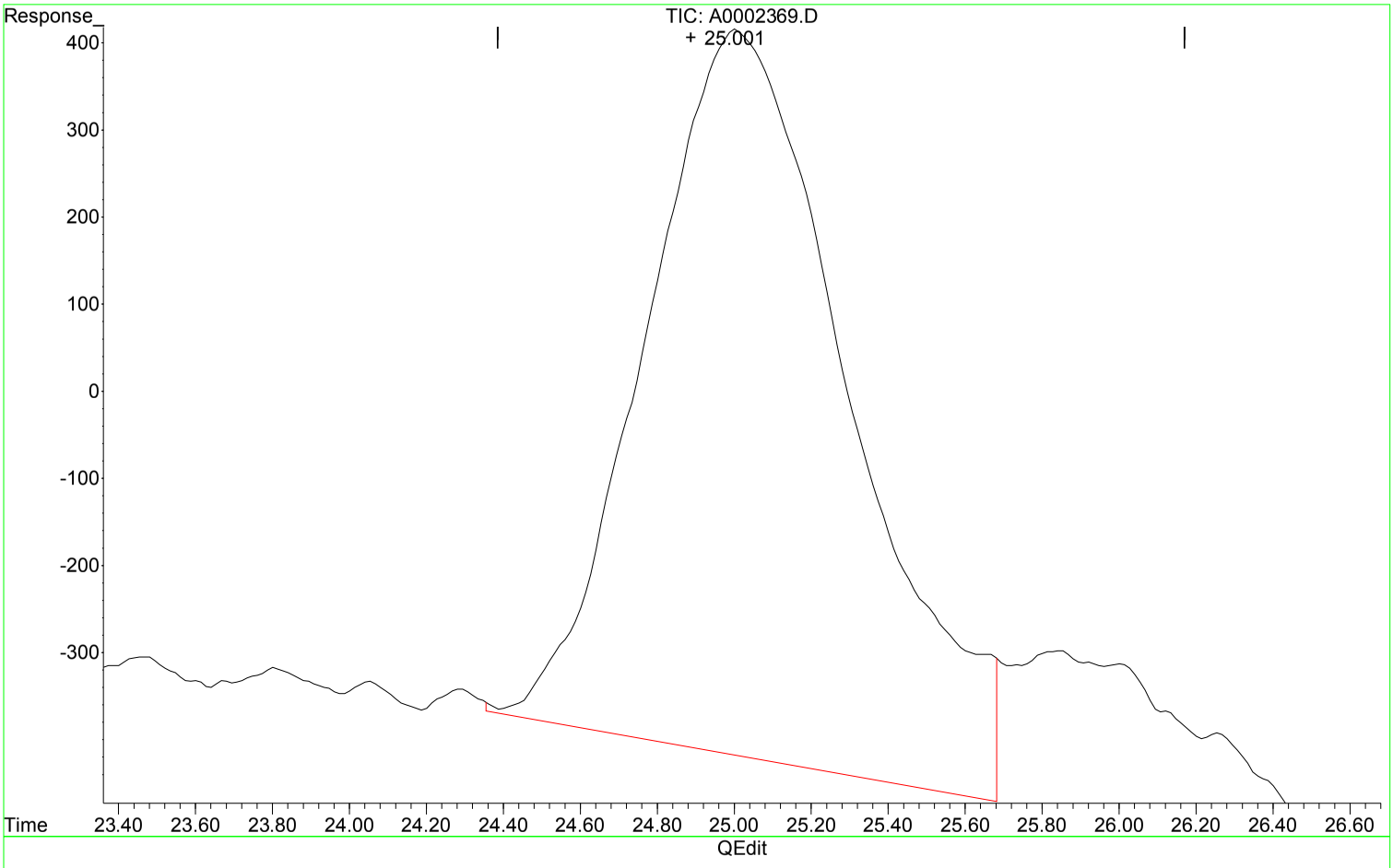
(+) = Expected Retention Time

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

25.001min 5.144 ppm m

response 310758

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

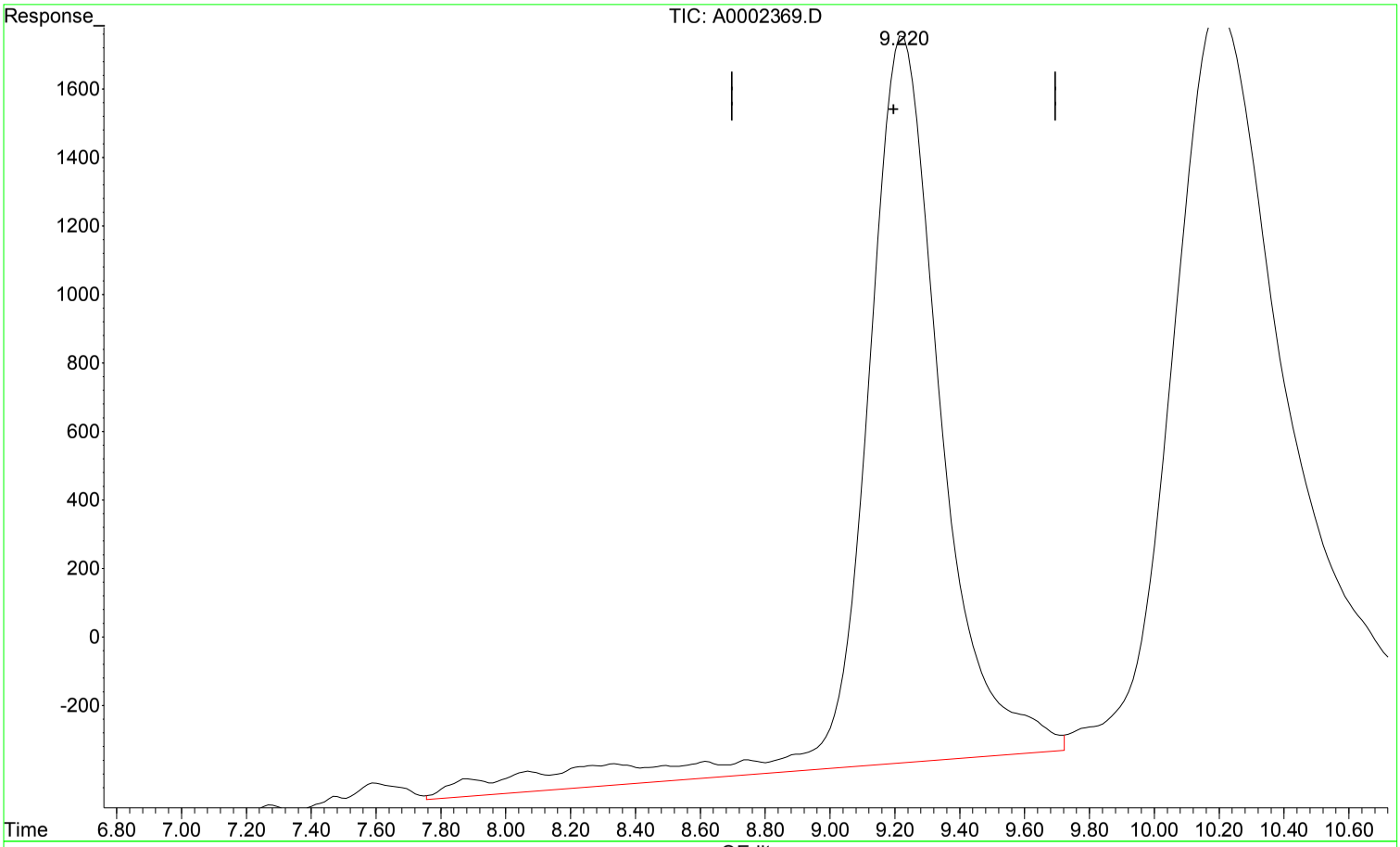
00944332

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.226min 6.027 ppm

response 355419

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

MA100418.M Thu Oct 04 13:44:57 2018 Page: 1

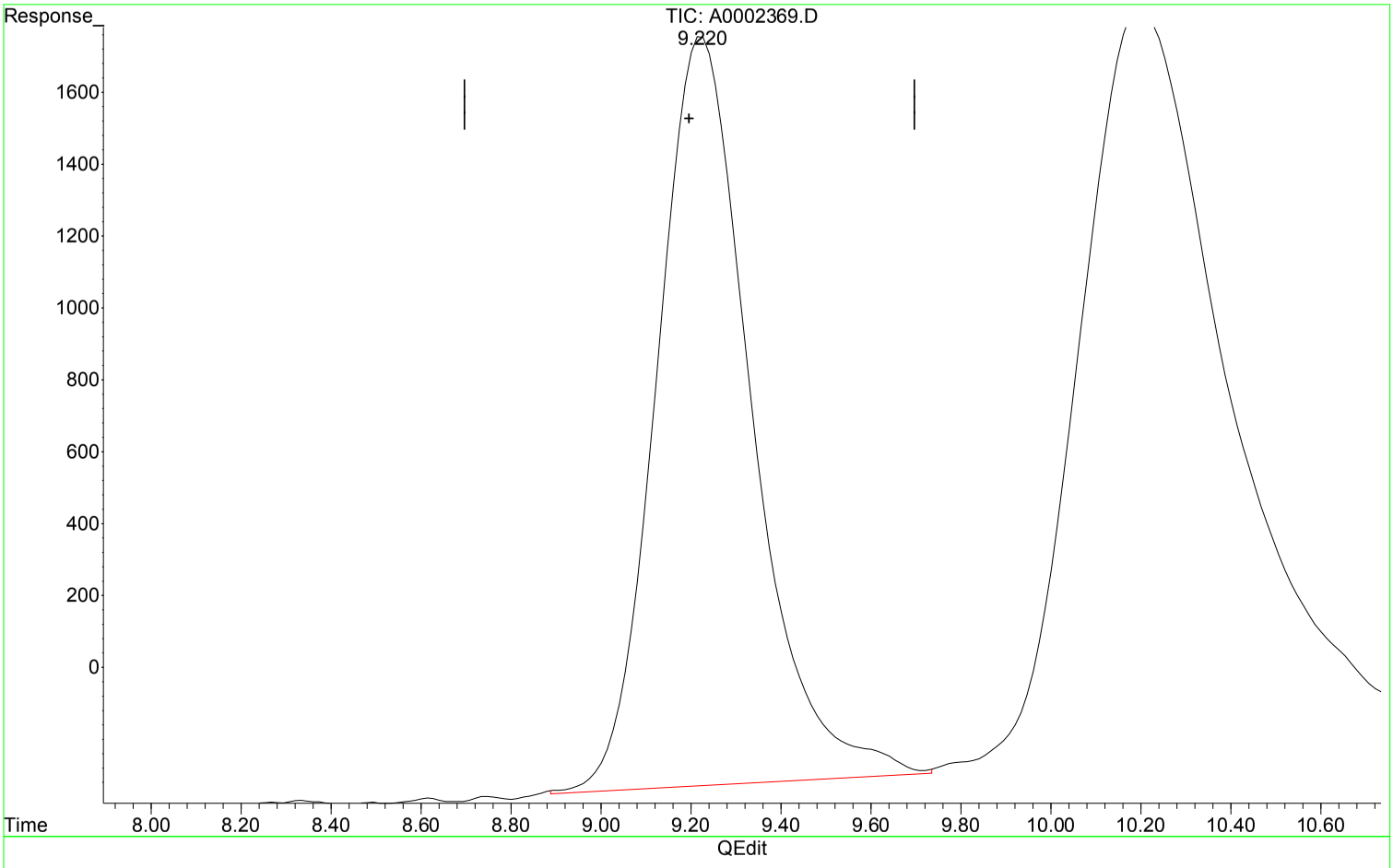
00944333

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.220min 5.196 ppm m

response 306395

Manual Integration:

After

Poor integration.

10/04/18

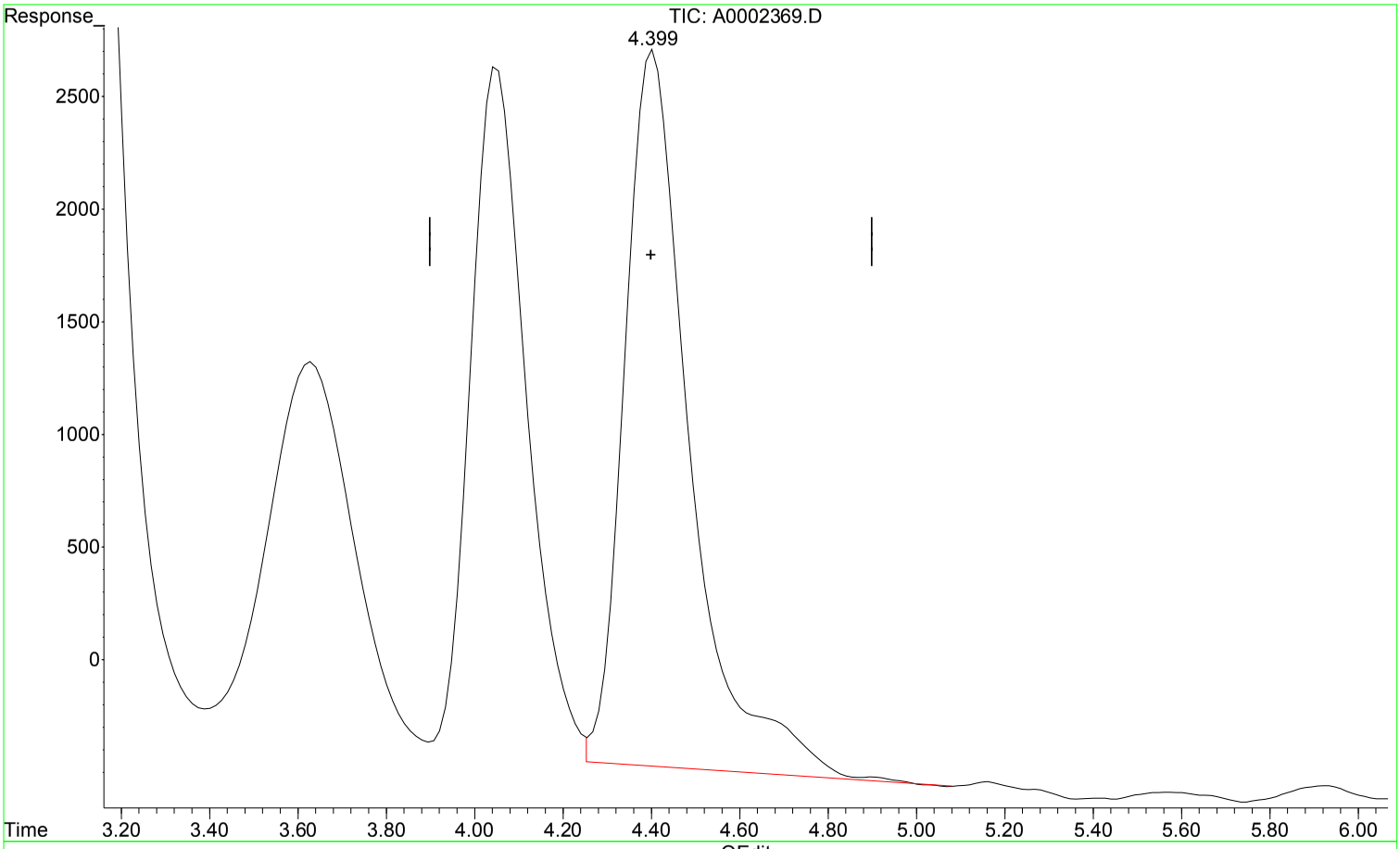
(+) = Expected Retention Time

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.406min 5.542 ppm

response 328094

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

MA100418.M Thu Oct 04 13:44:46 2018 Page: 1

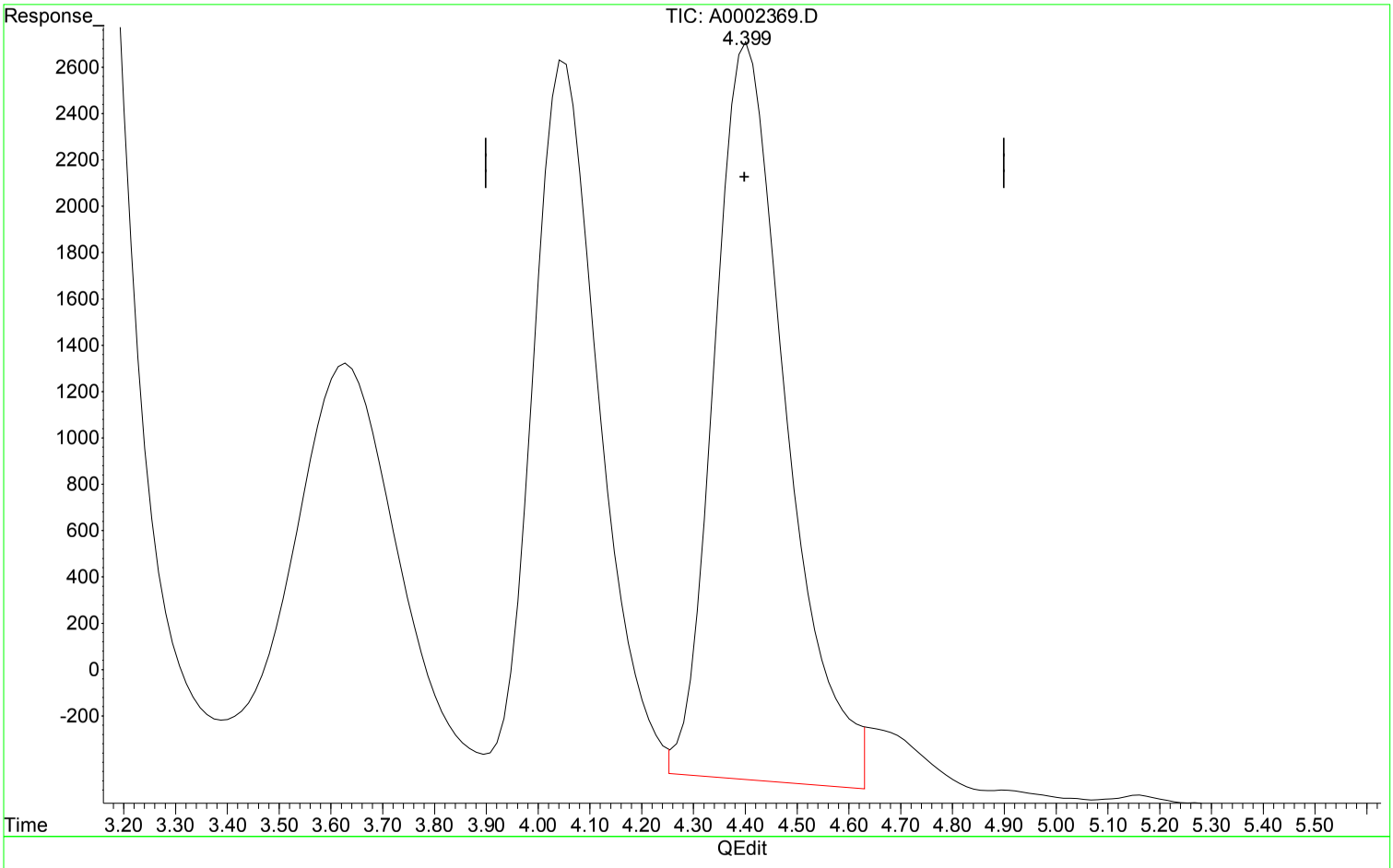
00944335

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002369.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 01:48:26
Operator : b.allgeier
Sample : 0.5-5.0ppm
Misc :
ALS Vial : 4 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:43:00 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.399min 5.228 ppm m

response 309471

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

00944336

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.133	197324	2.095	ppm	
2) T	Pyruvic acid	3.628	94203	0.209	ppm	
3) T	Lactic Acid	4.053	108314	2.047	ppm	
4) T	Acetic Acid	4.399	121343	2.050	ppm	m
5) T	Propionic Acid	9.219	118189	2.004	ppm	m
6) T	Butyric Acid	24.985	143852	2.381	ppm	m

(f)=RT Delta > 1/2 Window (m)=manual int.

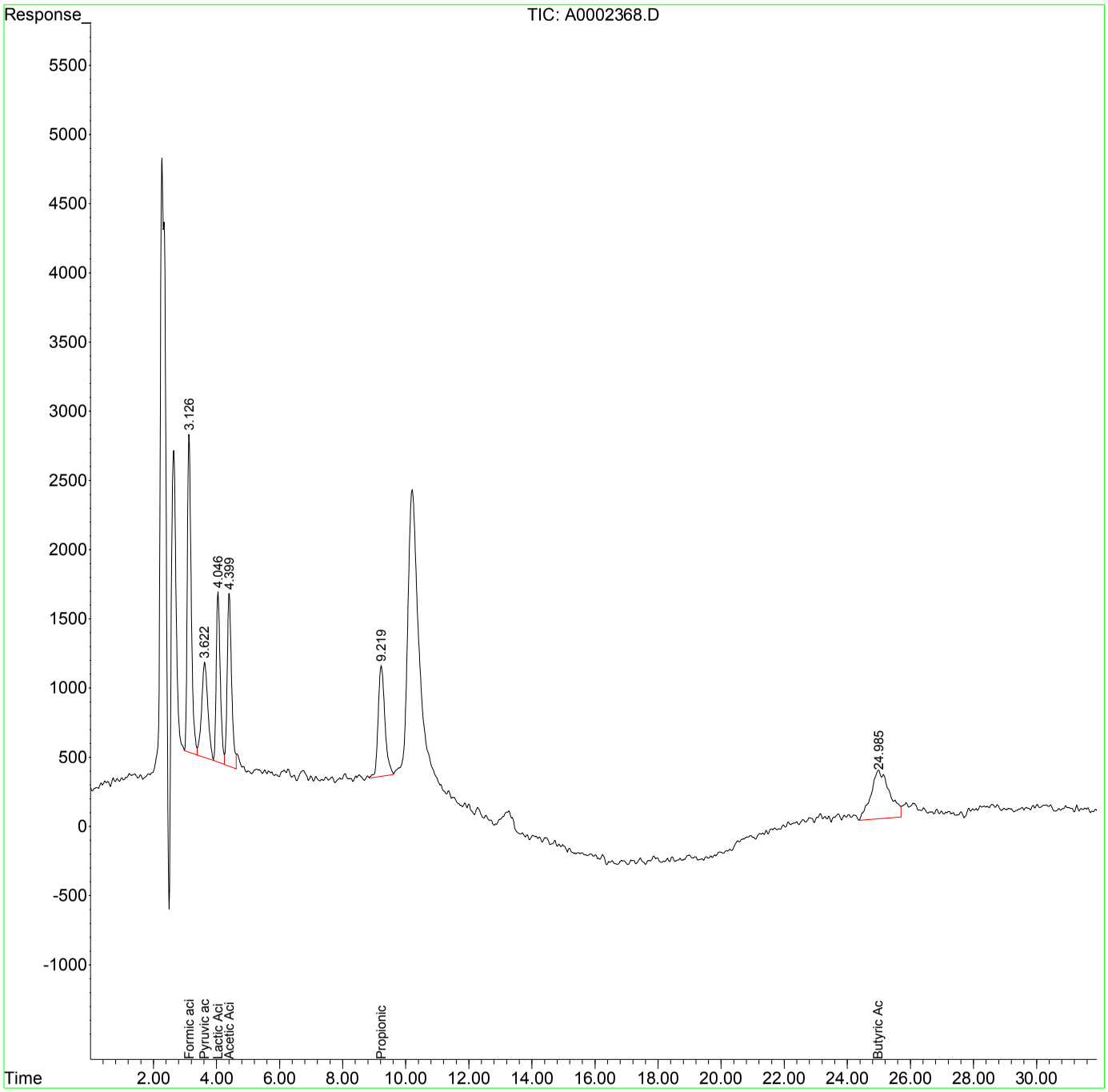
00944337

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944338

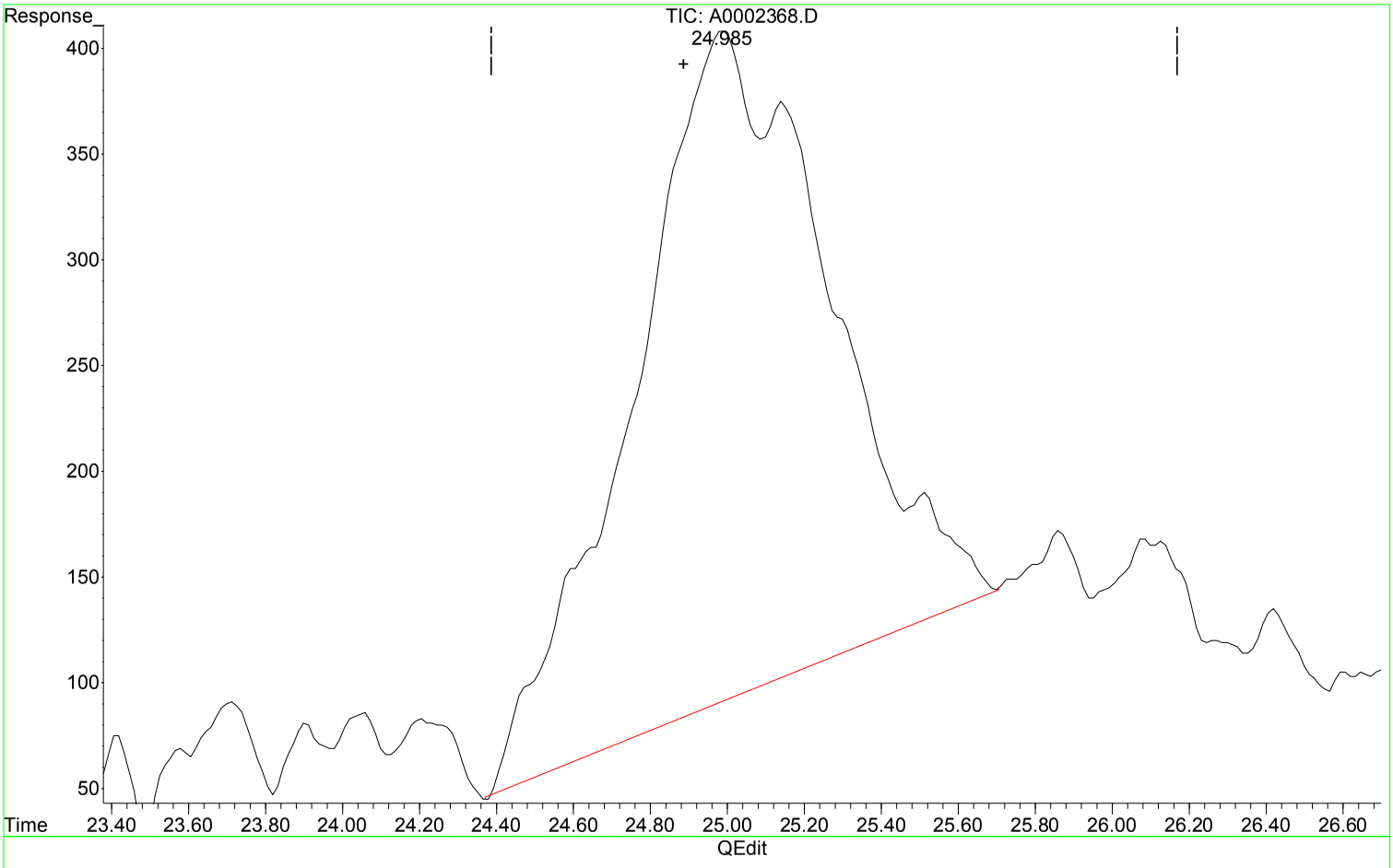
1st BA 10/05/18
2nd MP 10/09/18

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.991min 1.857 ppm

response 112205

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

MA100418.M Thu Oct 04 13:44:20 2018 Page: 1

00944339

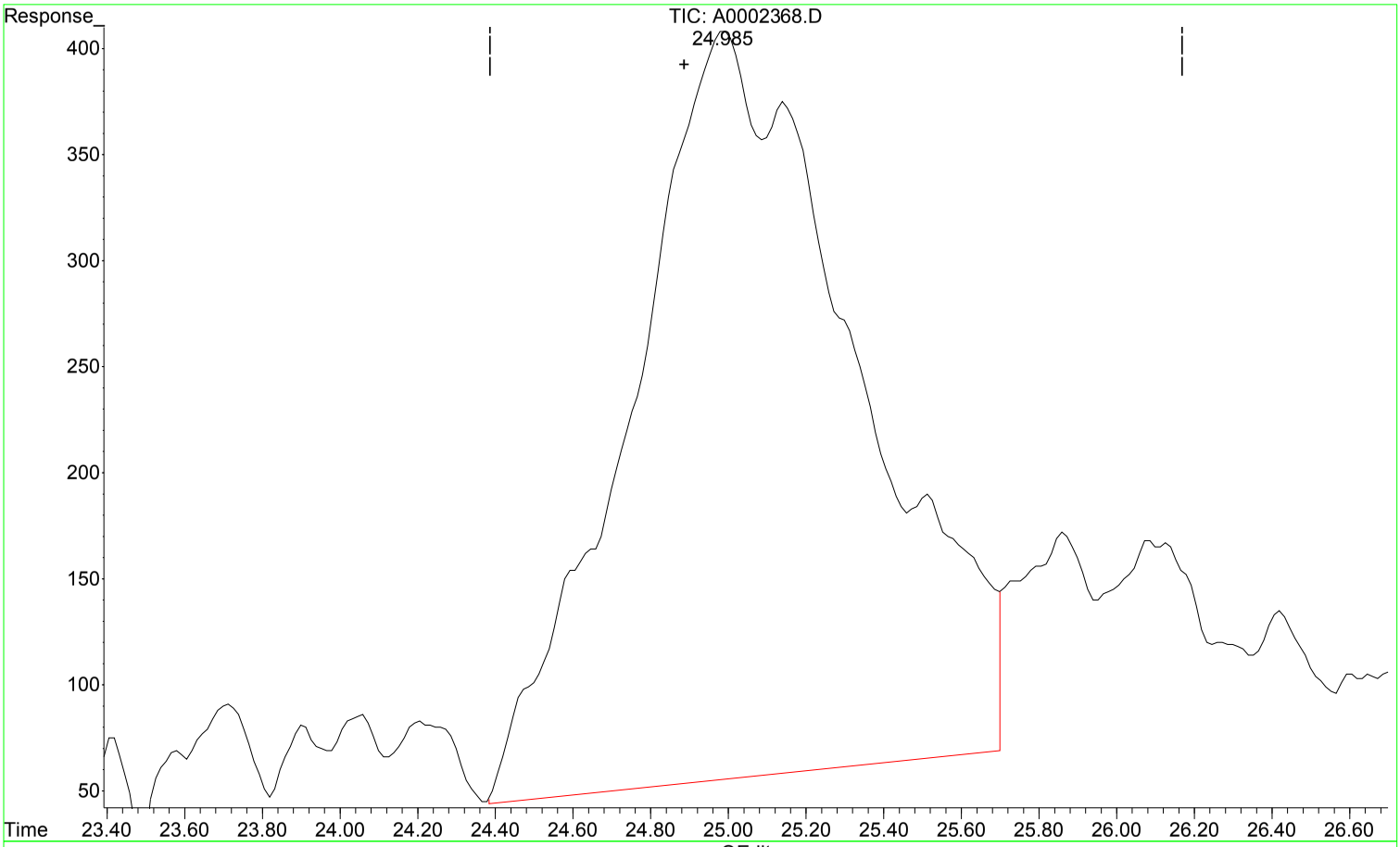
1st BA 10/05/18
2nd MP 10/09/18

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.985min 2.381 ppm m

response 143852

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

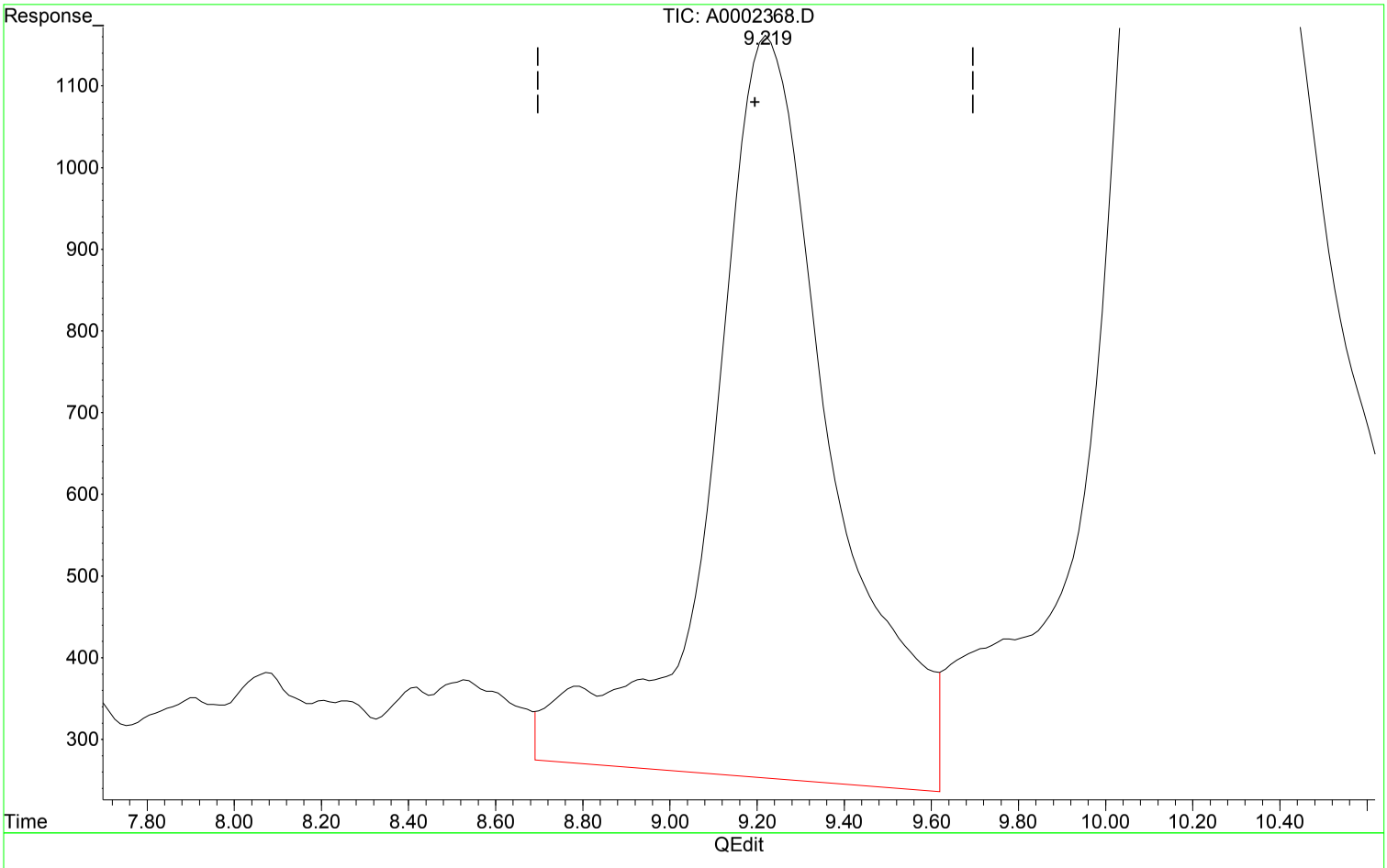
00944340

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.226min 3.005 ppm

response 177221

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

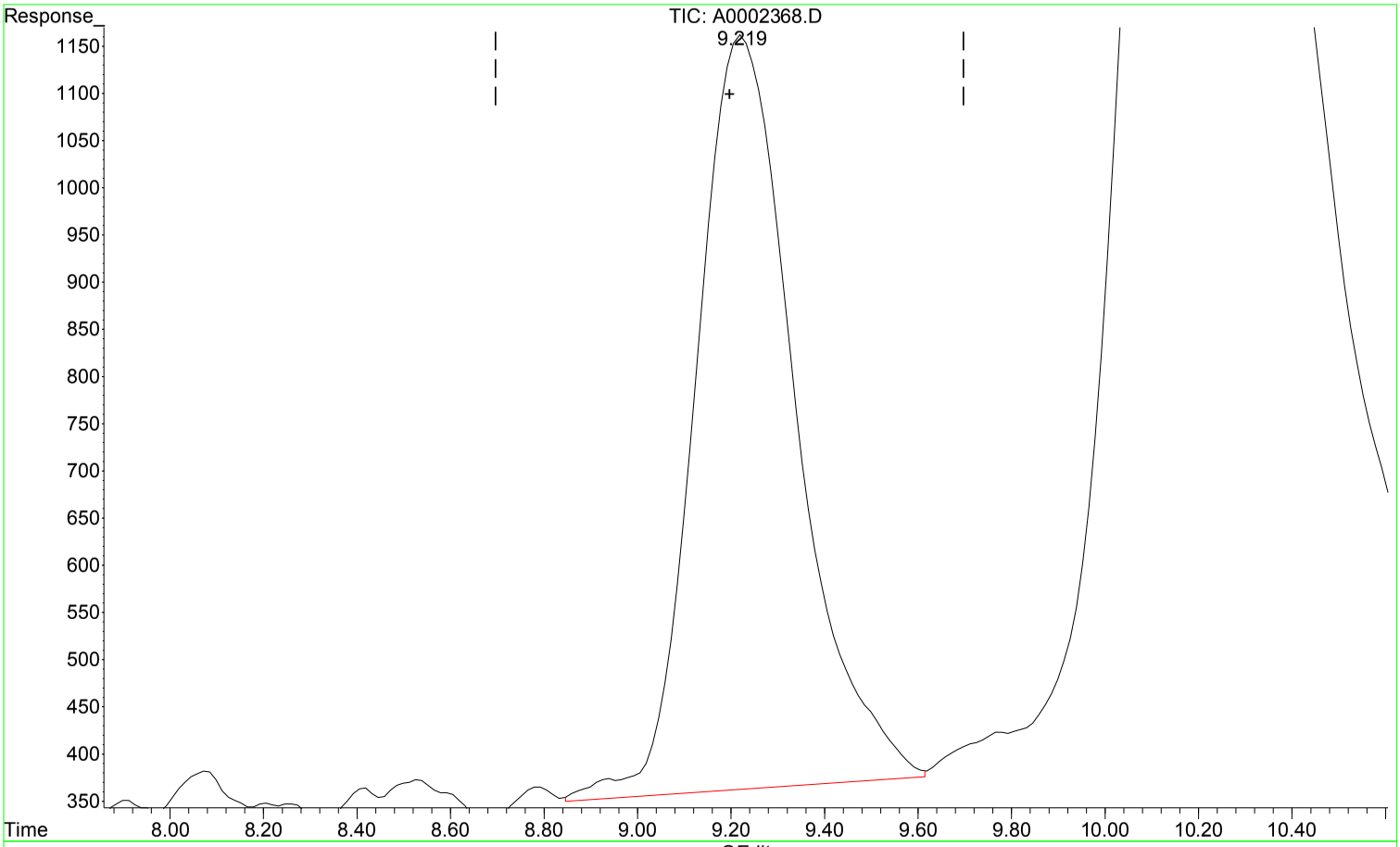
00944341

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.219min 2.004 ppm m

response 118189

Manual Integration:

After

Poor integration.

10/04/18

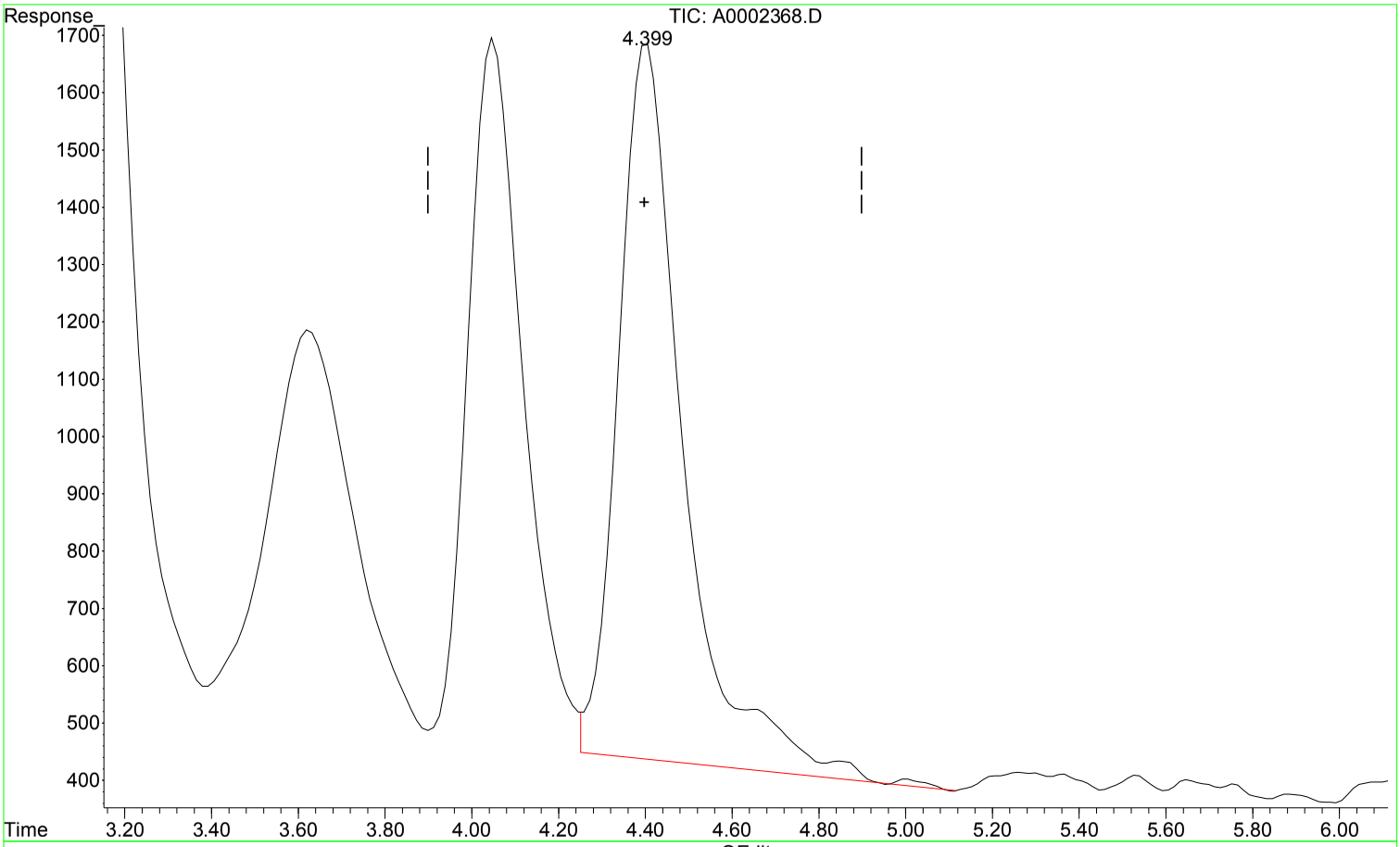
(+) = Expected Retention Time

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.406min 2.212 ppm

response 130945

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

MA100418.M Thu Oct 04 13:43:56 2018 Page: 1

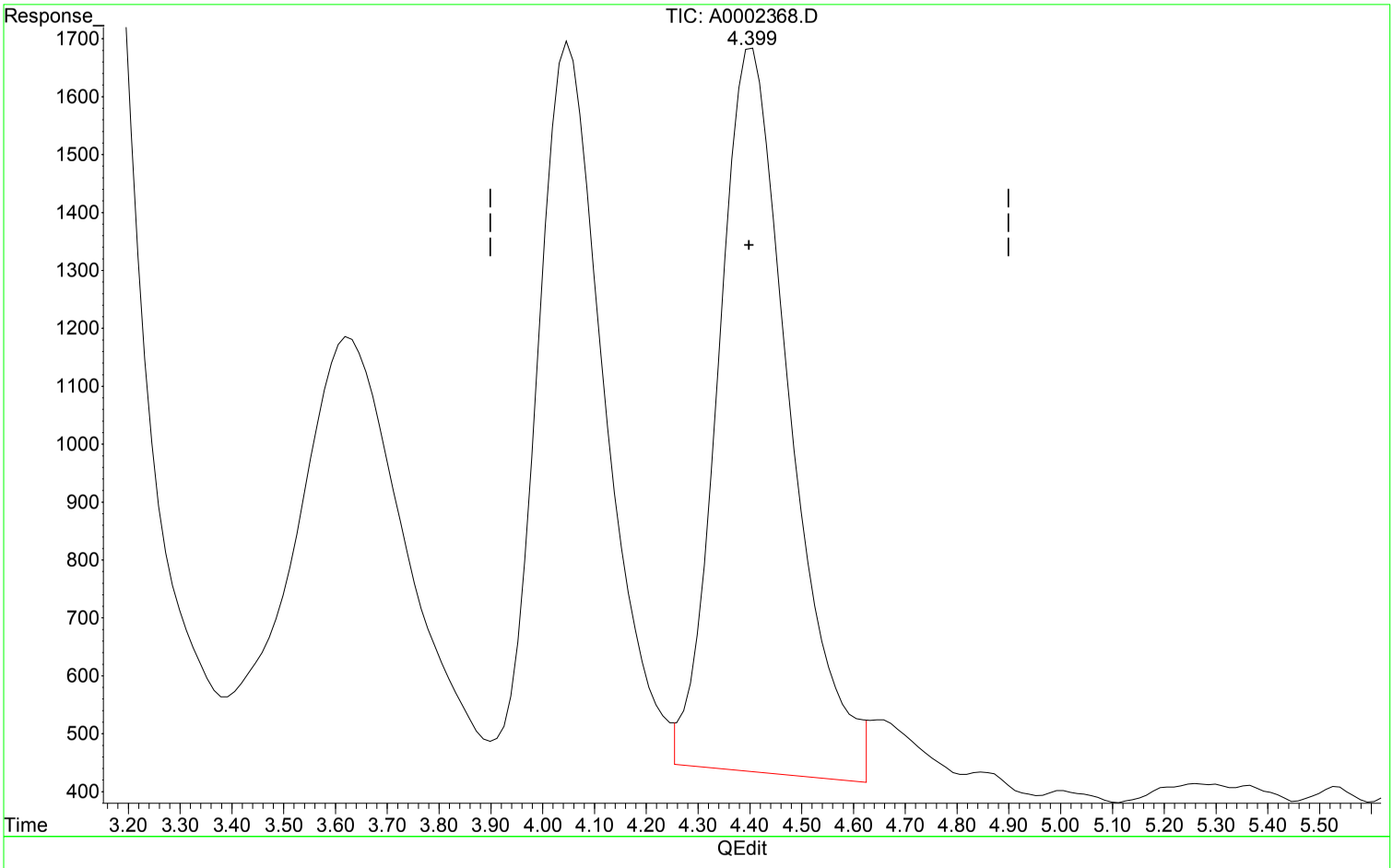
00944343

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002368.D
Signal(s) : dad1A.ch
Acq On : 30-Dec-2000, 16:48:22
Operator : b.allgeier
Sample : 0.2-2.0ppm
Misc :
ALS Vial : 3 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:49 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(4) Acetic Acid (T)

4.399min 2.050 ppm m

response 121343

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

MA100418.M Thu Oct 04 13:44:02 2018 Page: 1

00944344

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002367.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 12:01:56
Operator : b.allgeier
Sample : 0.1-1.0ppm
Misc :
ALS Vial : 2 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:47 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	3.133	101923	1.082	ppm	
2) T	Pyruvic acid	3.631	46367	0.103	ppm	
3) T	Lactic Acid	4.052	58945	1.114	ppm	
4) T	Acetic Acid	4.404	60257	1.018	ppm	
5) T	Propionic Acid	9.215	69400	1.177	ppm	m
6) T	Butyric Acid	24.964	74253	1.229	ppm	m

(f)=RT Delta > 1/2 Window (m)=manual int.

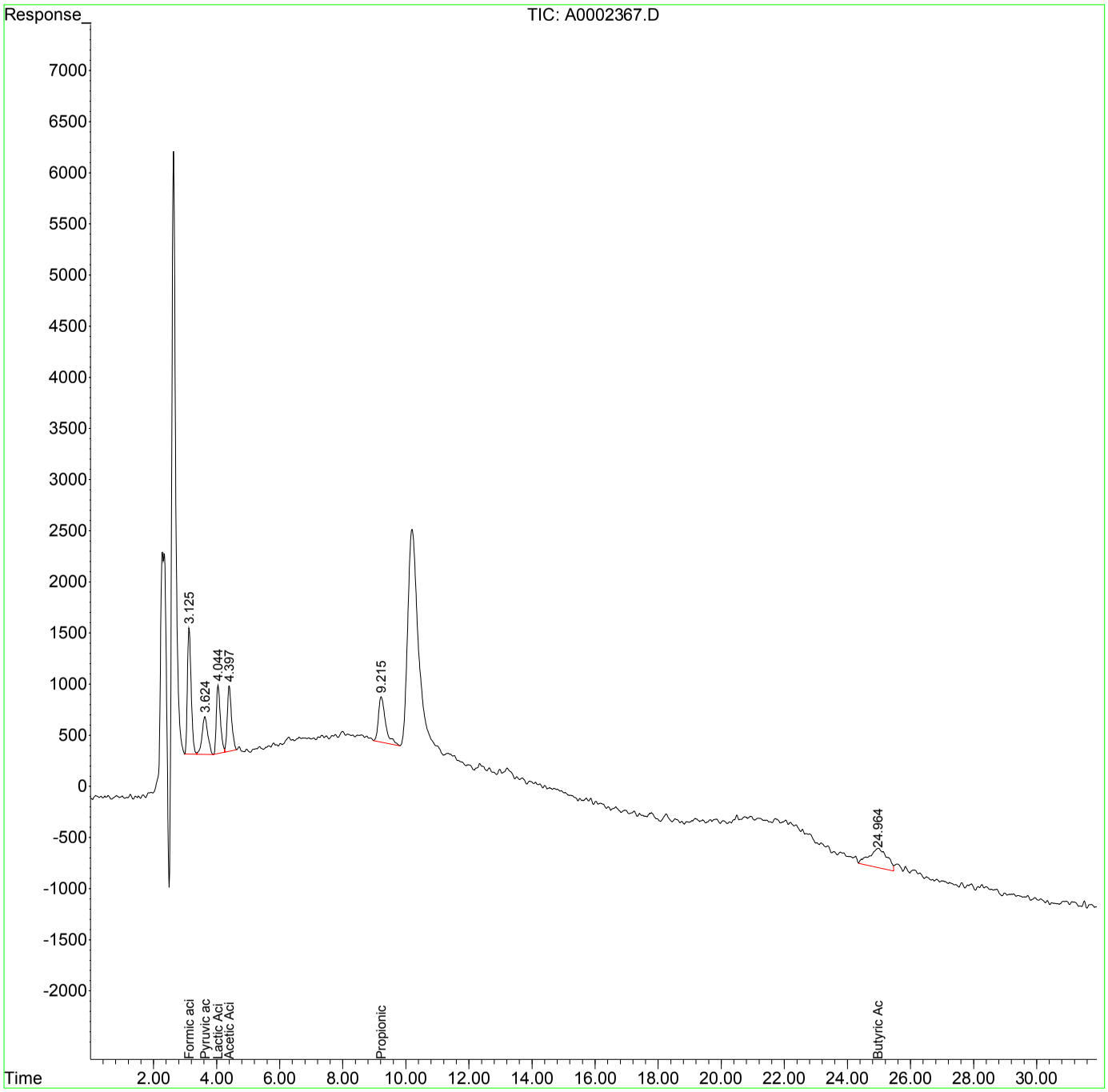
00944345

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002367.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 12:01:56
Operator : b.allgeier
Sample : 0.1-1.0ppm
Misc :
ALS Vial : 2 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:47 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



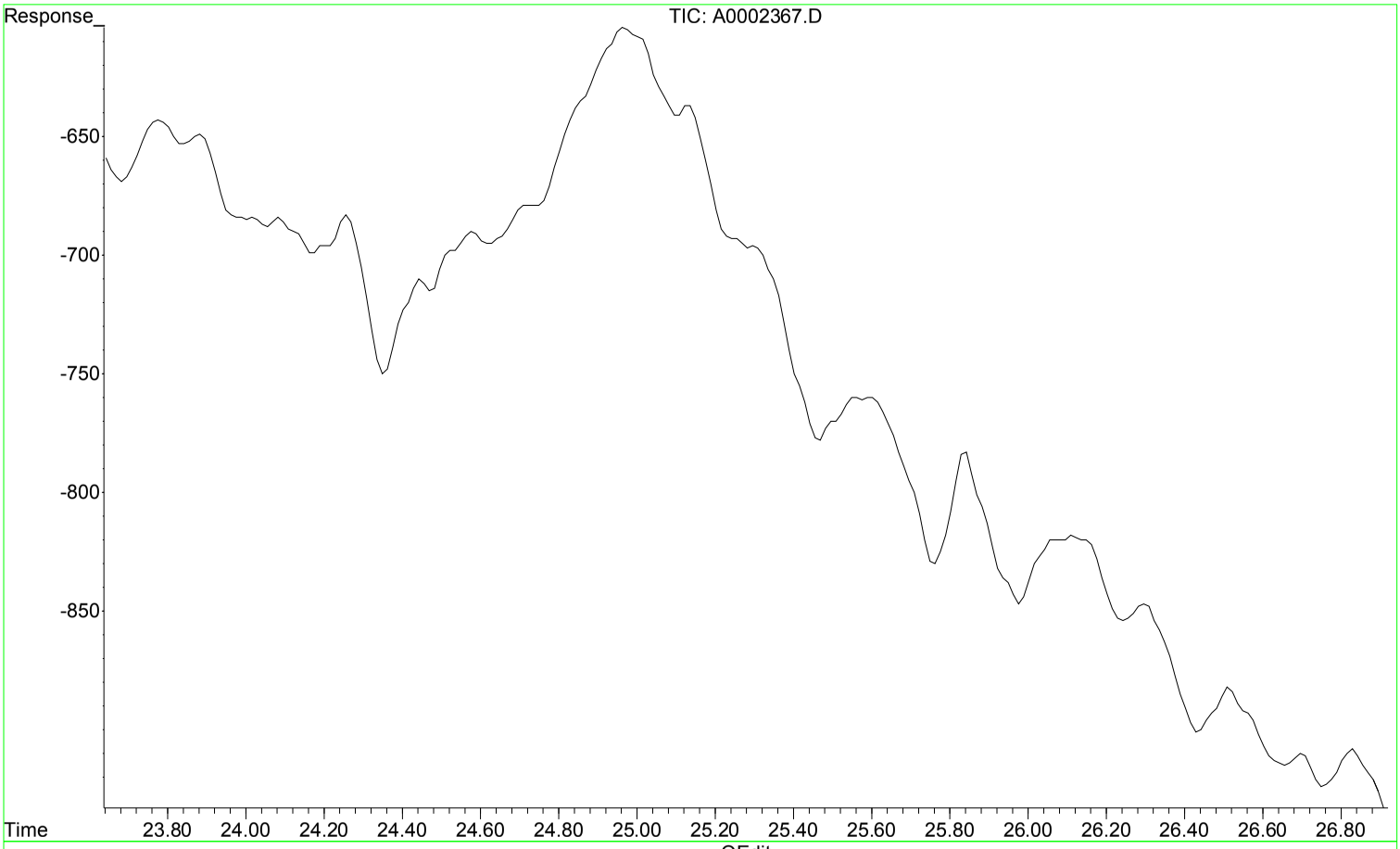
00944346

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002367.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 12:01:56
Operator : b.allgeier
Sample : 0.1-1.0ppm
Misc :
ALS Vial : 2 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:47 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(6) Butyric Acid (T)

24.887min 0.000 ppm

response 0

Manual Integration:

Before

10/04/18

(+) = Expected Retention Time

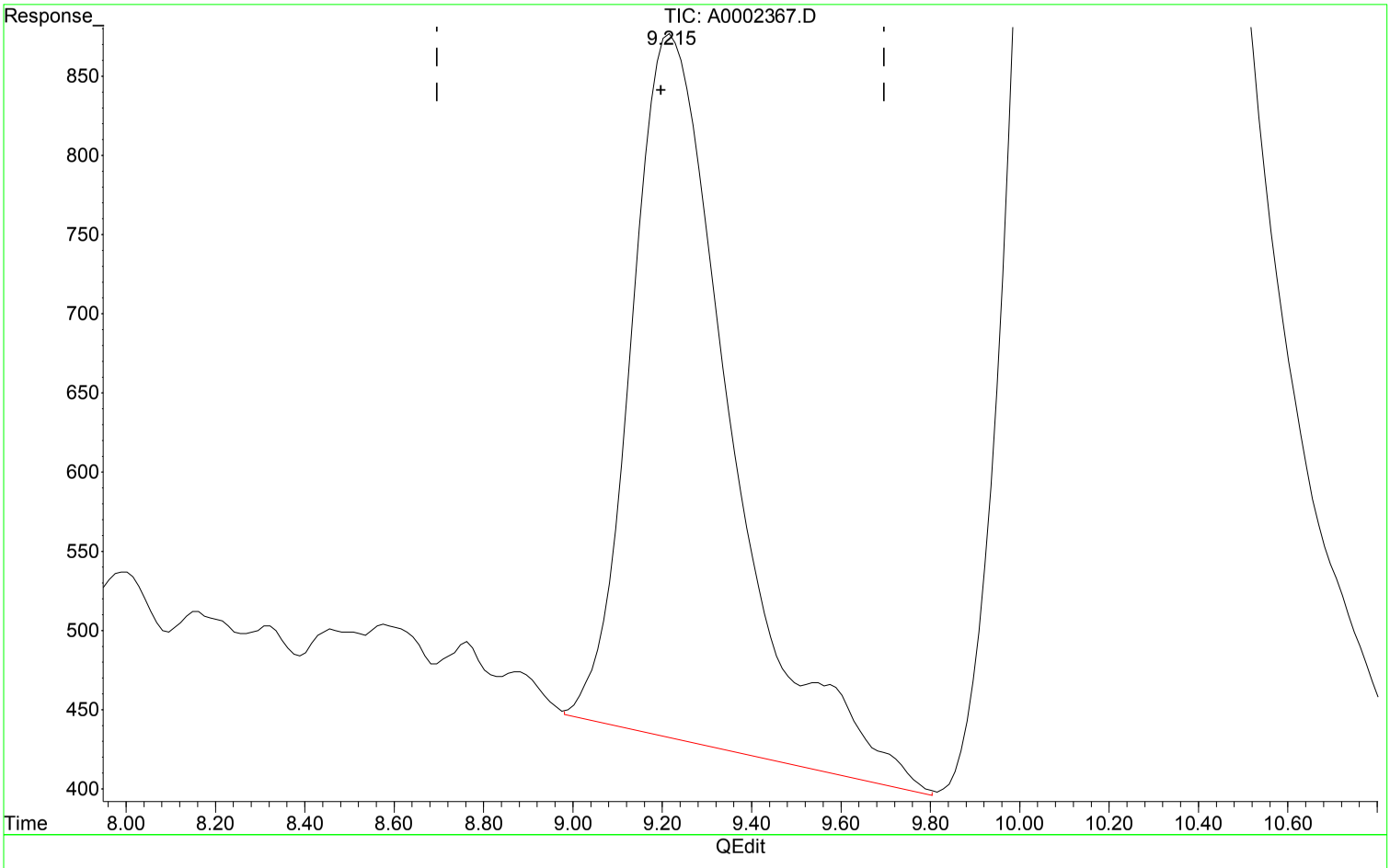
1st BA 10/05/18
2nd MP 10/09/18

Quantitation Report (Qedit)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002367.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 12:01:56
Operator : b.allgeier
Sample : 0.1-1.0ppm
Misc :
ALS Vial : 2 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 13:42:47 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 08:47:26 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



(5) Propionic Acid (T)

9.215min 1.177 ppm m

response 69400

Manual Integration:

After

Poor integration.

10/04/18

(+) = Expected Retention Time

00944348

1st BA 10/05/18
2nd MP 10/09/18

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002366.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 11:26:57
Operator : b.allgeier
Sample : inst blk
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:43:03 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210

	Compound	R.T.	Response	Conc	Units	
Target Compounds						
1) t	Formic acid	0.000	0	N.D.	ppm	
2) T	Pyruvic acid	3.655	25630	0.057	ppm	m
3) T	Lactic Acid	0.000	0	N.D.	ppm	
4) T	Acetic Acid	0.000	0	N.D.	ppm	
5) T	Propionic Acid	0.000	0	N.D.	ppm	
6) T	Butyric Acid	0.000	0	N.D.	ppm	

(f)=RT Delta > 1/2 Window (m)=manual int.

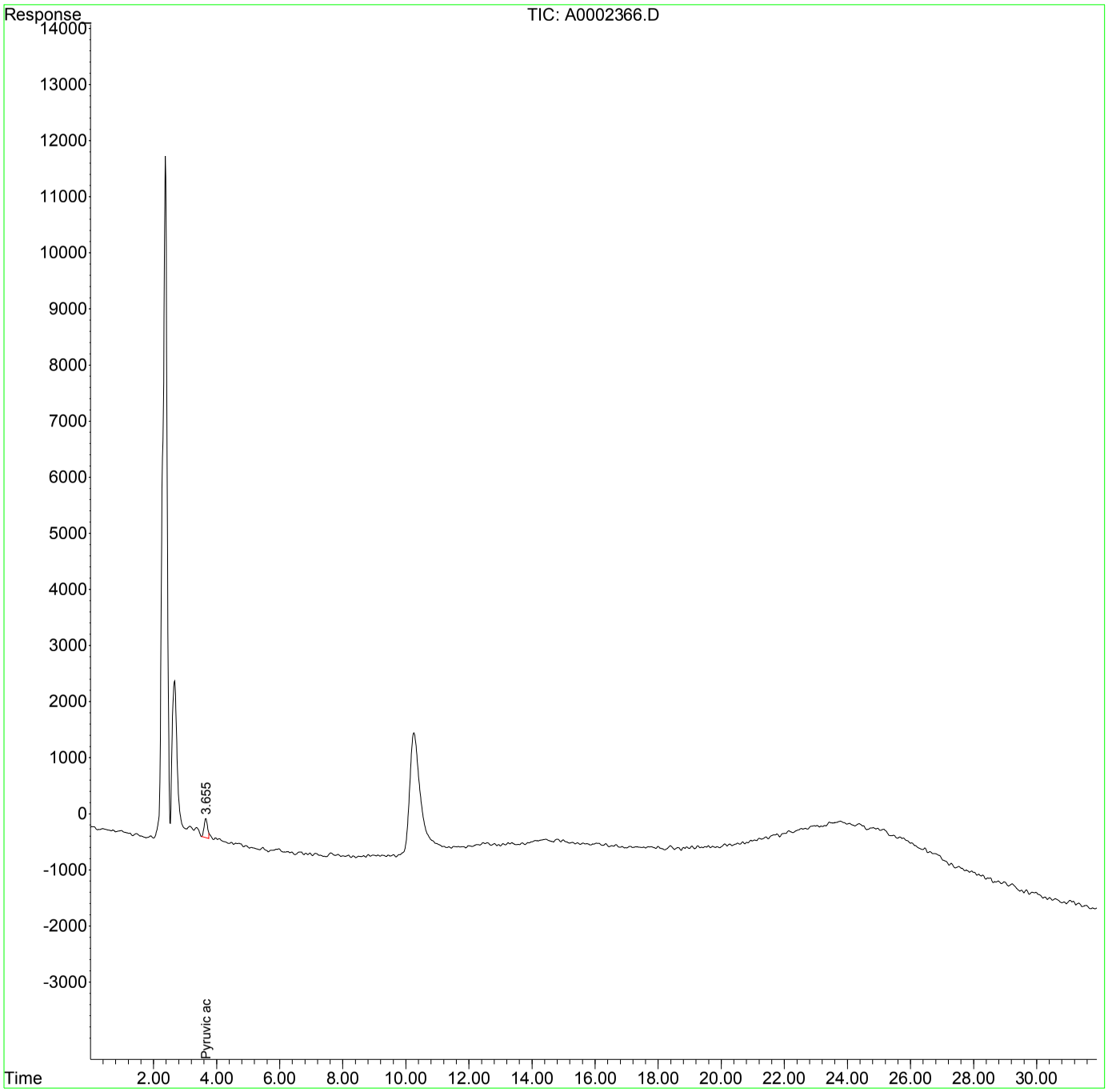
00944349

Quantitation Report (QT Reviewed)

Data Path : I:\ACQUDATA\hplc05\data\100418\
Data File : A0002366.D
Signal(s) : dad1A.ch
Acq On : 04-Oct-2018, 11:26:57
Operator : b.allgeier
Sample : inst blk
Misc :
ALS Vial : 1 Sample Multiplier: 1

Integration File: MA1.E
Quant Time: Oct 04 16:43:03 2018
Quant Method : I:\ACQUDATA\hplc05\Methods\MA100418.M
Quant Title : organic acids
QLast Update : Thu Oct 04 16:42:39 2018
Response via : Initial Calibration
Integrator: ChemStation

Volume Inj. : 50.0ul
Signal Phase : synergi hydro rp
Signal Info : UV wave 210



00944350

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58

Service Request: R1809393
Calibration Date: 10/4/2018

Initial Calibration Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Calibration ID: RC1800114
Instrument ID: R-HPLC-05

Signal ID: synergi hydro rp

#	Lab Code	Sample Name	File Location	Acquisition Date
01	RC1800114-01	0.1-1.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002367.D	10/04/2018 12:01
02	RC1800114-02	0.2-2.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002368.D	10/04/2018 12:32
03	RC1800114-03	0.5-5.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002369.D	10/04/2018 13:04
04	RC1800114-04	1.0-10.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002370.D	10/04/2018 13:36
05	RC1800114-05	2.0-20.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002371.D	10/04/2018 14:21
06	RC1800114-06	5.0-50.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002372.D	10/04/2018 14:56
07	RC1800114-07	10.0-100.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002373.D	10/04/2018 15:31
08	RC1800114-08	20.0-200.0ppm	I:\ACQUDATA\hplc05\data\100418\A0002374.D	10/04/2018 16:03

Analyte

Acetic Acid

#	Amount	RF	#	Amount	RF	#	Amount	RF	#	Amount	RF
01	1.000	6.026E4	02	2.000	6.067E4	03	5.000	6.189E4	04	10.000	5.859E4
05	20.000	5.483E4	06	50.000	6.053E4	07	100.000	5.725E4	08	200.000	5.933E4

Butanoic Acid (Butyric Acid)

#	Amount	RF	#	Amount	RF	#	Amount	RF	#	Amount	RF
01	1.000	7.425E4	02	2.000	7.193E4	03	5.000	6.215E4	04	10.000	6.021E4
05	20.000	6.035E4	06	50.000	5.865E4	07	100.000	5.511E4	08	200.000	6.053E4

Lactic Acid

#	Amount	RF	#	Amount	RF	#	Amount	RF	#	Amount	RF
01	1.000	5.895E4	02	2.000	5.416E4	03	5.000	5.388E4	04	10.000	5.286E4
05	20.000	5.017E4	06	50.000	5.423E4	07	100.000	5.216E4	08	200.000	5.371E4

Propionic Acid

#	Amount	RF	#	Amount	RF	#	Amount	RF	#	Amount	RF
01	1.000	6.94E4	02	2.000	5.909E4	03	5.000	6.128E4	04	10.000	5.86E4
05	20.000	5.703E4	06	50.000	5.9E4	07	100.000	5.508E4	08	200.000	5.726E4

Pyruvic Acid

#	Amount	RF	#	Amount	RF	#	Amount	RF	#	Amount	RF
01	0.100	4.637E5	02	0.200	4.71E5	03	0.500	4.552E5	04	1.000	4.481E5
05	2.000	4.25E5	06	5.000	4.588E5	07	10.000	4.43E5	08	20.000	4.585E5

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58

Service Request: R1809393
Calibration Date: 10/4/2018

Initial Calibration Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Calibration ID: RC1800114
Instrument ID: R-HPLC-05

Signal ID: synergi hydro rp

		Calibration Evaluation				Calibration Evaluation	
Analyte Name	Compound Type	Fit Type	Eval	Eval Result	Control Criteria	Average RRF	Minimum RRF
Acetic Acid	TRG	Average RF	% RSD	3.8	≤	5.917E4	
Butanoic Acid (Butyric Acid)	TRG	Average RF	% RSD	10.6	≤	6.29E4	
Lactic Acid	TRG	Average RF	% RSD	4.6	≤	5.376E4	
Propionic Acid	TRG	Average RF	% RSD	7.3	≤	5.959E4	
Pyruvic Acid	TRG	Average RF	% RSD	3.1	≤	4.529E5	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58

Service Request: R1809393
Calibration Date: 10/4/2018

Initial Calibration Verification Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Calibration ID: RC1800114
Instrument ID: R-HPLC-05

Signal ID: synergi hydro rp

#	Lab Code	Sample Name	File Location	Acquisition Date
09	RC1800114-09	icv	I:\ACQUDATA\hplc05\data\100418\A0002375.D	10/04/2018 16:35

Analyte Name	Expected	Result	Average RF	SSV RF	Rec.	Criteria	Curve Fit
Pyruvic Acid	2.00	3.00	4.529E5	6.787E5	150*	85-115	Average RF
Acetic Acid	20.0	20.6	5.917E4	6.092E4	103	85-115	Average RF
Butanoic Acid (Butyric Acid)	20.0	18.1	6.29E4	5.694E4	90.5	85-115	Average RF
Lactic Acid	20.0	20.2	5.376E4	5.434E4	101	85-115	Average RF
Propionic Acid	20.0	19.2	5.959E4	5.733E4	96.0	85-115	Average RF

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58

Service Request: R1809393
Date Analyzed: 10/04/18 17:16

Continuing Calibration Verification (CCV) Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids
File ID: I:\ACQUDATA\hplc05\data\100418\A0002376.D\
Signal ID: synergi hydro rp

Calibration Date: 10/4/2018
Calibration ID: RC1800114
Analysis Lot: 609639
Units: mg/L

Analyte Name	Expected	Result	Average RF	CCV RF	% D	% Drift	Criteria	Curve Fit
Pyruvic Acid	5.03	5.11	4.529E5	4.608E5	1.7	NA	±15	Average RF
Acetic Acid	50.1	51.7	5.917E4	6.1E4	3.1	NA	±15	Average RF
Butanoic Acid (Butyric Acid)	50.8	45.9	6.29E4	5.677E4	-9.7	NA	±15	Average RF
Lactic Acid	49.8	51.2	5.376E4	5.528E4	2.8	NA	±15	Average RF
Propionic Acid	50.3	49.3	5.959E4	5.839E4	-2.0	NA	±15	Average RF

ALS Group USA, Corp.
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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58

Service Request: R1809393
Date Analyzed: 10/04/18 23:40

Continuing Calibration Verification (CCV) Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids
File ID: I:\ACQUDATA\hplc05\data\100418\A0002387.D\
Signal ID: synergi hydro rp

Calibration Date: 10/4/2018
Calibration ID: RC1800114
Analysis Lot: 609639
Units: mg/L

Analyte Name	Expected	Result	Average RF	CCV RF	% D	% Drift	Criteria	Curve Fit
Pyruvic Acid	5.03	5.08	4.529E5	4.579E5	1.1	NA	±15	Average RF
Acetic Acid	50.1	52.3	5.917E4	6.17E4	4.3	NA	±15	Average RF
Butanoic Acid (Butyric Acid)	50.8	46.7	6.29E4	5.78E4	-8.1	NA	±15	Average RF
Lactic Acid	49.8	51.3	5.376E4	5.543E4	3.1	NA	±15	Average RF
Propionic Acid	50.3	49.3	5.959E4	5.838E4	-2.0	NA	±15	Average RF

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58

Service Request: R1809393
Date Analyzed: 10/05/18 01:25

Continuing Calibration Verification (CCV) Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids
File ID: I:\ACQUDATA\hplc05\data\100418\A0002390.D\
Signal ID: synergi hydro rp

Calibration Date: 10/4/2018
Calibration ID: RC1800114
Analysis Lot: 609639
Units: mg/L

Analyte Name	Expected	Result	Average RF	CCV RF	% D	% Drift	Criteria	Curve Fit
Pyruvic Acid	5.03	4.66	4.529E5	4.201E5	-7.2	NA	±15	Average RF
Acetic Acid	50.1	49.8	5.917E4	5.88E4	-0.6	NA	±15	Average RF
Butanoic Acid (Butyric Acid)	50.8	46.0	6.29E4	5.689E4	-9.6	NA	±15	Average RF
Lactic Acid	49.8	49.3	5.376E4	5.327E4	-0.9	NA	±15	Average RF
Propionic Acid	50.3	49.2	5.959E4	5.823E4	-2.3	NA	±15	Average RF

ALS Group USA, Corp.
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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58

Service Request: R1809393
Date Analyzed: 10/05/18 10:29

Continuing Calibration Verification (CCV) Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids
File ID: I:\ACQUDATA\hplc05\data\100518\A0002392.D\
Signal ID: synergi hydro rp

Calibration Date: 10/4/2018
Calibration ID: RC1800114
Analysis Lot: 609806
Units: mg/L

Analyte Name	Expected	Result	Average RF	CCV RF	% D	% Drift	Criteria	Curve Fit
Pyruvic Acid	5.03	5.01	4.529E5	4.514E5	-0.3	NA	±15	Average RF
Acetic Acid	50.1	51.2	5.917E4	6.044E4	2.2	NA	±15	Average RF
Butanoic Acid (Butyric Acid)	50.8	46.7	6.29E4	5.78E4	-8.1	NA	±15	Average RF
Lactic Acid	49.8	50.2	5.376E4	5.429E4	1.0	NA	±15	Average RF
Propionic Acid	50.3	48.8	5.959E4	5.778E4	-3.0	NA	±15	Average RF

ALS Group USA, Corp.
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QA/QC Report

Client: ALS Environmental - US
Project: LHAAP / Site 58

Service Request: R1809393
Date Analyzed: 10/05/18 15:09

Continuing Calibration Verification (CCV) Summary
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids
File ID: I:\ACQUDATA\hplc05\data\100518\A0002400.D\
Signal ID: synergi hydro rp

Calibration Date: 10/4/2018
Calibration ID: RC1800114
Analysis Lot: 609806
Units: mg/L

Analyte Name	Expected	Result	Average RF	CCV RF	% D	% Drift	Criteria	Curve Fit
Pyruvic Acid	5.03	5.04	4.529E5	4.543E5	0.3	NA	±15	Average RF
Acetic Acid	50.1	50.8	5.917E4	6.004E4	1.5	NA	±15	Average RF
Butanoic Acid (Butyric Acid)	50.8	46.5	6.29E4	5.757E4	-8.5	NA	±15	Average RF
Lactic Acid	49.8	50.5	5.376E4	5.46E4	1.6	NA	±15	Average RF
Propionic Acid	50.3	48.1	5.959E4	5.691E4	-4.5	NA	±15	Average RF

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QA/QC Report

Client: ALS Environmental - US **Service Request:**R1809393
Project: LHAAP / Site 58

Analysis Run Log
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: **Analysis Lot:**609639
Instrument ID:R-HPLC-05

Raw Data File	Sample Name	Lab Code	Date Analyzed	Time Analyzed	Q
I:\ACQUDATA\hplc05\data\100418\A0002385.D\	ZZZZZZZ	ZZZZZZZ	12/29/2000	23:10:21	
I:\ACQUDATA\hplc05\data\100418\A0002379.D\	Duplicate Lab Control Sample	RQ1810603-06	12/29/2000	23:47:53	
I:\ACQUDATA\hplc05\data\100418\A0002384.D\	ZZZZZZZ	ZZZZZZZ	12/30/2000	16:48:23	
I:\ACQUDATA\hplc05\data\100418\A0002376.D\	Continuing Calibration Verification	RQ1810603-01	10/4/2018	17:16:44	
I:\ACQUDATA\hplc05\data\100418\A0002377.D\	Method Blank	RQ1810603-04	10/4/2018	17:51:39	
I:\ACQUDATA\hplc05\data\100418\A0002378.D\	Lab Control Sample	RQ1810603-05	10/4/2018	18:26:33	
I:\ACQUDATA\hplc05\data\100418\A0002379.D\	Duplicate Lab Control Sample	RQ1810603-06	10/4/2018	19:00:00	
I:\ACQUDATA\hplc05\data\100418\A0002383.D\	ZZZZZZZ	ZZZZZZZ	10/4/2018	21:21:05	
I:\ACQUDATA\hplc05\data\100418\A0002384.D\	ZZZZZZZ	ZZZZZZZ	10/4/2018	21:53:00	
I:\ACQUDATA\hplc05\data\100418\A0002385.D\	ZZZZZZZ	ZZZZZZZ	10/4/2018	22:25:00	
I:\ACQUDATA\hplc05\data\100418\A0002386.D\	35AWW24_092718	R1809393-001	10/4/2018	23:05:51	
I:\ACQUDATA\hplc05\data\100418\A0002387.D\	Continuing Calibration Verification	RQ1810603-02	10/4/2018	23:40:52	
I:\ACQUDATA\hplc05\data\100418\A0002388.D\	35AWW19_092718	R1809393-002	10/5/2018	00:15:52	
I:\ACQUDATA\hplc05\data\100418\A0002390.D\	Continuing Calibration Verification	RQ1810603-03	10/5/2018	01:25:46	

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QA/QC Report

Client: ALS Environmental - US **Service Request:**R1809393
Project: LHAAP / Site 58

Analysis Run Log
Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids **Analysis Lot:**609806
Instrument ID:R-HPLC-05

Raw Data File	Sample Name	Lab Code	Date Analyzed	Time Analyzed	Q
I:\ACQUDATA\hplc05\data\100518 \A0002395.D\	Duplicate Lab Control Sample	RQ1810656-05	12/29/2000	23:18:07	
I:\ACQUDATA\hplc05\data\100518 \A0002399.D\	35AWW11_092718	R1809393-003	12/31/2000	02:47:48	
I:\ACQUDATA\hplc05\data\100518 \A0002392.D\	Continuing Calibration Verification	RQ1810656-01	10/5/2018	10:29:40	
I:\ACQUDATA\hplc05\data\100518 \A0002393.D\	Method Blank	RQ1810656-03	10/5/2018	11:04:39	
I:\ACQUDATA\hplc05\data\100518 \A0002394.D\	Lab Control Sample	RQ1810656-04	10/5/2018	11:39:38	
I:\ACQUDATA\hplc05\data\100518 \A0002395.D\	Duplicate Lab Control Sample	RQ1810656-05	10/5/2018	12:02:00	
I:\ACQUDATA\hplc05\data\100518 \A0002396.D\	ZZZZZZZ	ZZZZZZZ	10/5/2018	12:49:31	
I:\ACQUDATA\hplc05\data\100518 \A0002397.D\	ZZZZZZZ	ZZZZZZZ	10/5/2018	13:24:22	
I:\ACQUDATA\hplc05\data\100518 \A0002398.D\	ZZZZZZZ	ZZZZZZZ	10/5/2018	13:59:20	
I:\ACQUDATA\hplc05\data\100518 \A0002399.D\	35AWW11_092718	R1809393-003	10/5/2018	14:30:00	
I:\ACQUDATA\hplc05\data\100518 \A0002400.D\	Continuing Calibration Verification	RQ1810656-02	10/5/2018	15:09:20	

Analysis: 10/4/18 Analyst: BA Run Method: NEWMETA (BA)

Date: Organic Acids Instr. _HPLC-05_____ Quant Method: ~~MA0926.18~~ MA100418

LIMS Run#: 609639

Setup: Column: Synergi Hydro RP 150x46 Col.Temp: 35 Flow: 0.6 ml/min

Mobile Phase: 0.2 KH2 prep 0.1 PO4 ul Inj.: 50

Pos.	Sample	Diln.	Stds. ID	File#	OK?	Comments
	BLK			A0009365	—	
	INST BLK			66	Y	
	0.1-1.0 PPM	200 / 1 ml	193753	67	Y	
	0.2-2.0	400 /		68	Y	
	0.5-5.0	1000 /		69	Y	
	1.0-10.0	2000 /		70	Y	
	2.0-20.0	4000 /		71	Y	
	5.0-50.0	10000 /		72	Y	
	10.0-100.0	20000 /		73	Y	
	20.0-200.0	40000 /		74	Y	
	ICV	10000 /	193754	75	Y	Pyruvic out
	CCV	1000 / 1 ml	193753	76	YC	
	MET BLK			77	Y	
	LCS	1000 / 1 ml	193754	78	Y	Pyruvic out
	LCSD	"	"	79	Y	"
	R1809340-001			80	(N)	RPT 1/10
	-001	MS 1000 / 1 ml	193754	81		
	-001	MSD "	"	82	"	"
	-002			83	Y	
	-003			84	Y	
	-004			85	Y	
	R1809343-001			86	Y	
	CCV	1000 / 1 ml	193754	87	YC	
	-002			88	Y	
	-003			89	(N)	RPT 1/10
	CCV	1000 / 1 ml	193754	90	YC	

BJA 10/4/18

All samples = _____mL + _____uL Combined IS/Surr.;

Primary :_____ exp: Secondary :_____ exp:

Primary:_____ exp: Secondary :_____ exp:

Runlog HPLC05r1
1/10/13

O-979 Page 82

Analysis: 10/5/18 Analyst: BA Run Method: NEWMETA
Date: Organic Acids Instr. HPLC-05 Quant Method: MA100418
LIMS Run#: 609806
Setup: Column: Synergi Hydro RP 150x4.6 Col.Temp: 35 Flow: 0.6 ml/min
Mobile Phase: 0.02 KH2PO4 prep 0.1 H3PO4 ul Inj.: 50

Pos.	Sample	Diln.	Stds. ID	File#	OK?	Comments
	BLK			A0002391	—	
	CCV	1000 ppm	193753	92	YC	
	MET BLK			93	Y	
	LCS	1000 ppm	193754	94	Y	PYRUVIC ↓
	DLCS	↓	↓	95	Y	↓
	R1809340-001	10.0		96	Y	
	-001	10.0mg	1000 ppm 193754	97	Y	
	-001	10.0mg50	↓ ↓	98	Y	
	R1809393-003			99	Y	
	CCV	1000 ppm	193753	2400	YC	

BD 10/5/18

All samples = _____mL + _____uL Combined IS/Surr.;

Primary :_____ exp: Secondary :_____ exp:
Primary:_____ exp: Secondary :_____ exp:

General Chemistry

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

ALS Group USA, Corp.
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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	09/27/18 09:30
Sample Matrix:	Water	**Date Received:**	09/28/18 09:00
Sample Name:	35AWW24_092718	**Basis:**	NA
Lab Code:	R1809393-001		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**0.31**	mg/L	0.10	0.08	0.03	1	09/28/18 16:10	*

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	09/27/18 10:35
Sample Matrix:	Water	**Date Received:**	09/28/18 09:00
Sample Name:	35AWW19_092718	**Basis:**	NA
Lab Code:	R1809393-002		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**3.99**	mg/L	0.50	0.40	0.11	5	09/28/18 16:10	*

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1809393
Project:	LHAAP / Site 58	**Date Collected:**	09/27/18 11:50
Sample Matrix:	Water	**Date Received:**	09/28/18 09:00
Sample Name:	35AWW11_092718	**Basis:**	NA
Lab Code:	R1809393-003		

Inorganic Parameters

Analyte Name	Analysis Method	Result	Units	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Iron, Divalent (Ferrous Iron)	SM 3500-Fe B.4.c	**36.5**	mg/L	5.0	4.0	1.1	50	09/28/18 16:10	*

Analytical Results Summary

Instrument Name: R-UV-VIS-05 **Analyst:** MROGERSON **Analysis Lot:** 609190 **Method/Testcode:** SM 3500-Fe B.4.c/Ferrous DOD

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
RQ1810496-01	Iron, Divalent (Ferrous Iron)	CCV		Water	2.00 mg/L	5 mL	2.00 mg/L	1					9/28/18 16:10	N	IV
RQ1810496-02	Iron, Divalent (Ferrous Iron)	CCB		Water	0.00 mg/L	5 mL	0.10 mg/L U	1	0.03	0.10			9/28/18 16:10	N	IV
RQ1810496-03	Iron, Divalent (Ferrous Iron)	LCS		Water	0.39 mg/L	5 mL	0.389 mg/L	1	0.03	0.10	97		9/28/18 16:10	N	IV
RQ1810496-04	Iron, Divalent (Ferrous Iron)	MB		Water	0.00 mg/L	5 mL	0.10 mg/L U	1	0.08	0.10			9/28/18 16:10:00	N	IV
R1809393-001	Iron, Divalent (Ferrous Iron)	N/A		Water	0.31 mg/L	5 mL	0.31 mg/L	1	0.03	0.10			9/28/18 16:10	N	IV
RQ1810496-07	Iron, Divalent (Ferrous Iron)	MS	R1809393-001	Water	0.81 mg/L	5 mL	0.81 mg/L	1	0.03	0.10	124		9/28/18 16:10	N	IV
RQ1810496-08	Iron, Divalent (Ferrous Iron)	DMS	R1809393-001	Water	0.81 mg/L	5 mL	0.81 mg/L	1	0.03	0.10	124	<1	9/28/18 16:10	N	IV
R1809393-002	Iron, Divalent (Ferrous Iron)	N/A		Water	3.99 mg/L	5 mL	3.99 mg/L	5	0.11	0.50			9/28/18 16:10	N	IV
R1809393-003	Iron, Divalent (Ferrous Iron)	N/A		Water	36.49 mg/L	5 mL	36.5 mg/L	50	1.1	5.0			9/28/18 16:10	N	IV
R1809387-001	Iron, Divalent (Ferrous Iron)	N/A		Water	0.08 mg/L	5 mL	0.08 mg/L J	1	0.03	0.10			9/28/18 16:10	N	II
R1809387-004	Iron, Divalent (Ferrous Iron)	N/A		Water	23.47 mg/L	5 mL	23.5 mg/L	10	0.3	1.0			9/28/18 16:10	N	II
RQ1810496-06	Iron, Divalent (Ferrous Iron)	CCV		Water	2.00 mg/L	5 mL	2.00 mg/L	1					9/28/18 16:10	N	II
RQ1810496-05	Iron, Divalent (Ferrous Iron)	CCB		Water	0.00 mg/L	5 mL	0.10 mg/L U	1	0.03	0.10			9/28/18 16:10	N	II

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

Sample Dilutions

Analyst: MMR
Instrument: UV-05

Date 9/28/18
Analysis Fe^{2+}

Sample ID	Matrix of Diluent	1st Dilution			2nd Dilution			3rd Dilution			4th Dilution			5th Dilution		
		mL's of Sample	mL's of Diluent	Dilution Factor	mL's of Sample	mL's of Diluent	Dilution Factor	mL's of Sample	mL's of Diluent	Dilution Factor	mL's of Sample	mL's of Diluent	Dilution Factor	mL's of Sample	mL's of Diluent	Dilution Factor
R1809393-002	DI	2	8	1/5												
R1809393003	↓	2	8	1/5	1	9	1/50									
R1809387-004	↓	1	9	1/10												

MMR 10/2/18

Pippetor Calibration

ALS Environmental

Frequency:

Pipettes: 3 trials for both bias and precision DOD Projects - Daily before use at each volume of use, or if more than 3 volumes of use, a high, medium, and low. Non-DOD: Monthly at high, medium, and low.	**Calculations:** %Recovery = Mean/Nominal Volume*100 %RSD = Stdev/Volume*100
Repeaters, Dispensers, and Repipettors: 3 trials for both bias and precision If used for dilutions - Daily before use and each time the volume is changed. If not used for dilutions - monthly	**Limits:** % Rec: 98-102 for Pipettes and others for dilutions % Recovery: 90-110 (Repeaters, Dispensers, Repipettors not for dilutions) %RSD: ≤1 (Pipets); ≤3 (Repeaters, Dispensers, and Repipettors)

Use a balance and DI for all except Dispensers and Repipettors which contain reagents. For these, dispense into a To Contain Class A grad cylinder and document the Max Volume of the cylinder instead of the Balance ID. Record to 1/10 the graduation of the cylinder.

Date	Init.	Equipment ID	Volume (mL)	Trial #1 (g/mL)	Trial #2 (g/mL)	Trial #3 (g/mL)	Bias %Recovery	Pass/ Fail	Precision %RSD	Pass/ Fail	Recal? Y/N	Balance ID or Class A (TC)	Comments/ Corrective Action
9/26/18	GN	DAISY	0.0060	0.0602	0.0601	0.0602	100.2778	P	0.09625	P	N	R-10 ~~DOP~~	DOD
		THOR	0.3600	0.3608	0.3605	0.3606	100.1759	P	0.0424	P	N	GN	
		↓	0.2400	0.2403	0.2405	0.2407	100.2917	P	0.0833	P	N	9/26/18	
		↓	0.7500	0.7503	0.7505	0.7504	100.0533	P	0.0133	P	N		
		Frauly	1.5000	1.5003	1.5007	1.5006	100.0356	P	0.0133	P	N		
↓	↓	Nessy	6.0000	6.0015	6.0010	6.0011	100.0172	P	0.0096	P	N	↓	↓
9/28/18	MAR	Hawk	5.000	5.0220	5.0131	5.0078	100.286	P	0.143	P	N	R-10	DOD
↓	↓	Thor	1.000	1.0053	1.0021	1.0020	100.31	P	0.188	P	N	↓	Monthly / DOD
		↓	0.5000	0.5007	0.5004	0.5005	100.10	P	0.031	P	N		↓
↓	↓	↓	0.2000	0.1978	0.1980	0.1980	98.97	P	0.058	P	N	↓	

MAR 10/2/18

ALS ENVIRONMENTAL

Analyte: Ferrous Iron By Standard Methods Analyst: MAR Date: 9/28/18

Method: 3500-Fe,D Pipette: THOR Time: 16:10

Instrument: UV-1600PC (R-UV-VIS-05) DOD Pipet Check: WC178 P. 47 Balance: NA

Calibration:

Std	Conc.	Absorb.	Result	% Rec
1	0.00	0.000	-0.001	
2	0.10	0.010	0.097	96.6%
3	0.20	0.021	0.204	101.9%
4	0.30	0.031	0.301	100.4%
5	0.40	0.041	0.399	99.7%
6	0.80	0.081	0.788	98.5%
7	1.00	0.103	1.003	100.3%
8	2.00	0.207	2.016	100.8%
9	3.00	0.308	3.000	100.0%
10	4.00	0.410	3.994	99.8%

Curve Date: 7/16/2018
C.C = 0.999986
y-int. = 0.000084
Slope: 0.102641
Wavelength: 510nm

	Misc.	Order #	Absorb.	Color Blk, if nec.	Abs. Difference Sample - Color	mg/L	Dilution	Final Result (mg/L)/(mg/Kg)	Check if Soil
1	TV=2.0	ICV	0.202		0.202	1.9672	1.0	1.967	
2		ICB	0.000		0.000	-0.0008	1.0	-0.001	
3	TV=0.4	LCS	0.038		0.038	0.3694	1.0	0.369	
4		CCV	0.205		0.205	1.9964	1.0	1.996	
5		CCB	0.000		0.000	-0.0008	1.0	-0.001	
6		LCS	0.040		0.040	0.3889	1.0	0.389	
7		R1809393-001	0.032	0.005	0.032	0.3110	1.0	0.311	
8		R1809393-001 MS	0.083	0.005	0.083	0.8078	1.0	0.808	
9		R1809393-001 DMS	0.083	0.005	0.083	0.8078	1.0	0.808	
10		R1809393-002	0.082	0.001	0.082	0.7981	5.0	3.990	
11		R1809393-003	0.075	0.000	0.075	0.7299	50.0	36.494	
12		R1809387-001	0.008		0.008	0.0771	1.0	0.077	
13		R1809387-004	0.253	0.012	0.241	2.3472	10.0	23.472	
14		CCV	0.205		0.205	1.9964	1.0	1.996	
15		CCB	0.000		0.000	-0.0008	1.0	-0.001	

ALS Environmental
1565 Jefferson Rd., Rochester, NY 14623

General Chemistry Analytical Run Cover Sheet

Analyst: MAC Date: 8/28/18

Analysis: Ferrous Iron by Method 3500-Fe, D. Instrument: R-UV-VIS-05

Quality Control:

	Same as Log#, Date,	Stocks Prep. Log#, Date,	Stock Sol (mLs)	Stock Sol (mg/L)	Final Vol (mLs)	True Value (mg/L)
a) Standards Prep.:	WC126121A,11/25/13	WC149110A, 10/13/15				
b) ICV Preparation:	WC126121B,11/25/13	191837, 7/16/18	2.5	4.0	5	2.00
b2) CCV Preparation:	WC126121B, 11/25/14	191837, 7/16/18				
c) LCS Preparation:	WC126121C, 11/25/14	191836, 7/16/18	0.5	4.0	5	0.40
d) Matrix Spike Prep.:	WC126121C, 11/25/13	191836, 7/16/18	0.5	4.0	5	0.40

Instrument log filled in? (Y) (N)

Packages: Copy and attach Standards Preparation

Comments:

All standards, QC (CCV's, LCS's, Matrix Spikes) and samples are based on the Standard Methods 3500-Fe D. Phenanthroline Method being scaled down by a factor of 10. Hence, 1.0 mL of Ammonium acetate buffer and 2.0 mL of Phenanthroline solution are added to 5.0 mL of sample, standards, or QC and brought to 10.0 mL with DI water. True values are based on sample volumes of 5.0 mLs.

Color blank absorbance is not measured where the sample itself is clear or the sample absorbance is less than the PQL. Samples above the PQL do not have their color blank absorbance subtracted if it is less than the absorbance of the low standard (PQL).

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
T : +1 360 577 7222
F : +1 360 636 1068
www.alsglobal.com

October 10, 2018

Analytical Report for Service Request No: K1809491

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

RE: HS18091510

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory October 02, 2018
For your reference, these analyses have been assigned our service request number **K1809491.**

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

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
T : +1 360 577 7222
F : +1 360 636 1068
www.alsglobal.com

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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.

00944377

Case Narrative

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577- 7222 Fax (360)636-1 068
www.alsglobal.com

ALS Environmental

Client: ALS Environmental - US
Project: HS18091510
Sample Matrix: Ground Water

Service Request: K1809491
Date Received: 10/02/2018

CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier IV validation deliverables including summary forms and all of the associated raw data for each of the analyses. When appropriate to the method, method blank results have been reported with each analytical test.

Sample Receipt:

Three ground water samples were received for analysis at ALS Environmental on 10/02/2018. 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 Bowjay Date 10/10/2018

00944379

Chain of Custody

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577- 7222 Fax (360)636-1 068
www.alsglobal.com

K1809491

00944380

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: 9918

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:	HS18091510
TSR:	Danielle Winnings

	LAB SAMPLE ID	CLIENT SAMPLE ID	MATRIX	COLLECT DATE
	ANALYSIS REQUESTED			DUE DATE
1.	**HS18091510-01**	**35AWW24_092718**	**Groundwater**	**27 Sep 2018 09:30**
	TOC Analysis for DOD Level IV			08 Oct 2018
2.	**HS18091510-02**	**35AWW19_092718**	**Groundwater**	**27 Sep 2018 10:35**
	TOC Analysis for DOD Level IV			08 Oct 2018
3.	**HS18091510-03**	**35AWW11_092718**	**Groundwater**	**27 Sep 2018 11:50**
	TOC Analysis for DOD Level IV			08 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: 10/1/18 1800

Received By: _____ Date/Time: 10/2/18 0930

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

RIGHT SOLUTIONS | RIGHT PARTNER

00944381

PC KL

Cooler Receipt and Preservation Form

Client ALS Houston Service Request *K18* 09491

Received: 10/2/18 Opened: 10/2/18 By: CG Unloaded: 10/2/18 By: CG

1. Samples were received via? *USPS* (*FedEx*) *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
-1.1	-1.2	-0.3	-0.4	-0.1	352		4380 9533 0727	

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

00944382

General Chemistry

ALS Environmental—Kelso Laboratory
1317 South 13th Avenue, Kelso, WA 98626
Phone (360)577- 7222 Fax (360)636-1 068
www.alsglobal.com

ALS Group USA, Corp.
dba ALS Environmental

Analytical Report

Client:	ALS Environmental - US	**Service Request:**	K1809491
Project:	HS18091510	**Date Collected:**	09/27/18
Sample Matrix:	Ground Water	**Date Received:**	10/2/18
Analysis Method:	SM 5310 C	**Units:**	mg/L
Prep Method:	None	**Basis:**	NA

Carbon, Total Organic

Sample Name	Lab Code	Result	LOQ	LOD	Dil.	Date Analyzed	Q
HS18091510-01	K1809491-001	**0.87**	0.50	0.20	1	10/04/18 17:10	
HS18091510-02	K1809491-002	**2.21**	0.50	0.20	1	10/06/18 05:28	
HS18091510-03	K1809491-003	**1120**	25	10	50	10/06/18 06:32	
Method Blank	K1809491-MB1	ND U	0.50	0.20	1	10/04/18 20:55	
Method Blank	K1809491-MB2	ND U	0.50	0.20	1	10/05/18 15:51	
Method Blank	K1809491-MB3	ND U	0.50	0.20	1	10/06/18 01:28	

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1809491
Project	HS18091510	**Date Collected:**	09/27/18
Sample Matrix:	Ground Water	**Date Received:**	10/02/18
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	Sample Result	Duplicate Result	Average	RPD	RPD Limit	Date Analyzed
HS18091510-01	K1809491-001DUP	0.50	0.20	0.87	0.85	0.861	2	10	10/04/18
HS18091510-02	K1809491-002DUP2	0.50	0.20	2.21	2.14	2.18	3	10	10/06/18
HS18091510-03	K1809491-003DUP2	25	10	1120	1090	1110	3	10	10/06/18

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.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1809491
Project:	HS18091510	**Date Collected:**	09/27/18
Sample Matrix:	Ground Water	**Date Received:**	10/02/18
		Date Analyzed:	10/4/18
		Date Extracted:	NA

Matrix Spike Summary
Carbon, Total Organic

Sample Name:	HS18091510-01	**Units:**	mg/L
Lab Code:	K1809491-001	**Basis:**	NA
Analysis Method:	SM 5310 C		
Prep Method:	None		

Matrix Spike
K1809491-001MS

Analyte Name	Sample Result	Result	Spike Amount	% Rec	% Rec Limits
Carbon, Total Organic	0.87	26.4	25.0	102	83-117

Results flagged with an asterisk (*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1809491
Project:	HS18091510	**Date Analyzed:**	10/04/18
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:	609436

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1809491-LCS1	20.8	21.9	95	83-117

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client:	ALS Environmental - US	**Service Request:**	K1809491
Project:	HS18091510	**Date Analyzed:**	10/05/18
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:	609741

Sample Name	Lab Code	Result	Spike Amount	% Rec	% Rec Limits
Lab Control Sample	K1809491-LCS2	20.7	21.9	95	83-117
Lab Control Sample	K1809491-LCS3	20.2	21.9	92	83-117

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:** K1809491
Project: HS18091510

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	609436	KQ1814370-23	10/04/18 10:29	25.0	24.3	97	90-110
CCV2	609436	KQ1814370-24	10/04/18 15:17	25.0	24.7	99	90-110
CCV3	609436	KQ1814370-25	10/04/18 20:22	25.0	24.4	98	90-110
CCV4	609436	KQ1814370-26	10/05/18 00:38	25.0	24.6	98	90-110
CCV5	609436	KQ1814370-27	10/05/18 05:10	25.0	24.0	96	90-110
CCV6	609741	KQ1814385-27	10/05/18 15:18	25.0	24.6	98	90-110
CCV7	609741	KQ1814385-28	10/05/18 19:21	25.0	24.8	99	90-110
CCV8	609741	KQ1814385-29	10/06/18 00:55	25.0	24.5	98	90-110
CCV9	609741	KQ1814385-30	10/06/18 05:59	25.0	25.2	101	90-110
CCV10	609741	KQ1814385-31	10/06/18 11:04	25.0	24.7	99	90-110

ALS Group USA, Corp.
dba ALS Environmental

QA/QC Report

Client: ALS Environmental - US **Service Request:**K1809491
Project: HS18091510

Continuing Calibration Blank (CCB) Summary
Carbon, Total Organic

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

	Analysis Lot	Lab Code	Date Analyzed	LOQ	LOD	Result	Q
CCB1	609436	KQ1814370-28	10/04/18 10:45	0.50	0.20	ND	U
CCB2	609436	KQ1814370-29	10/04/18 15:34	0.50	0.20	ND	U
CCB3	609436	KQ1814370-30	10/04/18 20:38	0.50	0.20	ND	U
CCB4	609436	KQ1814370-31	10/05/18 00:55	0.50	0.20	ND	U
CCB5	609436	KQ1814370-32	10/05/18 05:26	0.50	0.20	ND	U
CCB6	609741	KQ1814385-32	10/05/18 15:35	0.50	0.20	ND	U
CCB7	609741	KQ1814385-33	10/05/18 19:37	0.50	0.20	ND	U
CCB8	609741	KQ1814385-34	10/06/18 01:12	0.50	0.20	ND	U
CCB9	609741	KQ1814385-35	10/06/18 06:16	0.50	0.20	ND	U
CCB10	609741	KQ1814385-36	10/06/18 11:20	0.50	0.20	ND	U

10515 Research Drive
Knoxville, TN 37932
Phone: (865) 573-8188
Fax: (865) 573-8133

Client: RJ Modashia
ALS Laboratory Group
10450 Stancliff Rd
Suite 210
Houston, TX 77040

Phone: 281-575-2279

Fax:

Identifier: 125PI **Date Rec:** 09/28/2018 **Report Date:** 10/03/2018

Client Project #: NW01312.0150 **Client Project Name:** LHAAP-58

Purchase Order #:

Analysis Requested: CENSUS

Reviewed By:



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MICROBIAL INSIGHTS, INC.

10515 Research Dr., Knoxville, TN 37932
Tel. (865) 573-8188 Fax. (865) 573-8133

CENSUS

Client: **ALS Laboratory Group**
Project: LHAAP-58

MI Project Number: **125PI**
Date Received: 09/28/2018

Sample Information

Client Sample ID:		**35AWW24_092718**	**35AWW19_092718**	**35AWW11_092718**
Sample Date:		09/27/2018	09/27/2018	09/27/2018
Units:		cells/mL	cells/mL	cells/mL
Analyst/Reviewer:		JS	JS	JS
Dechlorinating Bacteria				
Dehalococcoides	*DHC*	<5.00E-01	**8.00E-01**	**2.10E+00**
tceA Reductase	TCE	<5.00E-01	**1.00E-01 (J)**	<7.00E-01
BAV1 Vinyl Chloride Reductase	BVC	<5.00E-01	<5.00E-01	<7.00E-01
Vinyl Chloride Reductase	VCR	<5.00E-01	<5.00E-01	**1.10E+00**
Dehalobacter spp.	*DHBt*	**4.60E+00 (J)**	**1.48E+05**	**3.94E+05**

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

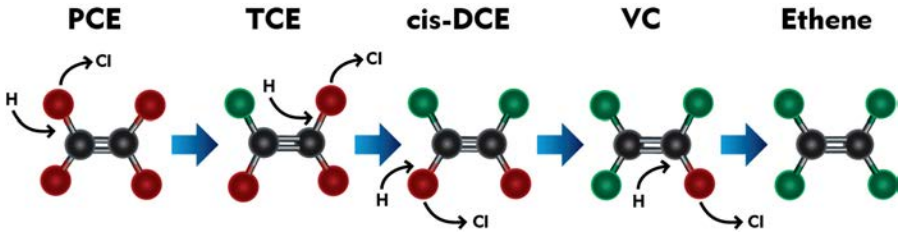
Samples Received **9/28/2018**

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
DHC	09/28/2018	10/03/2018	0 °C	101%	non-detect	non-detect
DHBt	09/28/2018	10/03/2018	0 °C	101%	non-detect	non-detect
BVC	09/28/2018	10/03/2018	0 °C	98%	non-detect	non-detect
TCE	09/28/2018	10/03/2018	0 °C	99%	non-detect	non-detect
VCR	09/28/2018	10/03/2018	0 °C	104%	non-detect	non-detect

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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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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Knoxville, TN 37932
Phone: 865.573.8188
Fax: 865.573.8133
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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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10515 Research Drive
Knoxville, TN 37932
Phone: 865.573.8188
Fax: 865.573.8133
www.microbe.com

00944398

REPORT TO:

Name: MARCIA OLIVE
Company: BHATE ENVIRONMENTAL
Address: 445 UNION BLVD. Suite 129
LAKE WOOD, CO. 80228
email: molive@bhate.com
Phone: (720) 463-3905
Fax:

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Address:
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microbialinsights
10515 Research Dr
Knoxville, TN 37932
865-573-8188
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Project Manager: Kim Nemmers
Project Name: LHAAP-58
Project No.: NW01312.0150

Purchase Order No.
Subcontract No.
MI Quote No.

Please Check One:
☐ More samples to follow
☒ No Additional Samples

Report Type: ☐ Standard (default) ☐ Microbial Insights Level III raw data(15% surcharge) ☐ Microbial Insights Level IV (25% surcharge) ☐ Comprehensive Interpretive(15%) ☐ Historical Interpretive (30%)

EDD type: ☐ Microbial Insights Standard (default) ☐ All other available EDDs (5% surcharge) Specify EDD Type:

Please contact us with any questions about the analyses or filling out the COC at (865) 573-8188 (9:00 am to 5:00 pm EST, M-F). After hours email: customerservice@microbe.com

Sample Information					Analyses					CENSUS: Please select the target organism/gene																							
MI ID (Laboratory Use Only)	Sample Name	Date Sampled	Time Sampled	Matrix	PLFA	DGGE+3ID	DGGE+5ID	QuantArray Chlor	QuantArray Petro	DHC (Dehalococcoides)	DHC Functional genes (bvc, tce, vcr)	DHBt (Dehalobacter)	DSM (Desulfuromonas)	DSB (Desulfitobacterium)	EBAC (Total)	SRB (Sulfate Reducing Bacteria-APS)	MGN (Methanogens)	MOB (Methanotrophs)	SMMO	DNF (Dentrifiers-nirS and nirK)	AOB (ammonia oxidizing bacteria)	PM1 (MTBE aerobic)	RMO (Toluene Monooxygenase)	RDEG (Toluene Monooxygenase)	PHE (Phenol Hydroxylase)	NAH (Napthalene-aerobic)	BSSA (Toluene/Xylene-Anaerobic)	add. qPCR:	add. qPCR:	RNA (Expression Option)*	Other:	Other:	Other:
125PI1	35AWW24_092718	9/27/18	0430								X	X																					
2	35AWW19_092718	9/27/18	1035								X	X																					
3	35AWW11_092718	9/27/18	1150								X	X																					

Relinquished by: Scott Beesley 9/27/18 1400
Received by: [signature] Date 9/28/18 10:44

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Failure to provide sufficient and/or correct information regarding reporting, invoicing & analyses requested information may result in delays for which MI will not be liable.

How to Retrieve and Use Estimated Percentile Ranks from the Microbial Insights Database

The MI Database

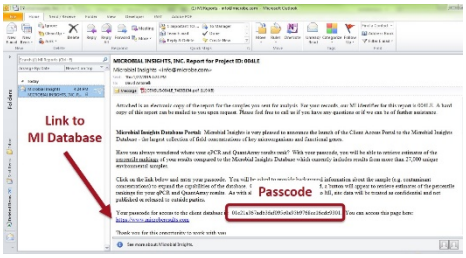
The Microbial Insights Database is the largest collection of field concentrations of key microorganisms and functional genes currently containing qPCR and QuantArray results for more than 40,000 unique groundwater, soil, and sediment samples from all 50 states and 33 countries worldwide.

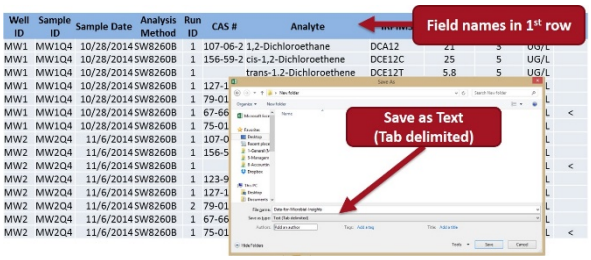
Is that low, medium or high?

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.





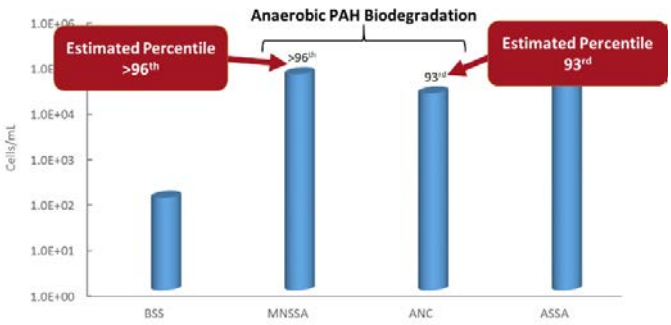
All site specific data will be treated as confidential and uploading is easy.

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.



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.

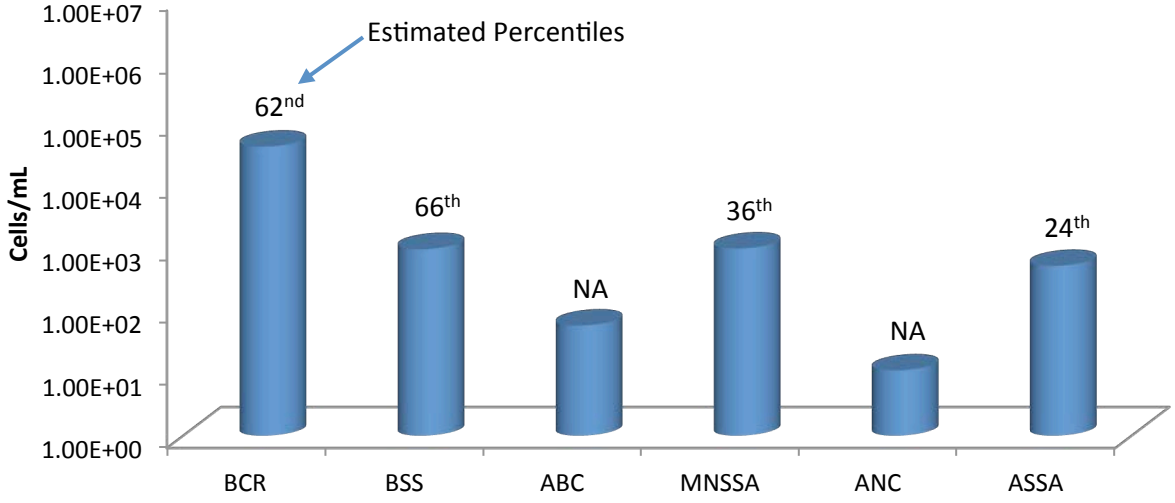
Is that a low, medium, or high concentration? The estimated percentile ranks retrieved from the MI Database answer that question by comparing your qPCR and QuantArray results to those of the literally thousands of other environmental samples submitted to MI for analysis over the last 20+ years.

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.

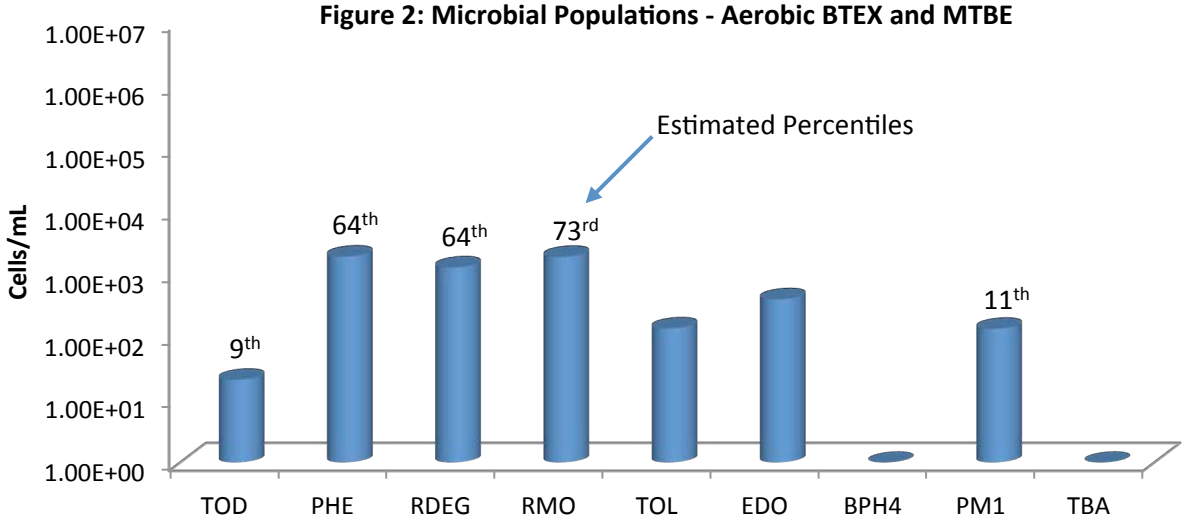
Figure 1: Microbial Populations - Anaerobic BTEX and PAHs



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.

Figure 2: Microbial Populations - Aerobic BTEX and MTBE



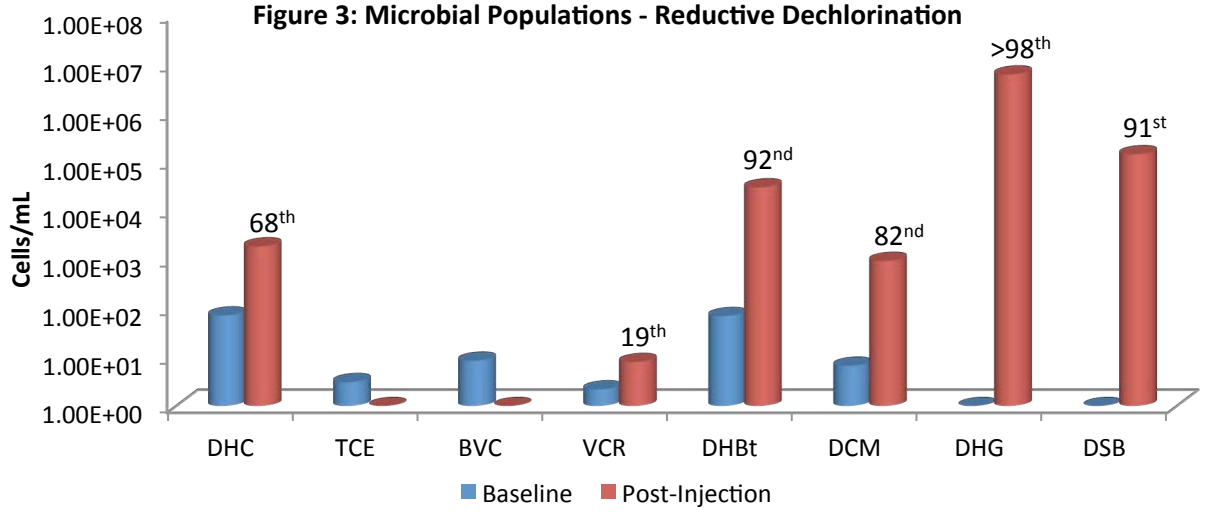
Aerobic BTEX and MTBE Biodegradation (Figure 2):

- 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.

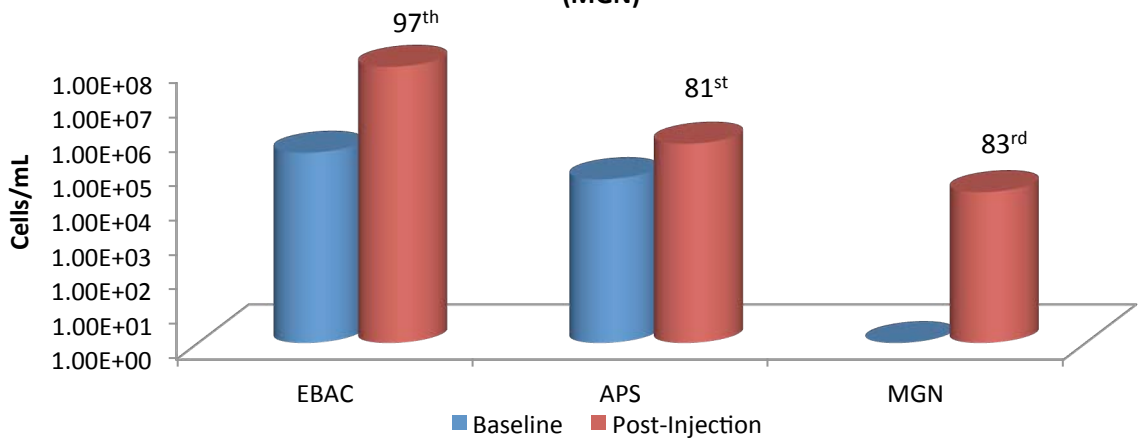
Figure 3: Microbial Populations - Reductive Dechlorination



- 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

Lu, X., J.T. Wilson, and D.H. Kampbell. 2006. Relationship between *Dehalococcoides* DNA in ground water and rates of reductive dechlorination at field scale. *Water Research* 40 no. 16: 3131-3140.

QUARTERLY CONTROL SUMMARY REPORT
LHAAP-58 DECEMBER 2018
SEMI-ANNUAL SAMPLING EVENT
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

February 2019

Prepared For:

Longhorn Army Ammunition Plant
Karnack, Texas

Under Contract To:

U.S. Army Corps of Engineers
Tulsa District
Tulsa, Oklahoma

Contract Number: W9128F-13-D-0012
Task Order Number: W912BV17F0150

Prepared By:

1608 13th Avenue South, Suite 300
Birmingham, Alabama 35205
1-800-806-4001 • www.bhate.com

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1 INTRODUCTION

Bhate reviewed five data packages from ALS Environmental, Houston, Texas with the analyses for ferrous iron and volatile fatty acids subcontracted to ALS Rochester, NY; and the analyses of dissolved gases to ALS Simi Valley, CA. The dechlorinating bacteria analysis was subcontracted to Microbial Insights in Knoxville, TN. Groundwater samples were collected on December 10-17, 2018, from Site LHAAP-58 at the Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. Data were reviewed for conformance to the requirements of the following guidance documents: [United States Environmental Protection Agency] *USEPA Contract Laboratory Program* [CLP] *National Functional Guidelines for Superfund Organic Methods Data Review* (USEPA, January 2017); *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review* (USEPA, January 2017); and the *Final Basewide Uniform Federal Policy (UFP) – Quality Assurance Project Plan (QAPP) Longhorn Army Ammunition Plant* (Bhate, May 2018).

1.1 Intended Use of Data

The objective of sampling at LHAAP-58 in December 2018 was to complete a semi-annual groundwater sampling event.

Analyses performed include:

- SM2320B – Alkalinity
- E365.3 – Phosphorus
- RSK175 – Dissolved Gases
- E415.1/SM5310C – Total Organic Carbon
- SW8260C – Volatile Organic Compounds (VOCs)
- SM3500-Fe - Ferrous Iron
- SW6020A – Total and Dissolved Metals (Iron and Manganese) and Total Arsenic
- SW9056A – Anions (chloride, nitrate, nitrite, and sulfate)
- E376.1 – Sulfide
- High Performance Liquid Chromatography (HPLC)-METACIDS – Volatile Fatty Acids (VFAs)
- CENSUS – Dechlorinating Bacteria (dehalococcoides [DHC]/dehalobacter [DHB])

Table 1 lists the sample identification (ID) numbers and their associated laboratory package.

Table 2 lists qualified results with the qualification flag and reason code.

The following narrative is a brief synopsis of data that required qualification due to quality control discrepancies.

1.2 Preservation and Holding Times

Sample ID data were evaluated for agreement with the chain-of-custody (COC). All samples were received in appropriate containers, within the proper temperature range, in good condition, and within the required hold time with the following exception.

- The analysis for ferrous iron was outside the requisite 24-hour hold time and all results were qualified as estimated, "J".

1.3 Calibrations

All analytes reported must be present in the initial and continuing calibration. The calibrations must meet the acceptance criteria specified in Worksheet 24 (Analytical Instrument Calibration) of the QAPP. All results reported must be within the calibration range. Samples were diluted, if necessary, to bring analyte responses within the calibration range.

1.3.1 Continuing Calibration Verifications

The calibrations must meet the following criteria otherwise the compound is qualified J or UJ: The continuing calibration verification (CCV) criteria are 20 percent difference (%D) for VOCs and 50% for closing CCVs. Metals and general chemistry - 10%D; VFAs, dissolved gases, and TOC - 15%D.

The CCV for 4-methyl-2-pentanone; cis-1,3-dichloropropene; 2-hexanone; and bromomethane were outside control limits associated with samples 35AWW19_121018, 35AWW20_121018, 35AWW23_121018, 35AWW24_121018, and LHSMW07_121018. These compound were considered estimated and flagged as "J/UJ".

1.4 Blanks

If the analyte result for an associated sample was less than 5X (10X for common laboratory contaminants) the analyte concentration in the blank, that result was qualified "UB" and considered an artifact of blank contamination. Where the sample result for the affected analyte was non-detect or greater than 5X the amount in the blank, no qualifier was applied.

The trip blank for samples in package HS18120913 reported a low level detection of acetone. Sample 35AWW12_121418 reported an acetone detection < 10X the blank concentration and was qualified as "UB".

1.5 Surrogates

Surrogates were evaluated using limits defined by each method in the project-specific QAPP Worksheet 28.

No surrogates were reported outside control limits.

1.6 Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD)

LCS/LCSD recoveries were evaluated using limits defined in the project-specific QAPP Worksheet 15.

All sample recoveries were within control limits.

1.7 Matrix Spike (MS)/Matrix Spike Duplicate Sample (MSD)

MS/MSD recoveries were evaluated using limits defined in Worksheet 15 of the project-specific QAPP. When sample results were greater than 4X the spike amount, control limits were not applicable and require no qualification. Furthermore, if a MS/MSD analyses was performed on a batched (unrelated) sample no qualification was made to the sample data.

No qualification was necessary based on MS/MSD recoveries.

1.8 Internal Standards

If the percent recovery (%R) for an internal standard in a sample is not within the limit, the associated sample is qualified for those analytes associated with the internal standard(s) outside of the limit.

Internal standards were within acceptance criteria for the associated compounds.

1.9 Field Precision

Precision is the measure of variability of individual sample measurements. Evaluation of field duplicates for precision was done using the relative percent difference (RPD). The RPD is defined as the difference between two duplicate samples divided by the mean and expressed as a percent. Field duplicate RPD limits were set at <30% for groundwater matrices.

1.9.1 SW6020

The RPD, between 35AWW10_121218 and its duplicate, was exceeded for dissolved and total iron. These compounds were qualified as estimated, “J”, in both sample and duplicate.

2 DATA USABILITY SUMMARY

The data are usable for the intended purposes of the project (see Table 3). The data quality objectives have been met for the project.

Table 1: Field Sample Identification and Laboratory Packages

Client Sample ID	Lab Package/ID	SM2320B	E365.3	SM/5310C E415.1	SW6020A	SW8260C	HPLC-METACIDS	SW9056A	RSK-175	SM3500Fe	E376.1	CENSUS	Arsenic (As) 6020A
03WW01_121218	HS18120736	X	X	X	X	X	X	X	X	X	X	X	
35ASW03_121718	HS18121030					X							
35AWW01_121318	HS18120913					X							X
35AWW05_121218	HS18120736					X							
35AWW06_121118	HS18120642	X	X	X	X	X	X	X	X	X	X	X	
35AWW08_121218	HS18120736	X	X	X	X	X	X	X	X	X	X	X	X
35AWW09_121118	HS18120642 HS18120736 (As)	X	X	X	X	X	X	X	X	X	X	X	X
35AWW10_121218	HS18120736	X	X	X	X	X	X	X	X	X	X	X	
35AWW10_121218_a	HS18120736	X	X	X	X	X	X	X	X	X	X		
35AWW11_121118	HS18120642	X	X	X	X	X	X	X	X	X	X	X	
35AWW12_121418	HS18120913					X							
35AWW13_121118	HS18120642					X							
35AWW14_121318	HS18120913					X							
35AWW15_121218	HS18120736					X							
35AWW16_121218	HS18120736					X							
35AWW17_121718	HS18121030					X							
35AWW18_121718	HS18121030					X							
35AWW18_121718_a	HS18121030					X							
35AWW19_121018	HS18120569	X	X	X	X	X	X	X	X	X	X	X	
35AWW20_121018	HS18120569	X	X	X	X	X	X	X	X	X	X	X	
34AWW21_121318	HS18120913					X							
35AWW22_121418	HS18120913					X							
35AWW23_121018	HS18120569	X	X	X	X	X	X	X	X	X	X	X	
35AWW24_121018	HS18120569	X	X	X	X	X	X	X	X	X	X	X	
LHSMW06_121318	HS18120913					X							X
LHSMW06_121318_a	HS18120913					X							X
LHSMW07_121018	HS18120569	X	X	X	X	X	X	X	X	X	X	X	

Notes:
MW – Monitoring Well
SM – Standard Method
SW-846 - Test Methods for Evaluating Solid Waste, Physical/Chemical Methods.
E – USEPA Method
HS - Houston

Table 2: Qualified Analytical Data

Client Sample ID Laboratory	Laboratory Package	Analyte Name	Result and Qualifier*	Reason for Qualification
35AWW10_121218	HS18120736	Dissolved Iron Total Iron Ferrous Iron	0.332 J 0.340 J 0.09 J	Dup RPD Dup RPD HT
35AWW10_121218_a	HS18120736	Dissolved Iron Total Iron Ferrous Iron	0.227 J 0.166 J 0.07 J	Dup RPD Dup RPD HT
35AWW12_121418	HS18120913	Acetone	3.2 UB	TB
03WW01_121218	HS18120736	Ferrous Iron	27.5 J	HT
35AWW06_121118	HS18120642	Ferrous Iron	88.1 J	HT
35AWW08_121218	HS18120642	Ferrous Iron	21 J	HT
35AWW09_121118	HS18120642	Ferrous Iron	0.13 J	HT
35AWW11_121118	HS18120642	Ferrous Iron	20.6 J	HT

Client Sample ID Laboratory	Laboratory Package	Analyte Name	Result and Qualifier*	Reason for Qualification
35AWW19_121018	HS18120569	Ferrous Iron	4.19 J	HT
		2-Hexanone	< 1.0 UJ	CCV
		4-Methyl-2-pentanone	< 1.0 UJ	CCV
		Bromomethane	< 0.5 UJ	CCV
		cis-1,3-Dichloropropene	< 0.5 UJ	CCV
35AWW20_121018	HS18120569	Ferrous Iron	5.01 J	HT
		2-Hexanone	< 1.0 UJ	CCV
		4-Methyl-2-pentanone	< 1.0 UJ	CCV
		Bromomethane	< 0.5 UJ	CCV
		cis-1,3-Dichloropropene	< 0.5 UJ	CCV
35AWW23_121018	HS18120569	Ferrous Iron	50 J	HT
		2-Hexanone	6.0 J	CCV
		4-Methyl-2-pentanone	3.9 J	CCV
		Bromomethane	< 0.5 UJ	CCV
		cis-1,3-Dichloropropene	3.3 J	CCV
35AWW24_121018	HS18120569	Ferrous Iron	0.54 J	HT
		2-Hexanone	< 1.0 UJ	CCV
		4-Methyl-2-pentanone	< 1.0 UJ	CCV
		Bromomethane	< 0.5 UJ	CCV
		cis-1,3-Dichloropropene	< 0.5 UJ	CCV
LHSMW07_121018	HS18120569	Ferrous Iron	0.43 J	HT
		2-Hexanone	< 1.0 UJ	CCV
		4-Methyl-2-pentanone	< 1.0 UJ	CCV
		Bromomethane	< 0.5 UJ	CCV
		cis-1,3-Dichloropropene	< 0.5 UJ	CCV

Notes:
J – Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.
UJ – The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
UB – Considered an artifact of blank contamination
TB – Trip Blank
Dup RPD – the relative percent difference between sample and duplicate was outside control limits
HT – exceeded recommended hold time
CCV – continuing calibration verification outside control limits
*Iron in milligrams per liter (mg/L), Volatiles in micrograms per liter (µg/L)

Table 3: Completeness by Method

Method	No. of Rejected Results	% Completeness
SM2320B	0	100
E365.3	0	100
E415.1	0	100
SW6020A	0	100
SW8260C	0	100
HPLC-METACIDS	0	100
SW9056A	0	100
RSK-175	0	100
SM3500Fe	0	100
E376.1	0	100
CENSUS	0	100

HS18120569 Cover Page

ALS WO# HS18120569

ALS Environmental
ALS Group USA, Corp
1317 South 13th Avenue
Kelso, WA 98626
T : +1 360 577 7222
F : +1 360 636 1068
www.alsglobal.com

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Form 11 - ICPMS05 Internal Standard Association
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Form 13 - ICPMS04_329719 Run Log
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HS18120569 Wet Chem Raw Data

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

WorkOrder: HS18120569

LHAAP-58

Bhate Environmental Associates, Inc.

Marcia Olive
445 Union Blvd Ste 129
Lakewood CO 80228

28-Jan-2019

HS18120569 LHAAP58 Final

ALS WO# HS18120569

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

January 04, 2019

Marcia Olive
Bhate Environmental Associates, Inc.
445 Union Blvd Ste 129
Lakewood, CO 80228

Work Order: **HS18120569**

Laboratory Results for: **LHAAP-58**

Dear Marcia,

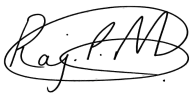
ALS Environmental received 6 sample(s) on Dec 11, 2018 for the analysis presented in the following report.

The analytical data provided relates directly to the samples received by ALS Environmental and for only the analyses requested. Results are expressed as "as received" unless otherwise noted.

QC sample results for this data met EPA or laboratory specifications except as noted in the Case Narrative or as noted with qualifiers in the QC batch information. Should this laboratory report need to be reproduced, it should be reproduced in full unless written approval has been obtained by ALS Environmental. Samples will be disposed in 30 days unless storage arrangements are made.

If you have any questions regarding this report, please feel free to call me.

Sincerely,



Generated By: JUMOKE.LAWAL
RJ Modashia
Project Manager

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Work Order: HS18120569

SAMPLE SUMMARY

Lab Samp ID	Client Sample ID	Matrix	TagNo	Collection Date	Date Received	Hold
HS18120569-01	35AWW20_121018	Groundwater		10-Dec-2018 09:10	11-Dec-2018 10:12	☐
HS18120569-02	35AWW24_121018	Groundwater		10-Dec-2018 10:15	11-Dec-2018 10:12	☐
HS18120569-03	35AWW19_121018	Groundwater		10-Dec-2018 11:15	11-Dec-2018 10:12	☐
HS18120569-04	35AWW23_121018	Groundwater		10-Dec-2018 12:30	11-Dec-2018 10:12	☐
HS18120569-05	LHSMW07_121018	Groundwater		10-Dec-2018 13:30	11-Dec-2018 10:12	☐
HS18120569-06	Trip Blank	Water		10-Dec-2018 00:00	11-Dec-2018 10:12	☐

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc. **CASE NARRATIVE**
Project: LHAAP-58
Work Order: HS18120569

Work Order Comments

- The analyses for RSK-175 Dissolved Gases and CO2 were subcontracted to ALS Environmental in Simi Valley, CA. Final Report attached.

  The analyses for Ferrous Iron and Volatile Fatty Acids were subcontracted to ALS Environmental in Rochester, NY. Final Report attached.

  The analysis for TOC was subcontracted to ALS Environmental in Kelso, WA. Final Report attached.

  The analyses for DHC/DHB were subcontracted to Microbial Insights in Knoxville, TN. Final Report attached.

GCMS Volatiles by Method SW8260

Batch ID: R329600

Sample ID: CCV_END

- Bromomethane outside recovery limits on closing CCV due to foamy sample run before closing CCV.

Sample ID: HS18120734-01MS

- MS and MSD are for an unrelated sample.

Sample ID: VLCSW-1812019

- Hexachlorobutadiene exceeded QC limits for LCS. CCV passed and associated samples are non-detect for this compound.

Sample ID: VSTD050

- 4-Methyl-2-Pentanone, cis-1,3-Dichloropropene and 2-Hexanone exceeded %D limits for CCV, associated samples are non-detect.

Metals by Method SW6020

Batch ID: 135804

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

Batch ID: 135805

Sample ID: HS18120927-08MS

- MS and MSD are for an unrelated sample.

WetChemistry by Method SW9056

Batch ID: R329899

Sample ID: 35AWW19_121018 (HS18120569-03)

- The reporting limit is elevated due to dilution for high concentrations of non-target analytes. (Nitrogen, Nitrate (As N),Nitrogen, Nitrite (As N))

Sample ID: HS18120545-04MS

- MS and MSD are for an unrelated sample (Sulfate).

Batch ID: R329896

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Work Order: HS18120569

CASE NARRATIVE

WetChemistry by Method E376.1

Batch ID: R329956

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

WetChemistry by Method SM2320B

Batch ID: R329695

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

WetChemistry by Method E365.3

Batch ID: 135598

- The test results meet requirements of the current NELAP standards, state requirements or programs where applicable.

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW20_121018
Collection Date: 10-Dec-2018 09:10

ANALYTICAL REPORT
WorkOrder:HS18120569
Lab ID:HS18120569-01
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 23:42
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 23:42
1,1,2-Trichloroethane	**88**		**0.30**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 23:42
1,1-Dichloroethane	**690**		**5.0**	**12**	**25**	**UG/L**	25	19-Dec-2018 23:17
1,1-Dichloroethene	**2,700**		**5.0**	**12**	**25**	**UG/L**	25	19-Dec-2018 23:17
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 23:42
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 23:42
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 23:42
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 23:42
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 23:42
1,2-Dichlorobenzene	**20**		**0.50**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 23:42
1,2-Dichloroethane	**26**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 23:42
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 23:42
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
1,3-Dichlorobenzene	**0.99**	J	**0.40**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 23:42
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
1,4-Dichlorobenzene	**3.5**		**0.40**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 23:42
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 23:42
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	19-Dec-2018 23:42
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	19-Dec-2018 23:42
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 23:42
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	19-Dec-2018 23:42
Acetone	2.0	U	0.40	2.0	2.0	UG/L	1	19-Dec-2018 23:42
Benzene	**9.0**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 23:42
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	19-Dec-2018 23:42
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 23:42

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc. **ANALYTICAL REPORT**
Project: LHAAP-58 WorkOrder:HS18120569
Sample ID: 35AWW20_121018 Lab ID:HS18120569-01
Collection Date: 10-Dec-2018 09:10 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 23:42
cis-1,2-Dichloroethene	**120**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 23:42
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	19-Dec-2018 23:42
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	19-Dec-2018 23:42
Methylene chloride	0.50	U	0.40	0.50	2.0	UG/L	1	19-Dec-2018 23:42
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 23:42
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Tetrachloroethene	**1.3**		**0.30**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 23:42
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 23:42
trans-1,2-Dichloroethene	**6.1**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 23:42
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Trichloroethene	**570**		**5.0**	**12**	**25**	**UG/L**	25	19-Dec-2018 23:17
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 23:42
Vinyl chloride	**110**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 23:42
Surr: 1,2-Dichloroethane-d4	*92.7*			**0**	*81-118*	*%REC*	*25*	*19-Dec-2018 23:17*
Surr: 1,2-Dichloroethane-d4	*91.7*			**0**	*81-118*	*%REC*	*1*	*19-Dec-2018 23:42*
Surr: 4-Bromofluorobenzene	*97.7*			**0**	*85-114*	*%REC*	*25*	*19-Dec-2018 23:17*
Surr: 4-Bromofluorobenzene	*99.2*			**0**	*85-114*	*%REC*	*1*	*19-Dec-2018 23:42*
Surr: Dibromofluoromethane	*91.5*			**0**	*80-119*	*%REC*	*25*	*19-Dec-2018 23:17*
Surr: Dibromofluoromethane	*91.0*			**0**	*80-119*	*%REC*	*1*	*19-Dec-2018 23:42*
Surr: Toluene-d8	*105*			**0**	*89-112*	*%REC*	*25*	*19-Dec-2018 23:17*
Surr: Toluene-d8	*105*			**0**	*89-112*	*%REC*	*1*	*19-Dec-2018 23:42*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 19-Dec-2018		Analyst: JCJ
Iron	**5.32**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	21-Dec-2018 21:12
Manganese	**6.19**		**0.0350**	**0.0500**	**0.250**	**mg/L**	50	24-Dec-2018 13:26
DISSOLVED METALS BY SW6020A		**Method:SW6020 (dissolved)**				Prep:SW3010A / 19-Dec-2018		Analyst: JCJ
Iron	**4.93**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	21-Dec-2018 23:28
Manganese	**5.32**		**0.0350**	**0.0500**	**0.250**	**mg/L**	50	24-Dec-2018 13:50

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW20_121018
Collection Date: 10-Dec-2018 09:10

ANALYTICAL REPORT
WorkOrder:HS18120569
Lab ID:HS18120569-01
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
PHOSPHORUS BY E365.3		**Method:E365.3**				Prep:E365.3 / 13-Dec-2018		Analyst: MZD
Phosphorus, Total (As P)	**0.101**		**0.0200**	**0.0400**	**0.0500**	**mg/L**	1	13-Dec-2018 15:15
SULFIDE BY E376.1		**Method:E376.1**						Analyst: JHD
Sulfide	**21.4**		**1.00**	**1.00**	**1.00**	**mg/L**	1	17-Dec-2018 16:30
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**1,190**		**5.00**	**5.00**	**5.00**	**mg/L**	1	20-Dec-2018 21:13
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Chloride	**1,010**		**10.0**	**25.0**	**25.0**	**mg/L**	50	24-Dec-2018 19:34
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Dec-2018 21:52
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Dec-2018 21:52
Sulfate	**1,010**		**10.0**	**25.0**	**25.0**	**mg/L**	50	24-Dec-2018 19:34
SUBCONTRACT ANALYSIS - DHC/DHB		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	18-Dec-2018 14:50
SUBCONTRACT ANALYSIS - FERROUS IRON		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	04-Jan-2019 10:12
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	26-Dec-2018 09:04
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	03-Jan-2019 09:43
SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	04-Jan-2019 10:12

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW24_121018
Collection Date: 10-Dec-2018 10:15

ANALYTICAL REPORT
WorkOrder:HS18120569
Lab ID:HS18120569-02
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:13
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	19-Dec-2018 21:13
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	19-Dec-2018 21:13
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:13
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	19-Dec-2018 21:13
Acetone	2.0	U	0.40	2.0	2.0	UG/L	1	19-Dec-2018 21:13
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	19-Dec-2018 21:13
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW24_121018
Collection Date: 10-Dec-2018 10:15

ANALYTICAL REPORT
WorkOrder:HS18120569
Lab ID:HS18120569-02
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	19-Dec-2018 21:13
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	19-Dec-2018 21:13
Methylene chloride	0.50	U	0.40	0.50	2.0	UG/L	1	19-Dec-2018 21:13
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:13
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:13
Surr: 1,2-Dichloroethane-d4	*93.1*			**0**	*81-118*	*%REC*	*1*	*19-Dec-2018 21:13*
Surr: 4-Bromofluorobenzene	*97.8*			**0**	*85-114*	*%REC*	*1*	*19-Dec-2018 21:13*
Surr: Dibromofluoromethane	*89.7*			**0**	*80-119*	*%REC*	*1*	*19-Dec-2018 21:13*
Surr: Toluene-d8	*104*			**0**	*89-112*	*%REC*	*1*	*19-Dec-2018 21:13*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 19-Dec-2018		Analyst: JCJ
Iron	**11.4**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	21-Dec-2018 21:14
Manganese	**0.134**		**0.000700**	**0.00100**	**0.00500**	**mg/L**	1	21-Dec-2018 21:14
DISSOLVED METALS BY SW6020A		**Method:SW6020 (dissolved)**				Prep:SW3010A / 19-Dec-2018		Analyst: JCJ
Iron	**11.1**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	21-Dec-2018 23:30
Manganese	**0.142**		**0.000700**	**0.00100**	**0.00500**	**mg/L**	1	21-Dec-2018 23:30
PHOSPHORUS BY E365.3		**Method:E365.3**				Prep:E365.3 / 13-Dec-2018		Analyst: MZD
Phosphorus, Total (As P)	**0.316**		**0.0200**	**0.0400**	**0.0500**	**mg/L**	1	13-Dec-2018 15:15
SULFIDE BY E376.1		**Method:E376.1**						Analyst: JHD
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	17-Dec-2018 16:30

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW24_121018
Collection Date: 10-Dec-2018 10:15

ANALYTICAL REPORT
WorkOrder:HS18120569
Lab ID:HS18120569-02
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**45.9**		**5.00**	**5.00**	**5.00**	**mg/L**	1	20-Dec-2018 21:18
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Chloride	**109**		**2.00**	**5.00**	**5.00**	**mg/L**	10	24-Dec-2018 19:56
Nitrogen, Nitrate (As N)	**0.157**		**0.0300**	**0.100**	**0.100**	**mg/L**	1	11-Dec-2018 22:07
Nitrogen, Nitrite (As N)	0.100	U	0.0300	0.100	0.100	mg/L	1	11-Dec-2018 22:07
Sulfate	**69.9**		**0.200**	**0.500**	**0.500**	**mg/L**	1	11-Dec-2018 22:07
SUBCONTRACT ANALYSIS - DHC/DHB		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	18-Dec-2018 14:50
SUBCONTRACT ANALYSIS - FERROUS IRON		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	04-Jan-2019 10:12
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	26-Dec-2018 09:04
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	03-Jan-2019 09:43
SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	04-Jan-2019 10:12

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW19_121018
Collection Date: 10-Dec-2018 11:15

ANALYTICAL REPORT
WorkOrder:HS18120569
Lab ID:HS18120569-03
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,1-Dichloroethane	**1.8**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 21:38
1,1-Dichloroethene	**7.5**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 21:38
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,2-Dichloroethane	**2.1**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 21:38
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:38
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	19-Dec-2018 21:38
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	19-Dec-2018 21:38
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:38
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	19-Dec-2018 21:38
Acetone	2.0	U	0.40	2.0	2.0	UG/L	1	19-Dec-2018 21:38
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	19-Dec-2018 21:38
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW19_121018
Collection Date: 10-Dec-2018 11:15

ANALYTICAL REPORT
WorkOrder:HS18120569
Lab ID:HS18120569-03
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	19-Dec-2018 21:38
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	19-Dec-2018 21:38
Methylene chloride	0.50	U	0.40	0.50	2.0	UG/L	1	19-Dec-2018 21:38
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 21:38
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Trichloroethene	**0.59**	J	**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 21:38
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 21:38
Surr: 1,2-Dichloroethane-d4	*93.4*			**0**	*81-118*	*%REC*	*1*	*19-Dec-2018 21:38*
Surr: 4-Bromofluorobenzene	*98.6*			**0**	*85-114*	*%REC*	*1*	*19-Dec-2018 21:38*
Surr: Dibromofluoromethane	*90.0*			**0**	*80-119*	*%REC*	*1*	*19-Dec-2018 21:38*
Surr: Toluene-d8	*106*			**0**	*89-112*	*%REC*	*1*	*19-Dec-2018 21:38*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 19-Dec-2018		Analyst: JCJ
Iron	**4.63**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	21-Dec-2018 21:16
Manganese	**6.65**		**0.0350**	**0.0500**	**0.250**	**mg/L**	50	24-Dec-2018 13:28
DISSOLVED METALS BY SW6020A		**Method:SW6020 (dissolved)**				Prep:SW3010A / 19-Dec-2018		Analyst: JCJ
Iron	**4.75**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	21-Dec-2018 23:33
Manganese	**6.88**		**0.0350**	**0.0500**	**0.250**	**mg/L**	50	24-Dec-2018 13:52
PHOSPHORUS BY E365.3		**Method:E365.3**				Prep:E365.3 / 13-Dec-2018		Analyst: MZD
Phosphorus, Total (As P)	**0.101**		**0.0200**	**0.0400**	**0.0500**	**mg/L**	1	13-Dec-2018 15:15
SULFIDE BY E376.1		**Method:E376.1**						Analyst: JHD
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	17-Dec-2018 16:30

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW19_121018
Collection Date: 10-Dec-2018 11:15

ANALYTICAL REPORT
WorkOrder:HS18120569
Lab ID:HS18120569-03
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**198**		**5.00**	**5.00**	**5.00**	**mg/L**	1	20-Dec-2018 21:24
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Chloride	**1,190**		**10.0**	**25.0**	**25.0**	**mg/L**	50	24-Dec-2018 20:17
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Dec-2018 22:21
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Dec-2018 22:21
Sulfate	**998**		**10.0**	**25.0**	**25.0**	**mg/L**	50	24-Dec-2018 20:17
SUBCONTRACT ANALYSIS - DHC/DHB		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	18-Dec-2018 14:50
SUBCONTRACT ANALYSIS - FERROUS IRON		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	04-Jan-2019 10:12
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	26-Dec-2018 09:04
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	03-Jan-2019 09:43
SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	04-Jan-2019 10:12

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW23_121018
Collection Date: 10-Dec-2018 12:30

ANALYTICAL REPORT
WorkOrder:HS18120569
Lab ID:HS18120569-04
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,1-Dichloroethane	**1.6**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 22:28
1,1-Dichloroethene	**2.5**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 22:28
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,2,3-Trichloropropane	**22**		**0.50**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 22:28
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:28
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28
2-Butanone	**300**		**0.50**	**1.0**	**2.0**	**UG/L**	1	19-Dec-2018 22:28
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
2-Hexanone	**6.0**		**1.0**	**1.0**	**2.0**	**UG/L**	1	19-Dec-2018 22:28
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:28
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
4-Methyl-2-pentanone	**3.9**		**0.70**	**1.0**	**2.0**	**UG/L**	1	19-Dec-2018 22:28
Acetone	**120**		**0.40**	**2.0**	**2.0**	**UG/L**	1	19-Dec-2018 22:28
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Bromoform	**1.8**		**0.40**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 22:28
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	19-Dec-2018 22:28
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc. **ANALYTICAL REPORT**
Project: LHAAP-58 WorkOrder:HS18120569
Sample ID: 35AWW23_121018 Lab ID:HS18120569-04
Collection Date: 10-Dec-2018 12:30 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28
cis-1,2-Dichloroethene	**20**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 22:28
cis-1,3-Dichloropropene	**3.3**		**0.10**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 22:28
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	19-Dec-2018 22:28
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	19-Dec-2018 22:28
Methylene chloride	0.50	U	0.40	0.50	2.0	UG/L	1	19-Dec-2018 22:28
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:28
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28
trans-1,3-Dichloropropene	**4.7**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 22:28
Trichloroethene	**5.3**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 22:28
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:28
Surr: 1,2-Dichloroethane-d4	*90.5*			**0**	*81-118*	*%REC*	*1*	*19-Dec-2018 22:28*
Surr: 4-Bromofluorobenzene	*102*			**0**	*85-114*	*%REC*	*1*	*19-Dec-2018 22:28*
Surr: Dibromofluoromethane	*88.8*			**0**	*80-119*	*%REC*	*1*	*19-Dec-2018 22:28*
Surr: Toluene-d8	*102*			**0**	*89-112*	*%REC*	*1*	*19-Dec-2018 22:28*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 19-Dec-2018		Analyst: JCJ
Iron	**50.8**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	21-Dec-2018 21:19
Manganese	**8.04**		**0.0700**	**0.100**	**0.500**	**mg/L**	100	24-Dec-2018 13:30
DISSOLVED METALS BY SW6020A		**Method:SW6020 (dissolved)**				Prep:SW3010A / 19-Dec-2018		Analyst: JCJ
Iron	**46.4**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	21-Dec-2018 23:35
Manganese	**7.73**		**0.0700**	**0.100**	**0.500**	**mg/L**	100	24-Dec-2018 13:54
PHOSPHORUS BY E365.3		**Method:E365.3**				Prep:E365.3 / 13-Dec-2018		Analyst: MZD
Phosphorus, Total (As P)	**1.08**		**0.200**	**0.400**	**0.500**	**mg/L**	10	13-Dec-2018 15:15
SULFIDE BY E376.1		**Method:E376.1**						Analyst: JHD
Sulfide	1.00	U	1.00	1.00	1.00	mg/L	1	17-Dec-2018 16:30

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: 35AWW23_121018
Collection Date: 10-Dec-2018 12:30

ANALYTICAL REPORT
WorkOrder:HS18120569
Lab ID:HS18120569-04
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**1,110**		**5.00**	**5.00**	**5.00**	**mg/L**	1	20-Dec-2018 21:34
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Chloride	**578**		**4.00**	**10.0**	**10.0**	**mg/L**	20	24-Dec-2018 20:39
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Dec-2018 22:36
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Dec-2018 22:36
Sulfate	**4.19**		**0.400**	**1.00**	**1.00**	**mg/L**	2	11-Dec-2018 22:36
SUBCONTRACT ANALYSIS - DHC/DHB		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	18-Dec-2018 14:50
SUBCONTRACT ANALYSIS - FERROUS IRON		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	04-Jan-2019 10:12
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	26-Dec-2018 09:04
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	03-Jan-2019 09:43
SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	04-Jan-2019 10:12

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc. **ANALYTICAL REPORT**
Project: LHAAP-58 WorkOrder:HS18120569
Sample ID: LHSMW07_121018 Lab ID:HS18120569-05
Collection Date: 10-Dec-2018 13:30 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,1-Dichloroethane	**42**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 22:52
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,2-Dichloroethane	**1.9**		**0.20**	**0.50**	**1.0**	**UG/L**	1	19-Dec-2018 22:52
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:52
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	19-Dec-2018 22:52
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	19-Dec-2018 22:52
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:52
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	19-Dec-2018 22:52
Acetone	2.0	U	0.40	2.0	2.0	UG/L	1	19-Dec-2018 22:52
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	19-Dec-2018 22:52
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc. **ANALYTICAL REPORT**
Project: LHAAP-58 WorkOrder:HS18120569
Sample ID: LHSMW07_121018 Lab ID:HS18120569-05
Collection Date: 10-Dec-2018 13:30 Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C		**Method:SW8260**						Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	19-Dec-2018 22:52
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	19-Dec-2018 22:52
Methylene chloride	0.50	U	0.40	0.50	2.0	UG/L	1	19-Dec-2018 22:52
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 22:52
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 22:52
Surr: 1,2-Dichloroethane-d4	*91.1*			**0**	*81-118*	*%REC*	*1*	*19-Dec-2018 22:52*
Surr: 4-Bromofluorobenzene	*98.7*			**0**	*85-114*	*%REC*	*1*	*19-Dec-2018 22:52*
Surr: Dibromofluoromethane	*90.0*			**0**	*80-119*	*%REC*	*1*	*19-Dec-2018 22:52*
Surr: Toluene-d8	*105*			**0**	*89-112*	*%REC*	*1*	*19-Dec-2018 22:52*
ICP-MS METALS BY SW6020A		**Method:SW6020**				Prep:SW3010A / 19-Dec-2018		Analyst: JCJ
Iron	**0.773**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	21-Dec-2018 21:21
Manganese	**9.40**		**0.0700**	**0.100**	**0.500**	**mg/L**	100	24-Dec-2018 13:32
DISSOLVED METALS BY SW6020A		**Method:SW6020 (dissolved)**				Prep:SW3010A / 19-Dec-2018		Analyst: JCJ
Iron	**0.785**		**0.0120**	**0.100**	**0.200**	**mg/L**	1	21-Dec-2018 23:37
Manganese	**9.06**		**0.0700**	**0.100**	**0.500**	**mg/L**	100	24-Dec-2018 13:56
PHOSPHORUS BY E365.3		**Method:E365.3**				Prep:E365.3 / 13-Dec-2018		Analyst: MZD
Phosphorus, Total (As P)	**0.125**		**0.0200**	**0.0400**	**0.0500**	**mg/L**	1	13-Dec-2018 15:15
SULFIDE BY E376.1		**Method:E376.1**						Analyst: JHD
Sulfide	**14.8**		**1.00**	**1.00**	**1.00**	**mg/L**	1	17-Dec-2018 16:30

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: LHSMW07_121018
Collection Date: 10-Dec-2018 13:30

ANALYTICAL REPORT
WorkOrder:HS18120569
Lab ID:HS18120569-05
Matrix:Groundwater

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
ALKALINITY BY SM2320B		**Method:SM2320B**						Analyst: AJH
Alkalinity, Total (As CaCO3)	**1,640**		**5.00**	**5.00**	**5.00**	**mg/L**	1	20-Dec-2018 21:45
ANIONS BY SW9056A		**Method:SW9056**						Analyst: KMU
Chloride	**2,030**		**20.0**	**50.0**	**50.0**	**mg/L**	100	24-Dec-2018 21:44
Nitrogen, Nitrate (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Dec-2018 22:50
Nitrogen, Nitrite (As N)	0.200	U	0.0600	0.200	0.200	mg/L	2	11-Dec-2018 22:50
Sulfate	**1,530**		**20.0**	**50.0**	**50.0**	**mg/L**	100	24-Dec-2018 21:44
SUBCONTRACT ANALYSIS - DHC/DHB		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	18-Dec-2018 14:50
SUBCONTRACT ANALYSIS - FERROUS IRON		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	04-Jan-2019 10:12
SUBCONTRACT ANALYSIS - RSK		**Method:NA**						Analyst: SUBCA
Subcontract Analysis	See Attached		0	0		NA	1	26-Dec-2018 09:04
SUBCONTRACT ANALYSIS - TOC ANALYSIS		**Method:NA**						Analyst: SUBK
Subcontract Analysis	See Attached		0	0		NA	1	03-Jan-2019 09:43
SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS		**Method:NA**						Analyst: SUB
Subcontract Analysis	See Attached		0	0		NA	1	04-Jan-2019 10:12

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: Trip Blank
Collection Date: 10-Dec-2018 00:00

ANALYTICAL REPORT
WorkOrder:HS18120569
Lab ID:HS18120569-06
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
1,1,1,2-Tetrachloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,1,1-Trichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,1,2,2-Tetrachloroethane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,1,2-Trichloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,1-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,1-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,1-Dichloropropene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,2,3-Trichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,2,3-Trichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,2,4-Trichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,2,4-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,2-Dibromo-3-chloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,2-Dibromoethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,2-Dichlorobenzene	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,2-Dichloroethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,2-Dichloropropane	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,3,5-Trimethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,3-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,3-Dichloropropane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
1,4-Dichlorobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 20:49
2,2-Dichloropropane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
2-Butanone	1.0	U	0.50	1.0	2.0	UG/L	1	19-Dec-2018 20:49
2-Chlorotoluene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
2-Hexanone	1.0	U	1.0	1.0	2.0	UG/L	1	19-Dec-2018 20:49
4-Chlorotoluene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 20:49
4-Isopropyltoluene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
4-Methyl-2-pentanone	1.0	U	0.70	1.0	2.0	UG/L	1	19-Dec-2018 20:49
Acetone	2.0	U	0.40	2.0	2.0	UG/L	1	19-Dec-2018 20:49
Benzene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Bromobenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Bromochloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Bromodichloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Bromoform	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Bromomethane	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Carbon disulfide	1.0	U	0.60	1.0	2.0	UG/L	1	19-Dec-2018 20:49
Carbon tetrachloride	0.50	U	0.50	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Chlorobenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Chloroethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Chloroform	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49

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

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
Sample ID: Trip Blank
Collection Date: 10-Dec-2018 00:00

ANALYTICAL REPORT
WorkOrder:HS18120569
Lab ID:HS18120569-06
Matrix:Water

ANALYSES	RESULT	QUAL	DL	LOD	LOQ	UNITS	DILUTION FACTOR	DATE ANALYZED
VOLATILES ORGANICS BY METHOD 8260C	**Method:SW8260**							Analyst: PC
Chloromethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
cis-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
cis-1,3-Dichloropropene	0.50	U	0.10	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Dibromochloromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Dibromomethane	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Dichlorodifluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Ethylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Hexachlorobutadiene	1.0	U	1.0	1.0	1.0	UG/L	1	19-Dec-2018 20:49
Isopropylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
m,p-Xylene	1.0	U	0.50	1.0	2.0	UG/L	1	19-Dec-2018 20:49
Methylene chloride	0.50	U	0.40	0.50	2.0	UG/L	1	19-Dec-2018 20:49
n-Butylbenzene	0.50	U	0.40	0.50	1.0	UG/L	1	19-Dec-2018 20:49
n-Propylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Naphthalene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
o-Xylene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
sec-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Styrene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
tert-Butylbenzene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Tetrachloroethene	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Toluene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
trans-1,2-Dichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
trans-1,3-Dichloropropene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Trichloroethene	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Trichlorofluoromethane	0.50	U	0.30	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Vinyl chloride	0.50	U	0.20	0.50	1.0	UG/L	1	19-Dec-2018 20:49
Surr: 1,2-Dichloroethane-d4	*92.7*			**0**	*81-118*	*%REC*	*1*	*19-Dec-2018 20:49*
Surr: 4-Bromofluorobenzene	*97.7*			**0**	*85-114*	*%REC*	*1*	*19-Dec-2018 20:49*
Surr: Dibromofluoromethane	*89.8*			**0**	*80-119*	*%REC*	*1*	*19-Dec-2018 20:49*
Surr: Toluene-d8	*106*			**0**	*89-112*	*%REC*	*1*	*19-Dec-2018 20:49*

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

WEIGHT LOG

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

Batch ID: 135598 **Method:** PHOSPHORUS BY E365.3 **Prep:** P_TW_PR

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18120569-01	1	50	50 (mL)	1
HS18120569-02	1	50	50 (mL)	1
HS18120569-03	1	50	50 (mL)	1
HS18120569-04	1	50	50 (mL)	1
HS18120569-05	1	50	50 (mL)	1

Batch ID: 135804 **Method:** ICP-MS METALS BY SW6020A **Prep:** 3010A

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18120569-01	1	10	10 (mL)	1
HS18120569-02	1	10	10 (mL)	1
HS18120569-03	1	10	10 (mL)	1
HS18120569-04	1	10	10 (mL)	1
HS18120569-05	1	10	10 (mL)	1

Batch ID: 135805 **Method:** DISSOLVED METALS BY SW6020A **Prep:** 3010A DISS

SampID	Container	Sample Wt/Vol	Final Volume	Prep Factor
HS18120569-01	1	10	10 (mL)	1
HS18120569-02	1	10	10 (mL)	1
HS18120569-03	1	10	10 (mL)	1
HS18120569-04	1	10	10 (mL)	1
HS18120569-05	1	10	10 (mL)	1

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID 135598	**Test Name :** PHOSPHORUS BY E365.3			**Matrix:** Groundwater		
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10		13 Dec 2018 11:00	13 Dec 2018 15:15	1
HS18120569-02	35AWW24_121018	10 Dec 2018 10:15		13 Dec 2018 11:00	13 Dec 2018 15:15	1
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15		13 Dec 2018 11:00	13 Dec 2018 15:15	1
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30		13 Dec 2018 11:00	13 Dec 2018 15:15	10
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30		13 Dec 2018 11:00	13 Dec 2018 15:15	1
Batch ID 135804	**Test Name :** ICP-MS METALS BY SW6020A			**Matrix:** Groundwater		
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10		19 Dec 2018 13:00	24 Dec 2018 13:26	50
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10		19 Dec 2018 13:00	21 Dec 2018 21:12	1
HS18120569-02	35AWW24_121018	10 Dec 2018 10:15		19 Dec 2018 13:00	21 Dec 2018 21:14	1
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15		19 Dec 2018 13:00	24 Dec 2018 13:28	50
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15		19 Dec 2018 13:00	21 Dec 2018 21:16	1
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30		19 Dec 2018 13:00	24 Dec 2018 13:30	100
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30		19 Dec 2018 13:00	21 Dec 2018 21:19	1
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30		19 Dec 2018 13:00	24 Dec 2018 13:32	100
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30		19 Dec 2018 13:00	21 Dec 2018 21:21	1
Batch ID 135805	**Test Name :** DISSOLVED METALS BY SW6020A			**Matrix:** Groundwater		
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10		19 Dec 2018 13:00	24 Dec 2018 13:50	50
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10		19 Dec 2018 13:00	21 Dec 2018 23:28	1
HS18120569-02	35AWW24_121018	10 Dec 2018 10:15		19 Dec 2018 13:00	21 Dec 2018 23:30	1
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15		19 Dec 2018 13:00	24 Dec 2018 13:52	50
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15		19 Dec 2018 13:00	21 Dec 2018 23:33	1
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30		19 Dec 2018 13:00	24 Dec 2018 13:54	100
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30		19 Dec 2018 13:00	21 Dec 2018 23:35	1
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30		19 Dec 2018 13:00	24 Dec 2018 13:56	100
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30		19 Dec 2018 13:00	21 Dec 2018 23:37	1
Batch ID R329478	**Test Name :** SUBCONTRACT ANALYSIS - DHC/DHB			**Matrix:** Groundwater		
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10			18 Dec 2018 14:50	1
HS18120569-02	35AWW24_121018	10 Dec 2018 10:15			18 Dec 2018 14:50	1
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15			18 Dec 2018 14:50	1
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30			18 Dec 2018 14:50	1
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30			18 Dec 2018 14:50	1
Batch ID R329600	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C			**Matrix:** Water		
HS18120569-06	Trip Blank	10 Dec 2018 00:00			19 Dec 2018 20:49	1

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

DATES REPORT

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID R329600	**Test Name :** VOLATILES ORGANICS BY METHOD 8260C				**Matrix:** Groundwater	
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10			19 Dec 2018 23:42	1
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10			19 Dec 2018 23:17	25
HS18120569-02	35AWW24_121018	10 Dec 2018 10:15			19 Dec 2018 21:13	1
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15			19 Dec 2018 21:38	1
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30			19 Dec 2018 22:28	1
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30			19 Dec 2018 22:52	1
Batch ID R329695	**Test Name :** ALKALINITY BY SM2320B				**Matrix:** Groundwater	
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10			20 Dec 2018 21:13	1
HS18120569-02	35AWW24_121018	10 Dec 2018 10:15			20 Dec 2018 21:18	1
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15			20 Dec 2018 21:24	1
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30			20 Dec 2018 21:34	1
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30			20 Dec 2018 21:45	1
Batch ID R329884	**Test Name :** SUBCONTRACT ANALYSIS - RSK				**Matrix:** Groundwater	
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10			26 Dec 2018 09:04	1
HS18120569-02	35AWW24_121018	10 Dec 2018 10:15			26 Dec 2018 09:04	1
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15			26 Dec 2018 09:04	1
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30			26 Dec 2018 09:04	1
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30			26 Dec 2018 09:04	1
Batch ID R329896	**Test Name :** ANIONS BY SW9056A				**Matrix:** Groundwater	
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10			24 Dec 2018 19:34	50
HS18120569-02	35AWW24_121018	10 Dec 2018 10:15			24 Dec 2018 19:56	10
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15			24 Dec 2018 20:17	50
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30			24 Dec 2018 20:39	20
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30			24 Dec 2018 21:44	100
Batch ID R329899	**Test Name :** ANIONS BY SW9056A				**Matrix:** Groundwater	
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10			11 Dec 2018 21:52	2
HS18120569-02	35AWW24_121018	10 Dec 2018 10:15			11 Dec 2018 22:07	1
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15			11 Dec 2018 22:21	2
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30			11 Dec 2018 22:36	2
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30			11 Dec 2018 22:50	2
Batch ID R329956	**Test Name :** SULFIDE BY E376.1				**Matrix:** Groundwater	
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10			17 Dec 2018 16:30	1
HS18120569-02	35AWW24_121018	10 Dec 2018 10:15			17 Dec 2018 16:30	1
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15			17 Dec 2018 16:30	1
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30			17 Dec 2018 16:30	1
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30			17 Dec 2018 16:30	1

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58 **DATES REPORT**
WorkOrder: HS18120569

Sample ID	Client Samp ID	Collection Date	TCLP Date	Prep Date	Analysis Date	DF
Batch ID R330379	**Test Name :** SUBCONTRACT ANALYSIS - TOC ANALYSIS				**Matrix:** Groundwater	
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10			03 Jan 2019 09:43	1
HS18120569-02	35AWW24_121018	10 Dec 2018 10:15			03 Jan 2019 09:43	1
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15			03 Jan 2019 09:43	1
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30			03 Jan 2019 09:43	1
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30			03 Jan 2019 09:43	1
Batch ID R330453	**Test Name :** SUBCONTRACT ANALYSIS - VOLATILE FATTY ACIDS				**Matrix:** Groundwater	
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10			04 Jan 2019 10:12	1
HS18120569-01	35AWW20_121018	10 Dec 2018 09:10			04 Jan 2019 10:12	1
HS18120569-02	35AWW24_121018	10 Dec 2018 10:15			04 Jan 2019 10:12	1
HS18120569-02	35AWW24_121018	10 Dec 2018 10:15			04 Jan 2019 10:12	1
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15			04 Jan 2019 10:12	1
HS18120569-03	35AWW19_121018	10 Dec 2018 11:15			04 Jan 2019 10:12	1
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30			04 Jan 2019 10:12	1
HS18120569-04	35AWW23_121018	10 Dec 2018 12:30			04 Jan 2019 10:12	1
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30			04 Jan 2019 10:12	1
HS18120569-05	LHSMW07_121018	10 Dec 2018 13:30			04 Jan 2019 10:12	1

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: 135804 **Instrument: ICPMS04** **Method: SW6020**

MBLK Sample ID: **MBLK-135804** Units: **mg/L** Analysis Date: **21-Dec-2018 21:07**
Client ID: Run ID: **ICPMS04_329719** SeqNo: **4879116** PrepDate: **19-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	0.100	0.200								U
Manganese	0.00100	0.00500								U

LCS Sample ID: **LCS-135804** Units: **mg/L** Analysis Date: **21-Dec-2018 21:10**
Client ID: Run ID: **ICPMS04_329719** SeqNo: **4879117** PrepDate: **19-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	4.811	0.200	5	0	96.2	80 - 120				
Manganese	0.04729	0.00500	0.05	0	94.6	80 - 120				

MS Sample ID: **HS18120913-04MS** Units: **mg/L** Analysis Date: **21-Dec-2018 22:12**
Client ID: Run ID: **ICPMS04_329719** SeqNo: **4879142** PrepDate: **19-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	15.56	0.200	5	10.76	96.0	80 - 120				
Manganese	0.1135	0.00500	0.05	0.06587	95.3	80 - 120				

MSD Sample ID: **HS18120913-04MSD** Units: **mg/L** Analysis Date: **21-Dec-2018 22:14**
Client ID: Run ID: **ICPMS04_329719** SeqNo: **4879143** PrepDate: **19-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	15.34	0.200	5	10.76	91.6	80 - 120	15.56	1.43	20	
Manganese	0.1084	0.00500	0.05	0.06587	85.0	80 - 120	0.1135	4.65	20	

PDS Sample ID: **HS18120913-04PDS** Units: **mg/L** Analysis Date: **21-Dec-2018 22:17**
Client ID: Run ID: **ICPMS04_329719** SeqNo: **4879144** PrepDate: **19-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	22.17	0.200	10	10.76	114	75 - 125				
Manganese	0.1632	0.00500	0.1	0.06587	97.3	75 - 125				

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: 135804 **Instrument: ICPMS04** **Method: SW6020**

SD Sample ID: **HS18120913-04SD** Units: **mg/L** Analysis Date: **21-Dec-2018 22:10**
Client ID: Run ID: **ICPMS04_329719** SeqNo: **4879141** PrepDate: **19-Dec-2018** DF: **5**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Iron	11.5	1.00					10.76	6.85	10	
Manganese	0.06612	0.0250					0.06587	0.376	10	

The following samples were analyzed in this batch: HS18120569-01 HS18120569-02 HS18120569-03 HS18120569-04 HS18120569-05

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: 135805 **Instrument: ICPMS04** **Method: SW6020 (dissolved) (DISSOLVED)**

MBLK Sample ID: **MBLK-135805** Units: **mg/L** Analysis Date: **21-Dec-2018 23:24**
Client ID: Run ID: **ICPMS04_329719** SeqNo: **4879287** PrepDate: **19-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	0.100	0.200								U
Manganese	0.00100	0.00500								U

LCS Sample ID: **LCS-135805** Units: **mg/L** Analysis Date: **21-Dec-2018 23:26**
Client ID: Run ID: **ICPMS04_329719** SeqNo: **4879288** PrepDate: **19-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	4.612	0.200	5	0	92.2	80 - 120				
Manganese	0.04744	0.00500	0.05	0	94.9	80 - 120				

MS Sample ID: **HS18120927-08MS** Units: **mg/L** Analysis Date: **22-Dec-2018 00:45**
Client ID: Run ID: **ICPMS04_329719** SeqNo: **4879323** PrepDate: **19-Dec-2018** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	4.965	2.00	5	0.101	97.3	75 - 125				
Manganese	0.04104	0.0500	0.05	0.004999	72.1	75 - 125				JS

MSD Sample ID: **HS18120927-08MSD** Units: **mg/L** Analysis Date: **22-Dec-2018 00:47**
Client ID: Run ID: **ICPMS04_329719** SeqNo: **4879324** PrepDate: **19-Dec-2018** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	4.346	2.00	5	0.101	84.9	75 - 125	4.965	13.3	20	
Manganese	0.03526	0.0500	0.05	0.004999	60.5	75 - 125	0.04104	0	20	JS

PDS Sample ID: **HS18120927-08PDS** Units: **mg/L** Analysis Date: **22-Dec-2018 00:50**
Client ID: Run ID: **ICPMS04_329719** SeqNo: **4879325** PrepDate: **19-Dec-2018** DF: **10**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Iron	99.19	2.00	100	0	99.2	75 - 125				
Manganese	1.104	0.0500	1	0	110	75 - 125				

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: 135805 **Instrument: ICPMS04** **Method: SW6020 (dissolved) (DISSOLVED)**

SD Sample ID: **HS18120927-08SD** Units: **mg/L** Analysis Date: **22-Dec-2018 00:43**
Client ID: Run ID: **ICPMS04_329719** SeqNo: **4879322** PrepDate: **19-Dec-2018** DF: **50**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%D	%D Limit	Qual
Iron	0.6201	10.0					0.101	0	10	J
Manganese	0.0500	0.250					0.004999	0	10	U

The following samples were analyzed in this batch: HS18120569-01 HS18120569-02 HS18120569-03 HS18120569-04 HS18120569-05

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: R329600 **Instrument: VOA9** **Method: SW8260**

MBLK Sample ID: **VBLKW-181219** Units: **UG/L** Analysis Date: **19-Dec-2018 14:12**
Client ID: Run ID: **VOA9_329600** SeqNo: **4873544** 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-Trichloroethane	0.50	1.0								U
1,1-Dichloroethane	0.50	1.0								U
1,1-Dichloroethene	0.50	1.0								U
1,1-Dichloropropene	0.50	1.0								U
1,2,3-Trichlorobenzene	0.50	1.0								U
1,2,3-Trichloropropane	0.50	1.0								U
1,2,4-Trichlorobenzene	0.50	1.0								U
1,2,4-Trimethylbenzene	0.50	1.0								U
1,2-Dibromo-3-chloropropane	0.50	1.0								U
1,2-Dibromoethane	0.50	1.0								U
1,2-Dichlorobenzene	0.50	1.0								U
1,2-Dichloroethane	0.50	1.0								U
1,2-Dichloropropane	0.50	1.0								U
1,3,5-Trimethylbenzene	0.50	1.0								U
1,3-Dichlorobenzene	0.50	1.0								U
1,3-Dichloropropane	0.50	1.0								U
1,4-Dichlorobenzene	0.50	1.0								U
2,2-Dichloropropane	0.50	1.0								U
2-Butanone	1.0	2.0								U
2-Chlorotoluene	0.50	1.0								U
2-Hexanone	1.0	2.0								U
4-Chlorotoluene	0.50	1.0								U
4-Isopropyltoluene	0.50	1.0								U
4-Methyl-2-pentanone	1.0	2.0								U
Acetone	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
Bromomethane	0.50	1.0								U

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: R329600 **Instrument: VOA9** **Method: SW8260**

MBLK Sample ID: **VBLKW-181219** Units: **UG/L** Analysis Date: **19-Dec-2018 14:12**
Client ID: Run ID: **VOA9_329600** SeqNo: **4873544** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
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	0.50	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	*45.52*	*1.0*	*50*	*0*	*91.0*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*48.78*	*1.0*	*50*	*0*	*97.6*	*85 - 114*				
Surr: Dibromofluoromethane	*43.82*	*1.0*	*50*	*0*	*87.6*	*80 - 119*				
Surr: Toluene-d8	*52.21*	*1.0*	*50*	*0*	*104*	*89 - 112*				

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: R329600 **Instrument: VOA9** **Method: SW8260**

LCS Sample ID: **VLCSW-1812019** Units: **UG/L** Analysis Date: **19-Dec-2018 13:23**
Client ID: Run ID: **VOA9_329600** SeqNo: **4873543** 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	21.45	1.0	20	0	107	78 - 124				
1,1,1-Trichloroethane	19.64	1.0	20	0	98.2	74 - 131				
1,1,2,2-Tetrachloroethane	21.9	1.0	20	0	109	71 - 121				
1,1,2-Trichloroethane	21.95	1.0	20	0	110	80 - 119				
1,1-Dichloroethane	20.76	1.0	20	0	104	77 - 125				
1,1-Dichloroethene	18.1	1.0	20	0	90.5	71 - 131				
1,1-Dichloropropene	22.21	1.0	20	0	111	78 - 125				
1,2,3-Trichlorobenzene	22.77	1.0	20	0	114	69 - 129				
1,2,3-Trichloropropane	21.86	1.0	20	0	109	73 - 122				
1,2,4-Trichlorobenzene	22.37	1.0	20	0	112	69 - 130				
1,2,4-Trimethylbenzene	23.07	1.0	20	0	115	76 - 124				
1,2-Dibromo-3-chloropropane	19.95	1.0	20	0	99.7	62 - 128				
1,2-Dibromoethane	22.07	1.0	20	0	110	77 - 121				
1,2-Dichlorobenzene	21.09	1.0	20	0	105	80 - 119				
1,2-Dichloroethane	20.53	1.0	20	0	103	73 - 128				
1,2-Dichloropropane	22.8	1.0	20	0	114	78 - 122				
1,3,5-Trimethylbenzene	22.87	1.0	20	0	114	75 - 124				
1,3-Dichlorobenzene	21.54	1.0	20	0	108	80 - 119				
1,3-Dichloropropane	21.79	1.0	20	0	109	80 - 119				
1,4-Dichlorobenzene	22.65	1.0	20	0	113	79 - 118				
2,2-Dichloropropane	20.46	1.0	20	0	102	60 - 139				
2-Butanone	43.93	2.0	40	0	110	56 - 143				
2-Chlorotoluene	22.31	1.0	20	0	112	79 - 122				
2-Hexanone	47.86	2.0	40	0	120	57 - 139				
4-Chlorotoluene	22.58	1.0	20	0	113	78 - 122				
4-Isopropyltoluene	23.84	1.0	20	0	119	77 - 127				
4-Methyl-2-pentanone	47.37	2.0	40	0	118	67 - 130				
Acetone	43.94	2.0	40	0	110	39 - 160				
Benzene	22.47	1.0	20	0	112	79 - 120				
Bromobenzene	21.43	1.0	20	0	107	80 - 120				
Bromochloromethane	21.73	1.0	20	0	109	78 - 123				
Bromodichloromethane	20.41	1.0	20	0	102	79 - 125				
Bromoform	19.22	1.0	20	0	96.1	66 - 130				
Bromomethane	17.47	1.0	20	0	87.3	53 - 141				

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: R329600 **Instrument: VOA9** **Method: SW8260**

LCS Sample ID: **VLCSW-1812019** Units: **UG/L** Analysis Date: **19-Dec-2018 13:23**
Client ID: Run ID: **VOA9_329600** SeqNo: **4873543** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Carbon disulfide	43	2.0	40	0	108	64 - 133				
Carbon tetrachloride	20.87	1.0	20	0	104	72 - 136				
Chlorobenzene	21.48	1.0	20	0	107	82 - 118				
Chloroethane	18.03	1.0	20	0	90.2	60 - 138				
Chloroform	19.61	1.0	20	0	98.0	79 - 124				
Chloromethane	18.29	1.0	20	0	91.4	50 - 139				
cis-1,2-Dichloroethene	20.47	1.0	20	0	102	78 - 123				
cis-1,3-Dichloropropene	22.46	1.0	20	0	112	75 - 124				
Dibromochloromethane	21.34	1.0	20	0	107	74 - 126				
Dibromomethane	20.94	1.0	20	0	105	79 - 123				
Dichlorodifluoromethane	19.71	1.0	20	0	98.5	32 - 152				
Ethylbenzene	22.22	1.0	20	0	111	79 - 121				
Hexachlorobutadiene	27.23	1.0	20	0	136	66 - 134				S
Isopropylbenzene	22.91	1.0	20	0	115	72 - 131				
m,p-Xylene	45.06	2.0	40	0	113	80 - 121				
Methylene chloride	21.6	2.0	20	0	108	74 - 124				
Naphthalene	23.36	1.0	20	0	117	61 - 128				
n-Butylbenzene	24.55	1.0	20	0	123	75 - 128				
n-Propylbenzene	23.46	1.0	20	0	117	76 - 126				
o-Xylene	22.37	1.0	20	0	112	78 - 122				
sec-Butylbenzene	23.63	1.0	20	0	118	77 - 126				
Styrene	23	1.0	20	0	115	78 - 123				
tert-Butylbenzene	23.12	1.0	20	0	116	78 - 124				
Tetrachloroethene	22.72	1.0	20	0	114	74 - 129				
Toluene	22.34	1.0	20	0	112	80 - 121				
trans-1,2-Dichloroethene	20.96	1.0	20	0	105	75 - 124				
trans-1,3-Dichloropropene	19.75	1.0	20	0	98.8	73 - 127				
Trichloroethene	21.24	1.0	20	0	106	79 - 123				
Trichlorofluoromethane	17.94	1.0	20	0	89.7	65 - 141				
Vinyl chloride	19.66	1.0	20	0	98.3	58 - 137				
Surr: 1,2-Dichloroethane-d4	*43.64*	*1.0*	*50*	*0*	*87.3*	*81 - 118*				
Surr: 4-Bromofluorobenzene	*51.2*	*1.0*	*50*	*0*	*102*	*85 - 114*				
Surr: Dibromofluoromethane	*44.46*	*1.0*	*50*	*0*	*88.9*	*80 - 119*				
Surr: Toluene-d8	*52.77*	*1.0*	*50*	*0*	*106*	*89 - 112*				

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: R329600 **Instrument: VOA9** **Method: SW8260**

MS Sample ID: **HS18120734-01MS** Units: **UG/L** Analysis Date: **19-Dec-2018 15:26**
Client ID: Run ID: **VOA9_329600** SeqNo: **4873547** 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	23.32	1.0	20	0	117	78 - 124				
1,1,1-Trichloroethane	21.6	1.0	20	0	108	74 - 131				
1,1,2,2-Tetrachloroethane	22.82	1.0	20	0	114	71 - 121				
1,1,2-Trichloroethane	23.2	1.0	20	0	116	80 - 119				
1,1-Dichloroethane	22.17	1.0	20	0	111	77 - 125				
1,1-Dichloroethene	18.5	1.0	20	0	92.5	71 - 131				
1,1-Dichloropropene	24.88	1.0	20	0	124	78 - 125				
1,2,3-Trichlorobenzene	22.86	1.0	20	0	114	69 - 129				
1,2,3-Trichloropropane	21.74	1.0	20	0	109	73 - 122				
1,2,4-Trichlorobenzene	22.74	1.0	20	0	114	69 - 130				
1,2,4-Trimethylbenzene	24.72	1.0	20	0	124	76 - 124				
1,2-Dibromo-3-chloropropane	20.38	1.0	20	0	102	62 - 128				
1,2-Dibromoethane	23.33	1.0	20	0	117	77 - 121				
1,2-Dichlorobenzene	22.08	1.0	20	0	110	80 - 119				
1,2-Dichloroethane	22.31	1.0	20	0	112	73 - 128				
1,2-Dichloropropane	24.66	1.0	20	0	123	78 - 122				S
1,3,5-Trimethylbenzene	24.62	1.0	20	0	123	75 - 124				
1,3-Dichlorobenzene	22.54	1.0	20	0	113	80 - 119				
1,3-Dichloropropane	23.31	1.0	20	0	117	80 - 119				
1,4-Dichlorobenzene	23.73	1.0	20	0	119	79 - 118				S
2,2-Dichloropropane	22.39	1.0	20	0	112	60 - 139				
2-Butanone	44.1	2.0	40	0	110	56 - 143				
2-Chlorotoluene	23.89	1.0	20	0	119	79 - 122				
2-Hexanone	48.46	2.0	40	0	121	57 - 139				
4-Chlorotoluene	24.02	1.0	20	0	120	78 - 122				
4-Isopropyltoluene	25.44	1.0	20	0	127	77 - 127				S
4-Methyl-2-pentanone	47.94	2.0	40	0	120	67 - 130				
Acetone	38.91	2.0	40	0	97.3	39 - 160				
Benzene	24.5	1.0	20	0	123	79 - 120				S
Bromobenzene	22.78	1.0	20	0	114	80 - 120				
Bromochloromethane	22.81	1.0	20	0	114	78 - 123				
Bromodichloromethane	22.36	1.0	20	0	112	79 - 125				
Bromoform	20.12	1.0	20	0	101	66 - 130				
Bromomethane	10.78	1.0	20	0	53.9	53 - 141				

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: R329600 **Instrument: VOA9** **Method: SW8260**

MS Sample ID: **HS18120734-01MS** Units: **UG/L** Analysis Date: **19-Dec-2018 15:26**
Client ID: Run ID: **VOA9_329600** SeqNo: **4873547** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit Qual
Carbon disulfide	45.07	2.0	40	0	113	64 - 133			
Carbon tetrachloride	24.07	1.0	20	0	120	72 - 136			
Chlorobenzene	23.31	1.0	20	0	117	82 - 118			
Chloroethane	18.58	1.0	20	0	92.9	60 - 138			
Chloroform	21.38	1.0	20	0	107	79 - 124			
Chloromethane	18.23	1.0	20	0	91.1	50 - 139			
cis-1,2-Dichloroethene	24.21	1.0	20	2.687	108	78 - 123			
cis-1,3-Dichloropropene	23.58	1.0	20	0	118	75 - 124			
Dibromochloromethane	23.08	1.0	20	0	115	74 - 126			
Dibromomethane	22.57	1.0	20	0	113	79 - 123			
Dichlorodifluoromethane	10.41	1.0	20	0	52.0	32 - 152			
Ethylbenzene	24.03	1.0	20	0	120	79 - 121			
Hexachlorobutadiene	26.9	1.0	20	0	135	66 - 134			S
Isopropylbenzene	25.07	1.0	20	0	125	72 - 131			
m,p-Xylene	48.89	2.0	40	0	122	80 - 121			S
Methylene chloride	23.42	2.0	20	0	117	74 - 124			
Naphthalene	23.64	1.0	20	0	118	61 - 128			
n-Butylbenzene	25.98	1.0	20	0	130	75 - 128			S
n-Propylbenzene	25.06	1.0	20	0	125	76 - 126			
o-Xylene	24.52	1.0	20	0	123	78 - 122			S
sec-Butylbenzene	25.5	1.0	20	0	127	77 - 126			S
Styrene	24.6	1.0	20	0	123	78 - 123			S
tert-Butylbenzene	24.94	1.0	20	0	125	78 - 124			S
Tetrachloroethene	24.23	1.0	20	0	121	74 - 129			
Toluene	24.29	1.0	20	0	121	80 - 121			S
trans-1,2-Dichloroethene	22.56	1.0	20	0	113	75 - 124			
trans-1,3-Dichloropropene	21.18	1.0	20	0	106	73 - 127			
Trichloroethene	24.47	1.0	20	0.8775	118	79 - 123			
Trichlorofluoromethane	17.99	1.0	20	0	90.0	65 - 141			
Vinyl chloride	16.71	1.0	20	0	83.6	58 - 137			
Surr: 1,2-Dichloroethane-d4	*43.67*	*1.0*	*50*	*0*	*87.3*	*81 - 118*			
Surr: 4-Bromofluorobenzene	*51.51*	*1.0*	*50*	*0*	*103*	*85 - 114*			
Surr: Dibromofluoromethane	*44.82*	*1.0*	*50*	*0*	*89.6*	*80 - 119*			
Surr: Toluene-d8	*52.8*	*1.0*	*50*	*0*	*106*	*89 - 112*			

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: R329600 **Instrument: VOA9** **Method: SW8260**

MSD Sample ID: **HS18120734-01MSD** Units: **UG/L** Analysis Date: **19-Dec-2018 15:51**
Client ID: Run ID: **VOA9_329600** SeqNo: **4873548** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
1,1,1,2-Tetrachloroethane	22.22	1.0	20	0	111	78 - 124	23.32	4.81	20	
1,1,1-Trichloroethane	20.38	1.0	20	0	102	74 - 131	21.6	5.84	20	
1,1,2,2-Tetrachloroethane	22.36	1.0	20	0	112	71 - 121	22.82	2.04	20	
1,1,2-Trichloroethane	22.38	1.0	20	0	112	80 - 119	23.2	3.64	20	
1,1-Dichloroethane	21.22	1.0	20	0	106	77 - 125	22.17	4.42	20	
1,1-Dichloroethene	18.27	1.0	20	0	91.4	71 - 131	18.5	1.22	20	
1,1-Dichloropropene	23.42	1.0	20	0	117	78 - 125	24.88	6.07	20	
1,2,3-Trichlorobenzene	22.48	1.0	20	0	112	69 - 129	22.86	1.65	20	
1,2,3-Trichloropropane	21.67	1.0	20	0	108	73 - 122	21.74	0.315	20	
1,2,4-Trichlorobenzene	22.05	1.0	20	0	110	69 - 130	22.74	3.07	20	
1,2,4-Trimethylbenzene	23.62	1.0	20	0	118	76 - 124	24.72	4.54	20	
1,2-Dibromo-3-chloropropane	19.66	1.0	20	0	98.3	62 - 128	20.38	3.59	20	
1,2-Dibromoethane	22.49	1.0	20	0	112	77 - 121	23.33	3.68	20	
1,2-Dichlorobenzene	21.13	1.0	20	0	106	80 - 119	22.08	4.4	20	
1,2-Dichloroethane	21.39	1.0	20	0	107	73 - 128	22.31	4.18	20	
1,2-Dichloropropane	23.86	1.0	20	0	119	78 - 122	24.66	3.3	20	
1,3,5-Trimethylbenzene	23.29	1.0	20	0	116	75 - 124	24.62	5.55	20	
1,3-Dichlorobenzene	21.54	1.0	20	0	108	80 - 119	22.54	4.53	20	
1,3-Dichloropropane	22.62	1.0	20	0	113	80 - 119	23.31	3	20	
1,4-Dichlorobenzene	22.88	1.0	20	0	114	79 - 118	23.73	3.64	20	
2,2-Dichloropropane	20.98	1.0	20	0	105	60 - 139	22.39	6.5	20	
2-Butanone	43.88	2.0	40	0	110	56 - 143	44.1	0.488	20	
2-Chlorotoluene	22.65	1.0	20	0	113	79 - 122	23.89	5.34	20	
2-Hexanone	48.28	2.0	40	0	121	57 - 139	48.46	0.379	20	
4-Chlorotoluene	23.02	1.0	20	0	115	78 - 122	24.02	4.27	20	
4-Isopropyltoluene	24.51	1.0	20	0	123	77 - 127	25.44	3.7	20	
4-Methyl-2-pentanone	47.49	2.0	40	0	119	67 - 130	47.94	0.944	20	
Acetone	43.99	2.0	40	0	110	39 - 160	38.91	12.3	20	
Benzene	23.02	1.0	20	0	115	79 - 120	24.5	6.22	20	
Bromobenzene	21.66	1.0	20	0	108	80 - 120	22.78	5.05	20	
Bromochloromethane	22.48	1.0	20	0	112	78 - 123	22.81	1.46	20	
Bromodichloromethane	21.71	1.0	20	0	109	79 - 125	22.36	2.97	20	
Bromoform	19.3	1.0	20	0	96.5	66 - 130	20.12	4.19	20	
Bromomethane	9.701	1.0	20	0	48.5	53 - 141	10.78	10.5	20	S

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: R329600 **Instrument: VOA9** **Method: SW8260**

MSD Sample ID: **HS18120734-01MSD** Units: **UG/L** Analysis Date: **19-Dec-2018 15:51**
Client ID: Run ID: **VOA9_329600** SeqNo: **4873548** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	RPD %RPD	RPD Limit	Qual
Carbon disulfide	43.1	2.0	40	0	108	64 - 133	45.07	4.46	20	
Carbon tetrachloride	22.67	1.0	20	0	113	72 - 136	24.07	5.99	20	
Chlorobenzene	22.05	1.0	20	0	110	82 - 118	23.31	5.52	20	
Chloroethane	16.63	1.0	20	0	83.1	60 - 138	18.58	11.1	20	
Chloroform	20.2	1.0	20	0	101	79 - 124	21.38	5.67	20	
Chloromethane	18.04	1.0	20	0	90.2	50 - 139	18.23	1.03	20	
cis-1,2-Dichloroethene	23.17	1.0	20	2.687	102	78 - 123	24.21	4.4	20	
cis-1,3-Dichloropropene	22.96	1.0	20	0	115	75 - 124	23.58	2.65	20	
Dibromochloromethane	22.14	1.0	20	0	111	74 - 126	23.08	4.18	20	
Dibromomethane	22.09	1.0	20	0	110	79 - 123	22.57	2.17	20	
Dichlorodifluoromethane	9.713	1.0	20	0	48.6	32 - 152	10.41	6.91	20	
Ethylbenzene	22.94	1.0	20	0	115	79 - 121	24.03	4.62	20	
Hexachlorobutadiene	25.6	1.0	20	0	128	66 - 134	26.9	4.97	20	
Isopropylbenzene	23.75	1.0	20	0	119	72 - 131	25.07	5.41	20	
m,p-Xylene	46.6	2.0	40	0	116	80 - 121	48.89	4.8	20	
Methylene chloride	22.17	2.0	20	0	111	74 - 124	23.42	5.49	20	
Naphthalene	23.33	1.0	20	0	117	61 - 128	23.64	1.32	20	
n-Butylbenzene	24.91	1.0	20	0	125	75 - 128	25.98	4.2	20	
n-Propylbenzene	23.78	1.0	20	0	119	76 - 126	25.06	5.24	20	
o-Xylene	23.15	1.0	20	0	116	78 - 122	24.52	5.76	20	
sec-Butylbenzene	24.17	1.0	20	0	121	77 - 126	25.5	5.32	20	
Styrene	23.59	1.0	20	0	118	78 - 123	24.6	4.18	20	
tert-Butylbenzene	23.79	1.0	20	0	119	78 - 124	24.94	4.7	20	
Tetrachloroethene	23.5	1.0	20	0	118	74 - 129	24.23	3.05	20	
Toluene	23.06	1.0	20	0	115	80 - 121	24.29	5.16	20	
trans-1,2-Dichloroethene	20.91	1.0	20	0	105	75 - 124	22.56	7.59	20	
trans-1,3-Dichloropropene	20.37	1.0	20	0	102	73 - 127	21.18	3.89	20	
Trichloroethene	23.12	1.0	20	0.8775	111	79 - 123	24.47	5.68	20	
Trichlorofluoromethane	17.26	1.0	20	0	86.3	65 - 141	17.99	4.19	20	
Vinyl chloride	16.07	1.0	20	0	80.3	58 - 137	16.71	3.91	20	
Surr: 1,2-Dichloroethane-d4	*43.51*	*1.0*	*50*	*0*	*87.0*	*81 - 118*	*43.67*	*0.368*	*20*	
Surr: 4-Bromofluorobenzene	*51.46*	*1.0*	*50*	*0*	*103*	*85 - 114*	*51.51*	*0.0905*	*20*	
Surr: Dibromofluoromethane	*44.68*	*1.0*	*50*	*0*	*89.4*	*80 - 119*	*44.82*	*0.318*	*20*	
Surr: Toluene-d8	*52.72*	*1.0*	*50*	*0*	*105*	*89 - 112*	*52.8*	*0.158*	*20*	

ALS Houston, US Date: 04-Jan-19

Client:	Bhate Environmental Associates, Inc.
Project:	LHAAP-58
WorkOrder:	HS18120569

QC BATCH REPORT

Batch ID: R329600	**Instrument:** VOA9	**Method:** SW8260

The following samples were analyzed in this batch:

HS18120569-01	HS18120569-02	HS18120569-03	HS18120569-04
HS18120569-05	HS18120569-06		

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: 135598 **Instrument: UV-2450** **Method: E365.3**

MBLK Sample ID: **MBLK-135598** Units: **mg/L** Analysis Date: **13-Dec-2018 15:15**
Client ID: Run ID: **UV-2450_329185** SeqNo: **4863283** PrepDate: **13-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.0400	0.0500								U

LCS Sample ID: **LCS-135598** Units: **mg/L** Analysis Date: **13-Dec-2018 15:15**
Client ID: Run ID: **UV-2450_329185** SeqNo: **4863282** PrepDate: **13-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.241	0.0500	0.25	0	96.4	80 - 120				

MS Sample ID: **HS18120487-01MS** Units: **mg/L** Analysis Date: **13-Dec-2018 15:15**
Client ID: Run ID: **UV-2450_329185** SeqNo: **4863280** PrepDate: **13-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.339	0.0500	0.25	0.113	90.4	80 - 120				

MSD Sample ID: **HS18120487-01MSD** Units: **mg/L** Analysis Date: **13-Dec-2018 15:15**
Client ID: Run ID: **UV-2450_329185** SeqNo: **4863281** PrepDate: **13-Dec-2018** DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Phosphorus, Total (As P)	0.338	0.0500	0.25	0.113	90.0	80 - 120	0.339	0.295	20	

The following samples were analyzed in this batch: HS18120569-01 HS18120569-02 HS18120569-03 HS18120569-04 HS18120569-05

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: R329695 **Instrument: ManTech01** **Method: SM2320B**

MBLK Sample ID: **WBLKW1-181220** Units: **mg/L** Analysis Date: **20-Dec-2018 20:45**
Client ID: Run ID: **ManTech01_329695** SeqNo: **4876171** 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: **LCS1-181220** Units: **mg/L** Analysis Date: **20-Dec-2018 20:54**
Client ID: Run ID: **ManTech01_329695** SeqNo: **4876172** 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)	1061	5.00	1000	0	106	85 - 115				

LCSD Sample ID: **LCSD1-181220** Units: **mg/L** Analysis Date: **20-Dec-2018 21:04**
Client ID: Run ID: **ManTech01_329695** SeqNo: **4876173** 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)	1057	5.00	1000	0	106	85 - 115	1061	0.378	20	

DUP Sample ID: **HS18120927-05DUP** Units: **mg/L** Analysis Date: **20-Dec-2018 23:05**
Client ID: Run ID: **ManTech01_329695** SeqNo: **4876188** 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)	650.2	5.00					647.6	0.402	20	

The following samples were analyzed in this batch: HS18120569-01 HS18120569-02 HS18120569-03 HS18120569-04 HS18120569-05

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: R329896 **Instrument: ICS3K2** **Method: SW9056**

MBLK Sample ID: **WBLKW1-122418** Units: **mg/L** Analysis Date: **24-Dec-2018 18:30**
Client ID: Run ID: **ICS3K2_329896** SeqNo: **4881426** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	0.500	0.500								U
Sulfate	0.500	0.500								U

LCS Sample ID: **WLCSW1-122418** Units: **mg/L** Analysis Date: **24-Dec-2018 18:51**
Client ID: Run ID: **ICS3K2_329896** SeqNo: **4881427** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	19.65	0.500	20	0	98.2	80 - 120				
Sulfate	19.18	0.500	20	0	95.9	80 - 120				

LCSD Sample ID: **WLCSDW1-122418** Units: **mg/L** Analysis Date: **24-Dec-2018 19:13**
Client ID: Run ID: **ICS3K2_329896** SeqNo: **4881428** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	19.53	0.500	20	0	97.7	80 - 120	19.65	0.592	20	
Sulfate	18.97	0.500	20	0	94.9	80 - 120	19.18	1.08	20	

MS Sample ID: **HS18120569-04MS** Units: **mg/L** Analysis Date: **24-Dec-2018 21:01**
Client ID: **35AWW23_121018** Run ID: **ICS3K2_329896** SeqNo: **4881433** PrepDate: DF: **20**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	760.9	10.0	200	578.1	91.4	80 - 120				
Sulfate	173	10.0	200	11.05	81.0	80 - 120				

MSD Sample ID: **HS18120569-04MSD** Units: **mg/L** Analysis Date: **24-Dec-2018 21:22**
Client ID: **35AWW23_121018** Run ID: **ICS3K2_329896** SeqNo: **4881434** PrepDate: DF: **20**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Chloride	764.8	10.0	200	578.1	93.4	80 - 120	760.9	0.509	20	
Sulfate	176.9	10.0	200	11.05	82.9	80 - 120	173	2.27	20	

The following samples were analyzed in this batch: HS18120569-01 HS18120569-02 HS18120569-03 HS18120569-04 HS18120569-05

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: R329899 **Instrument: ICS2100** **Method: SW9056**

MBLK Sample ID: **WBLKW1-121118** Units: **mg/L** Analysis Date: **11-Dec-2018 12:27**
Client ID: Run ID: **ICS2100_329899** SeqNo: **4881514** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
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: **WLCSW1-121118** Units: **mg/L** Analysis Date: **11-Dec-2018 12:42**
Client ID: Run ID: **ICS2100_329899** SeqNo: **4881515** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Nitrogen, Nitrate (As N)	3.958	0.100	4	0	99.0	80 - 120				
Nitrogen, Nitrite (As N)	4.395	0.100	4	0	110	80 - 120				
Sulfate	20.21	0.500	20	0	101	80 - 120				

LCSD Sample ID: **WLCSDW1-121118** Units: **mg/L** Analysis Date: **11-Dec-2018 12:56**
Client ID: Run ID: **ICS2100_329899** SeqNo: **4881516** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Nitrogen, Nitrate (As N)	3.852	0.100	4	0	96.3	80 - 120	3.958	2.71	20	
Nitrogen, Nitrite (As N)	4.275	0.100	4	0	107	80 - 120	4.395	2.77	20	
Sulfate	19.6	0.500	20	0	98.0	80 - 120	20.21	3.05	20	

MS Sample ID: **HS18120545-04MS** Units: **mg/L** Analysis Date: **11-Dec-2018 13:37**
Client ID: Run ID: **ICS2100_329899** SeqNo: **4881517** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Nitrogen, Nitrate (As N)	2.143	0.100	2	0	107	80 - 120				
Nitrogen, Nitrite (As N)	2.155	0.100	2	0	108	80 - 120				
Sulfate	233.4	0.500	10	228	54.5	80 - 120				SEO

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: R329899 **Instrument: ICS2100** **Method: SW9056**

MS Sample ID: **HS18120487-01MS** Units: **mg/L** Analysis Date: **11-Dec-2018 17:16**
Client ID: Run ID: **ICS2100_329899** SeqNo: **4881522** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Nitrogen, Nitrate (As N)	1.967	0.100	2	0.15	90.8	80 - 120				
Nitrogen, Nitrite (As N)	2.095	0.100	2	0	105	80 - 120				
Sulfate	51.45	0.500	10	43.21	82.4	80 - 120				O

MSD Sample ID: **HS18120545-04MSD** Units: **mg/L** Analysis Date: **11-Dec-2018 13:52**
Client ID: Run ID: **ICS2100_329899** SeqNo: **4881518** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Nitrogen, Nitrate (As N)	2.065	0.100	2	0	103	80 - 120	2.143	3.71	20	
Nitrogen, Nitrite (As N)	2.122	0.100	2	0	106	80 - 120	2.155	1.54	20	
Sulfate	227.1	0.500	10	228	-8.64	80 - 120	233.4	2.74	20	SEO

MSD Sample ID: **HS18120487-01MSD** Units: **mg/L** Analysis Date: **11-Dec-2018 17:30**
Client ID: Run ID: **ICS2100_329899** SeqNo: **4881523** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Nitrogen, Nitrate (As N)	1.975	0.100	2	0.15	91.2	80 - 120	1.967	0.406	20	
Nitrogen, Nitrite (As N)	2.094	0.100	2	0	105	80 - 120	2.095	0.0477	20	
Sulfate	51.31	0.500	10	43.21	81.0	80 - 120	51.45	0.282	20	O

The following samples were analyzed in this batch: HS18120569-01 HS18120569-02 HS18120569-03 HS18120569-04 HS18120569-05

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: HS18120569

QC BATCH REPORT

Batch ID: R329956 **Instrument: WetChem_HS** **Method: E376.1**

MBLK Sample ID: **MBLK-R329956** Units: **mg/L** Analysis Date: **17-Dec-2018 16:30**
Client ID: Run ID: **WetChem_HS_329956** SeqNo: **4882426** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	1.00	1.00								U

LCS Sample ID: **LCS-R329956** Units: **mg/L** Analysis Date: **17-Dec-2018 16:30**
Client ID: Run ID: **WetChem_HS_329956** SeqNo: **4882425** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	22.24	1.00	25	0	89.0	80 - 120				

LCSD Sample ID: **LCSD-R329956** Units: **mg/L** Analysis Date: **17-Dec-2018 16:30**
Client ID: Run ID: **WetChem_HS_329956** SeqNo: **4882424** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	22.44	1.00	25	0	89.8	80 - 120	22.24	0.895	20	

MS Sample ID: **HS18120569-04MS** Units: **mg/L** Analysis Date: **17-Dec-2018 16:30**
Client ID: **35AWW23_121018** Run ID: **WetChem_HS_329956** SeqNo: **4882427** PrepDate: DF: **1**

Analyte	Result	PQL	SPK Val	SPK Ref Value	%REC	Control Limit	RPD Ref Value	%RPD	RPD Limit	Qual
Sulfide	24.64	1.00	25	0.04	98.4	80 - 120				

The following samples were analyzed in this batch: HS18120569-01 HS18120569-02 HS18120569-03 HS18120569-04 HS18120569-05

ALS Houston, US Date: 04-Jan-19

Client: Bhate Environmental Associates, Inc.
Project: LHAAP-58
WorkOrder: **HS18120569**

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

CERTIFICATIONS,ACCREDITATIONS & LICENSES

Agency	Number	Expire Date
Arkansas	88-0356	27-Mar-2019
Texas	T10470231-18-21	30-Apr-2019
North Dakota	R193 2018-2019	30-Apr-2019
Illinois	004438	29-Jun-2019
Louisiana	03087	30-Jun-2019
Kentucky	123043 - 2018	30-Apr-2019
Kansas	E-10352 2018-2019	31-Jul-2019
Oklahoma	2018-156	31-Aug-2019

ALS Houston, US Date: 04-Jan-19

Sample Receipt Checklist

Client Name: Bhate Environmental
Work Order: HS18120569
Date/Time Received: **11-Dec-2018 10:12**
Received by: **JRM**

Checklist completed by: *Jared R. Makan* eSignature 11-Dec-2018 Date
Reviewed by: *RJ Modashia* eSignature 11-Dec-2018 Date

Matrices: **Water**
Carrier name: **ALS Courier**

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 ☑
Chain of custody present?	Yes ☑	No ☐	
Chain of custody signed when relinquished and received?	Yes ☑	No ☐	
Chain of custody agrees with sample labels?	Yes ☑	No ☐	
Samples in proper container/bottle?	Yes ☑	No ☐	
Sample containers intact?	Yes ☑	No ☐	
TX1005 solids received in hermetically sealed vials?	Yes ☐	No ☐	N/A ☑
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):	2.4c/2.7c UC/C	IR25	
Cooler(s)/Kit(s):	44492		
Date/Time sample(s) sent to storage:	12/11/2018 13:10		
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:

bhate

1608 13th Avenue South, Suite 300
Birmingham Alabama 35205
Tel: 205-918-4000
Fax: 205-918-4050

Chain of Custody and Analytical Request

Page: _____ of _____

Project/Phase No: NWO1312.0150

COC Number(1): _____

LIMS Number: _____

Facility/Base I.D.: LHAAP

Project/Site Name: LHAAP / Site 58

Client Name:

Collected by: Scott Beesinger

Sample Analysis Requested (5) / Quality Assurance Samples (6)

Field Sample ID (30 Characters Max)	ERPIMS LOCID (15 Characters Max)	Date Collected (dd-mmm-yyyy)	Time Collected (Military) (hhmm)	Sample Depth (beginning - ending)	SA Code (2)	Sample Number (3)	Sample Matrix (4)	Number of containers	VOC	MEE	TOC	Carbon Dioxide	Total Phosphorous	Total Manganese & Iron	Dissolved Manganese & Iron	Sulfide	Arsenic	ANIONS	Ambient Blank Lot Control Number	Equipment Blank Lot Control Number	Trip Blank Lot Control Number	Cooler ID
35AWW20_121018		10DEC2018	0910	-	N		WG	14	X	X	X	X	X	X	X	X		X				
35AWW24_121018		10DEC2018	1015	-	N		WG	14	X	X	X	X	X	X	X	X		X				
35AWW19_121018		10DEC2018	1115	-	N		WG	14	X	X	X	X	X	X	X	X		X				
35AWW23_121018		10DEC2018	1230		N		WG	14	X	X	X	X	X	X	X	X		X				
LHSMW07_121018		10DEC2018	1330		N		WG	14	X	X	X	X	X	X	X	X		X				
TRip BLANK		10DEC2018		-	TB		W	2	X													
				-																		
				-																		
				-																		
				-																		
				-																		

HS18120569
Bhate Environmental Associates, Inc.
LHAAP-58

COMMENTS:

Custody Transfers Prior to Receipt by Laboratory

Relinquished By (Signed)	Date	Time	Received by (signed)	Date	Time
1. Scott Beesinger	12/10/18	1500	1. [signature]	12/11/18	10:12 [illegible]
2.			2.		
3.			3.		

Sample Delivery Details / Laboratory Receipt

Delivered Directly to Lab: _____ Shipped No.:

Method of Shipment: _____

Fed Ex Airbill Number:

Analytical Lab: ALS 10450 Stancliff Rd, Suite 210 Houston, TX 77099 (281) 530-5656

ATTN: SONIA WEST Lab Recipient: Delivery Date/Time:

1.) Chain of Custody Number = date collected + custody number (e.g. 09-02-1999-01)
2.) Sample Type (SA) Codes: N = Normal Sample, TB = Trip Blank (-c) Sample, FD = Field Duplicate (-a) Samples, FR = Field Replicate (-b) Samples, EB = Equipment Blank (-d) Samples, MS = Matrix Spike, SD = Matrix Spike Duplicate, AB = Ambient Blank (-e)
3.) Sample Number: Unique sample number collected from a particular location per day. (e.g. Groundwater sample collected from MW-1 on 10/10/99 = 01, if sampled again on 10/10/99 = 02, etc.)
4.) Matrix Codes: GS = Soil Gas, WG = Groundwater, WS = Surface Water, SO = Soil, SE = Sediment, SL = Sludge, SS = Surface Soil Samples, WQ = Aqueous Blank Samples (trip, equipment, ambient, etc), SQ = Soil Blanks
5.) Sample Analysis Requested: Analytical method requested and number of containers provided for each.
6.) Quality assurance samples are assigned by date (ddmmyy) and the sample number associated with the sample (01, 02, etc) (e.g. Equipment blank collected in association with MW-1 on 10/10/99 will be designated 10109901 in the Equipment Blank Lot Control

Cooler 44492
Temp 2.4
1225
CF 0.3

00944464

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

44492

CUSTODY SEAL
Date: 12/10/18 Time: 1500
Name: Brett Dressinger
Company: ALS
Seal Broken By:
Date: 12/11/18

44492

DEC 11 2018

UPS Next Day Air®
UPS Worldwide Express®
Shipping Document

WEIGHT | LTR | PAK | WEIGHT | DIMENSIONAL WEIGHT If Applicable | LARGE PACKAGE | SHIPPER RELEASE

44492

EXPRESS (INT'L)
DOCUMENTS ONLY
SATURDAY DELIVERY

J461 688 017 8
J461 688 017 8

EXPORT

SHIPMENT FROM
UPS ACCOUNT NO.
REFERENCE NUMBER
TELEPHONE

UPS Next Day Air® 1

DELIVERY TO
TELEPHONE

J461 688 017 8
J461 688 017 8

DELIVERY

TRACKING NUMBER
DATE OF SHIPMENT

01019I120 6/14 BRD United Parcel Service, Louisville, KY

December 27, 2018 Service Request No:R1811942

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

Laboratory Results for: LHAAP / Site 58

Dear RJ,

Enclosed are the results of the sample(s) submitted to our laboratory December 11, 2018
For your reference, these analyses have been assigned our service request number **R1811942.**

All analyses were performed according to our laboratory's quality assurance program. The test results meet requirements of the NELAP standards except as noted in the case narrative report. All results are intended to be considered in their entirety, and ALS Environmental 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. The measurement uncertainty of the results included in this report is within that expected when using the prescribed method(s) for analysis of these samples, and represented by Laboratory Control Sample control limits. Any events, such as QC failures, which may add to the uncertainty are explained in the report narrative.

Please contact me if you have any questions. My extension is 7472. You may also contact me via email at Janice.Jaeger@alsglobal.com.

Respectfully submitted,

ALS Group USA, Corp. dba ALS Environmental

Janice Jaeger
Project Manager

ADDRESS 1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
PHONE +1 585 288 5380 | FAX +1 585 288 8475
ALS Group USA, Corp.
dba ALS Environmental

ALS Environmental
ALS Group USA, Corp
1565 Jefferson Road, Building 300, Suite 360
Rochester, NY 14623
T : +1 585 288 5380
F : +1 585 288 8475
www.alsglobal.com

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ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

ALS Environmental

Client: ALS Environmental - US
Project: LHAAP / Site 58
Sample Matrix: Water

Service Request: R1811942
Date Received: 12/11/2018

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 all summary forms and associated raw data. Analytical procedures performed by the lab are validated in accordance with NELAC standards. Any parameters that are not included in the lab's NELAC accreditation are identified on a "Non-Certified Analytes" report in the Miscellaneous Forms Section of this report. Individual analytical results requiring further explanation are flagged with qualifiers and/or discussed below. The flags are explained in the Report Qualifiers and Definitions page in the Miscellaneous Forms section of this report.

Sample Receipt:

Five water samples were received for analysis at ALS Environmental on 12/11/2018. Any discrepancies noted upon initial sample inspection are noted on the cooler receipt and preservation form included in this data package. The samples were received in good condition and consistent with the accompanying chain of custody form. Samples are refrigerated at 0 to 6°C upon receipt at the lab except for aqueous samples designated for metals analyses, which are stored at room temperature. If any samples were received for the analysis of pH, chlorine residual, sulfite, dissolved oxygen, or ferrous iron, the samples were analyzed past their holding time expiration since these analyses are required to be analyzed within 15 minutes of sampling.

Semivoa GC:

Method Organic Acids, 12/19/2018: The upper control criterion was exceeded for one or more analytes in the Laboratory Control Sample (LCS). There were no detections of the analyte(s) in the associated field samples. The error associated with elevated recovery equates to a high bias. The sample data is not significantly affected. No further corrective action was appropriate.

Method Organic Acids, 12/19/2018: The retention time limit was exceeded for one or more analytes in the Continuing Calibration Verification (CCV). The field samples analyzed in this sequence did not contain the analyte(s) in question. Since the exceedance equates to no hits, the data quality was not significantly affected and no further corrective action was taken.

General Chemistry:

No significant anomalies were noted with this analysis.

Approved by _____ Date 12/27/2018

SAMPLE DETECTION SUMMARY

CLIENT ID: 35AWW20_121018			Lab ID: R1811942-001			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Iron, Divalent (Ferrous Iron)	5.01		0.11	0.50	mg/L	SM 3500-Fe B.4.c
Acetic Acid	8.3		1.0	4.0	mg/L	Organic Acids
Lactic Acid	1.3	J	0.14	2.0	mg/L	Organic Acids

CLIENT ID: 35AWW24_121018			Lab ID: R1811942-002			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Iron, Divalent (Ferrous Iron)	0.54		0.03	0.10	mg/L	SM 3500-Fe B.4.c

CLIENT ID: 35AWW19_121018			Lab ID: R1811942-003			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Iron, Divalent (Ferrous Iron)	4.19		0.11	0.50	mg/L	SM 3500-Fe B.4.c

CLIENT ID: 35AWW23_121018			Lab ID: R1811942-004			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Iron, Divalent (Ferrous Iron)	50		3	10	mg/L	SM 3500-Fe B.4.c
Acetic Acid	570		10	40	mg/L	Organic Acids
Butanoic Acid (Butyric Acid)	140		3.2	20	mg/L	Organic Acids
Propionic Acid	850		1.9	20	mg/L	Organic Acids

CLIENT ID: LHSMW07_121018			Lab ID: R1811942-005			
Analyte	**Results**	**Flag**	**MDL**	**MRL**	**Units**	**Method**
Iron, Divalent (Ferrous Iron)	0.43		0.03	0.10	mg/L	SM 3500-Fe B.4.c
Lactic Acid	1.3	J	0.14	2.0	mg/L	Organic Acids

Sample Receipt Information

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Client: ALS Environmental - US **Service Request:**R1811942

Project: LHAAP / Site 58/NWO1312.0150

SAMPLE CROSS-REFERENCE

SAMPLE #	CLIENT SAMPLE ID	DATE	TIME
R1811942-001	35AWW20_121018	12/10/2018	0910
R1811942-002	35AWW24_121018	12/10/2018	1015
R1811942-003	35AWW19_121018	12/10/2018	1115
R1811942-004	35AWW23_121018	12/10/2018	1230
R1811942-005	LHSMW07_121018	12/10/2018	1330

00944475

bhate ENVIRONMENTAL CONSTRUCTION MILITARY

Page: ____ of ____

Project/Phase No: NWO1312.0150

COC Number(1): ____

LIMS Number: ____

1608 13th Avenue South, Suite 300
Birmingham Alabama 35205
Tel: 205-918-4000
Fax: 205-918-4050

Chain of Custody and Analytical Request

Facility/Base I.D.: LHAAP

Project/Site Name: LHAAP / Site 58

Client Name:

Collected by: Scott Beesinger

Field Sample ID (30 Characters Max)	ERPIMS LOCID (15 Characters Max)	Date Collected (dd-mmm-yyyy)	Time Collected (Military) (hhmm)	Sample Depth (beginning - ending)	SA Code (2)	Sample Number (3)	Sample Matrix (4)	Number of containers	VFA	Ferrous Iron								Ambient Blank Lot Control Number	Equipment Blank Lot Control Number	Trip Blank Lot Control Number	Cooler ID
								Sample Analysis Requested (5)										Quality Assurance Samples (6)			
35AWW19_121018		10 DEC 2018	0910	-	N		WG	2	X	X											
35AWW24_121018		10 DEC 2018	1015	-	N		WG	2	X	X											
35AWW24_121018		10 DEC 2018	1115	-	N		WG	2	X	X											
35AWW23_121018		10 DEC 2018	1230		N		WG	2	X	X											
LHSMW07_121018		10 DEC 2018	1330		N		WG	2	X	X											
				-																	
				-																	
				-																	
				-																	
				-																	
				-																	

COMMENTS: Sample bottles for sample collected 11:15 had sample ID of 35AWW19_121018 and 12/12/18

Custody Transfers Prior to Receipt by Laboratory

	Relinquished By (Signed)	Date	Time	Received By (Signed)	Date	Time
1.	Scott Beesinger	12/10/18	1500			
2.						
3.						12/11/18 1010

Sample Delivery Details / Laboratory Receipt

Delivered Directly to Lab: ____ Shipped ____ No.:

Method of Shipment: ____

Fed Ex ____ Airbill Number: ____

Analytical Lab: ALS 10450 Stancliff Rd. Suite 210 Houston, TX 77099 (281) 530-5656

ATTN: SONIA WEST Lab Recipient: Delivery Date/Time:

1.) Chain of Custody Number = date collected + custody number (e.g. 09-02-1999-01)

2.) Sample Type (SA) Codes: N = Normal Sample, TB = Trip Blank (-c) Sample, FD = Field Duplicate (-a) Samples, FR = Field Replicate (-b) Samples, EB = Equipment Blank (-d) Samples, MS = Matrix Spike, SD = Matrix Spike Duplicate, AB = Ambient Blank (-e)

3.) Sample Number: Unique sample number collected from a particular location per day. (e.g. Groundwater sample collected from MW-1 on 10/10/99 = 01, if sampled again on 10/10/99 = 02, etc.)

4.) Matrix Codes: GS = Soil Gas, WG = Groundwater, WS = Surface Water, SO = Soil, SE = Sediment, SL = Sludge, SS = Surface Soil Samples, WQ = Aqueous Blank Samples (trip, equipment, ambient, etc), SQ = Soil Blanks

5.) Sample Analysis Requested: Analytical method requested and number of containers provided for each.

6.) Quality assurance samples are assigned by date (ddmmyy) and the sample number associated with the sample (01, 02, etc) (e.g. Equipment blank collected in association with MW-1 on 10/10/99 will be designated 10109901 in the Equipment

R1811942 5
ALS Group USA, Corp.
LHAAP / Site 58

00944476

R1811942 5
ALS Group USA, Corp.
LHAAP / Site 66

Cooler Receipt and Preservation Check Form

Project/Client Bhate Folder Number R1811942

Cooler received on 12-11-18 by: ME

COURIER: ALS (UPS) FEDEX VELOCITY CLIENT

1	Were **Custody seals** on outside of cooler?	(Y)	N
2	**Custody papers** properly completed (ink, signed)?	(Y)	N
3	Did all bottles arrive in good **condition** (unbroken)?	(Y)	N
4	Circle: (Wet Ice) **Dry Ice, Gel packs** present?	(Y)	N

5a	**Perchlorate** samples have required headspace?	Y	N	(NA)
5b	Did VOA vials, Alk,or Sulfide have sig* **bubbles**?	Y	N	(NA)
6	Where did the bottles originate? ALS/ROC	(CLIENT)		
7	Soil VOA received as: Bulk Encore 5035set			(NA)

8. Temperature Readings Date: 12-11-18 Time: 10:27 ID: IR#7 (IR#10) From: (Temp Blank) Sample Bottle

Observed Temp (°C)	0.9						
Correction Factor (°C)	0						
Corrected Temp (°C)	0.9						
Temp from:Type of bottle	—						
Within 0-6°C?	(Y) N	Y N	Y N	Y N	Y N	Y N	Y N
If <0°C, were samples frozen?	Y N	Y N	Y N	Y N	Y N	Y N	Y N

If out of Temperature, note packing/ice condition: _____ Ice melted Poorly Packed (described below) Same Day Rule

&Client Approval to Run Samples: _____ Standing Approval Client aware at drop-off Client notified by: _____

All samples held in storage location: R-002 by ME on 12-11-18 at 10:30
5035 samples placed in storage location: _____ by _____ on _____ at _____

Cooler Breakdown/Preservation Check**: Date: 12-11-18 Time: 13:00 by: ME

9.	Were all bottle labels complete (*i.e.* analysis, preservation, etc.)?	(YES)	NO
10.	Did all bottle labels and tags agree with custody papers?	YES	(NO)
11.	Were correct containers used for the tests indicated?	(YES)	NO
12.	Were 5035 vials acceptable (no extra labels, not leaking)?	YES	NO (N/A)
13.	Air Samples: Cassettes / Tubes Intact with MS? Canisters Pressurized Tedlar® Bags Inflated		(N/A)

pH	Lot of test paper	Reagent	Preserved? Yes	Preserved? No	Lot Received	Exp	Sample ID Adjusted	Vol. Added	Lot Added	Final pH
≥12		NaOH								
≤2		HNO_3								
≤2		H_2SO_4								
<4		$NaHSO_4$								
5-9		For 608pest			No=Notify for 3day					
Residual Chlorine (-)		For CN, Phenol, 625, 608pest, 522			If +, contact PM to add $Na_2S_2O_3$ (625, 608, CN), ascorbic (phenol).					
		$Na_2S_2O_3$								
		ZnAcetate	-	-			**VOAs and 1664 Not to be tested before analysis. Otherwise, all bottles of all samples with chemical preservatives are checked (not just representatives).			
		HCl	**	**	Client bottles					

Bottle lot numbers: 092418-IBMC client bottles

Explain all Discrepancies/ Other Comments:

CLRES	BULK
DO	FLDT
HPROD	HGFB
HTR	LL3541
PH	SUB
SO3	MARRS
ALS	REV

Labels secondary reviewed by: ME

PC Secondary Review: _____ 12/12/18 *significant air bubbles: VOA > 5-6 mm : WC >1 in. diameter

ALS Group USA, Corp.
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Internal Chain of Custody Report

Client: ALS Laboratory Group **Service Request:** R1811942
Project: LHAAP / Site 58/NWO1312.0150

Bottle ID	Methods	Date	Time	Sample Location / User	Disposed On
R1811942-001.01					
	SM 3500-Fe B.4.c				
		12/11/2018	1301	SMO / GESMERIAN	
		12/12/2018	1216	RT000104 / GESMERIAN	
		12/12/2018	1217	R-015 / GESMERIAN	
R1811942-001.02					
	Organic Acids				
		12/11/2018	1301	SMO / GESMERIAN	
		12/11/2018	1303	R-002 / GESMERIAN	
		12/17/2018	0811	In Lab / BALLGEIER	
		12/17/2018	1520	R-002 / BALLGEIER	
R1811942-002.01					
	SM 3500-Fe B.4.c				
		12/11/2018	1301	SMO / GESMERIAN	
		12/12/2018	1216	RT000104 / GESMERIAN	
		12/12/2018	1217	R-015 / GESMERIAN	
R1811942-002.02					
	Organic Acids				
		12/11/2018	1301	SMO / GESMERIAN	
		12/11/2018	1303	R-002 / GESMERIAN	
		12/17/2018	0811	In Lab / BALLGEIER	
		12/17/2018	1520	R-002 / BALLGEIER	
R1811942-003.01					
	SM 3500-Fe B.4.c				
		12/11/2018	1301	SMO / GESMERIAN	
		12/12/2018	1216	RT000104 / GESMERIAN	
		12/12/2018	1217	R-015 / GESMERIAN	
R1811942-003.02					
	Organic Acids				
		12/11/2018	1301	SMO / GESMERIAN	
		12/11/2018	1303	R-002 / GESMERIAN	
		12/17/2018	0812	In Lab / BALLGEIER	
		12/17/2018	1520	R-002 / BALLGEIER	
R1811942-004.01					
	SM 3500-Fe B.4.c				
		12/11/2018	1301	SMO / GESMERIAN	
		12/12/2018	1216	RT000104 / GESMERIAN	
		12/12/2018	1217	R-015 / GESMERIAN	
R1811942-004.02					
	Organic Acids				
		12/11/2018	1301	SMO / GESMERIAN	

ALS Group USA, Corp.
dba ALS Environmental

Internal Chain of Custody Report

Client: ALS Laboratory Group **Service Request:** R1811942
Project: LHAAP / Site 58/NWO1312.0150

Bottle ID	Methods	Date	Time	Sample Location / User	Disposed On
	Organic Acids				
		12/11/2018	1303	R-002 / GESMERIAN	
		12/17/2018	0811	In Lab / BALLGEIER	
		12/17/2018	1520	R-002 / BALLGEIER	
R1811942-005.01					
	SM 3500-Fe B.4.c				
		12/11/2018	1301	SMO / GESMERIAN	
		12/12/2018	1216	RT000104 / GESMERIAN	
		12/12/2018	1217	R-015 / GESMERIAN	
R1811942-005.02					
	Organic Acids				
		12/11/2018	1301	SMO / GESMERIAN	
		12/11/2018	1303	R-002 / GESMERIAN	
		12/17/2018	0811	In Lab / BALLGEIER	
		12/17/2018	1520	R-002 / BALLGEIER	

Miscellaneous Forms

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

ALS Environmental

REPORT QUALIFIERS AND DEFINITIONS

U Analyte was analyzed for but not detected. The sample quantitation limit has been corrected for dilution and for percent moisture, unless otherwise noted in the case narrative.

J Estimated value due to either being a Tentatively Identified Compound (TIC) or that the concentration is between the MRL and the MDL. Concentrations are not verified within the linear range of the calibration. For DoD: concentration >40% difference between two GC columns (pesticides/Arclors).

B Analyte was also detected in the associated method blank at a concentration that may have contributed to the sample result.

E Inorganics- Concentration is estimated due to the serial dilution was outside control limits.

E Organics- Concentration has exceeded the calibration range for that specific analysis.

D Concentration is a result of a dilution, typically a secondary analysis of the sample due to exceeding the calibration range or that a surrogate has been diluted out of the sample and cannot be assessed.

* Indicates that a quality control parameter has exceeded laboratory limits. Under the ñNotesò column of the Form I, this qualifier denotes analysis was performed out of Holding Time.

H Analysis was performed out of hold time for tests that have an ñimmediateò hold time criteria.

Spike was diluted out.

\+ Correlation coefficient for MSA is <0.995.

N Inorganics- Matrix spike recovery was outside laboratory limits.

N Organics- Presumptive evidence of a compound (reported as a TIC) based on the MS library search.

S Concentration has been determined using Method of Standard Additions (MSA).

W Post-Digestion Spike recovery is outside control limits and the sample absorbance is <50% of the spike absorbance.

P Concentration >40% difference between the two GC columns.

C Confirmed by GC/MS

Q DoD reports: indicates a pesticide/Aroclor is not confirmed (Ó100% Difference between two GC columns).

X See Case Narrative for discussion.

MRL Method Reporting Limit. Also known as:
LOQ Limit of Quantitation (LOQ)
The lowest concentration at which the method analyte may be reliably quantified under the method conditions.

MDL Method Detection Limit. A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and MRL are estimated (see J qualifier).

LOD Limit of Detection. A value at or above the MDL which has been verified to be detectable.

ND Non-Detect. Analyte was not detected at the concentration listed. Same as U qualifier.

ACCREDITED IN ACCORDANCE WITH nelac

Rochester Lab ID # for State Certifications[1]

Connecticut ID # PH0556	Maine ID #NY0032	Pennsylvania ID# 68-786
Delaware Approved	New Hampshire ID # 2941	Rhode Island ID # 158
DoD ELAP #65817	New York ID # 10145	Virginia #460167
Florida ID # E87674	North Carolina #676	

[1] Analyses were performed according to our laboratoryôs NELAP-approved quality assurance program and any applicable state or agency requirements. The test results meet requirements of the current NELAP/TNI standards or state or agency requirements, where applicable, except as noted in the case narrative. Since not all analyte/method/matrix combinations are offered for state/NELAC accreditation, this report may contain results which are not accredited. For a specific list of accredited analytes, contact the laboratory or go to https://www.alsglobal.com/locations/americas/north-america/usa/new-york/rochester-environmental

ALS Laboratory Group

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
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.

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client: ALS Environmental - US
Project: LHAAP / Site 58/NWO1312.0150
Service Request: R1811942

Sample Name: 35AWW20_121018
Lab Code: R1811942-001
Sample Matrix: Water
Date Collected: 12/10/18
Date Received: 12/11/18

Analysis Method	Extracted/Digested By	Analyzed By
Organic Acids		BALLGEIER
SM 3500-Fe B.4.c		MROGERSON

Sample Name: 35AWW24_121018
Lab Code: R1811942-002
Sample Matrix: Water
Date Collected: 12/10/18
Date Received: 12/11/18

Analysis Method	Extracted/Digested By	Analyzed By
Organic Acids		BALLGEIER
SM 3500-Fe B.4.c		MROGERSON

Sample Name: 35AWW19_121018
Lab Code: R1811942-003
Sample Matrix: Water
Date Collected: 12/10/18
Date Received: 12/11/18

Analysis Method	Extracted/Digested By	Analyzed By
Organic Acids		BALLGEIER
SM 3500-Fe B.4.c		MROGERSON

Sample Name: 35AWW23_121018
Lab Code: R1811942-004
Sample Matrix: Water
Date Collected: 12/10/18
Date Received: 12/11/18

Analysis Method	Extracted/Digested By	Analyzed By
Organic Acids		BALLGEIER
SM 3500-Fe B.4.c		MROGERSON

ALS Group USA, Corp.
dba ALS Environmental

Analyst Summary report

Client:	ALS Environmental - US	**Service Request:**	R1811942
Project:	LHAAP / Site 58/NWO1312.0150		

Sample Name:	LHSMW07_121018	**Date Collected:**	12/10/18
Lab Code:	R1811942-005	**Date Received:**	12/11/18
Sample Matrix:	Water		

Analysis Method	Extracted/Digested By	Analyzed By
Organic Acids		BALLGEIER
SM 3500-Fe B.4.c		MROGERSON

INORGANIC PREPARATION METHODS

The preparation methods associated with this report are found in these tables unless discussed in the case narrative.

Water/Liquid Matrix

Analytical Method	Preparation Method
200.7	200.2
200.8	200.2
6010C	3005A/3010A
6020A	ILM05.3
9014 Cyanide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Reactivity	SW846 Ch7, 7.3.4.2
9034 Sulfide Acid Soluble	9030B
9056A Bomb (Halogens)	5050A
9066 Manual Distillation	9065
SM 4500-CN-E Residual Cyanide	SM 4500-CN-G
SM 4500-CN-E WAD Cyanide	SM 4500-CN-I

Solid/Soil/Non-Aqueous Matrix

Analytical Method	Preparation Method
6010C	3050B
6020A	3050B
6010C TCLP (1311) extract	3005A/3010A
6010 SPLP (1312) extract	3005A/3010A
7196A	3060A
7199	3060A
9056A Halogens/Halides	5050
300.0 Anions/ 350.1/ 353.2/ SM 2320B/ SM 5210B/ 9056A Anions	DI extraction

For analytical methods not listed, the preparation method is the same as the analytical method reference.

Sample Results

ALS Environmental—Rochester Laboratory
1565 Jefferson Road, Building 300, Suite 360, Rochester, NY 14623
Phone (585) 288-5380 Fax (585) 288-8475
www.alsglobal.com

Semivolatile Organic Compounds by GC

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ALS Group USA, Corp.
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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1811942
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	12/10/18 09:10
Sample Matrix:	Water	**Date Received:**	12/11/18 10:10
Sample Name:	35AWW20_121018	**Units:**	mg/L
Lab Code:	R1811942-001	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND	U	0.20	0.10	0.016	1	12/18/18 21:15	
Acetic Acid	**8.3**		4.0	2.0	1.0	1	12/18/18 21:15	
Butanoic Acid (Butyric Acid)	ND	U	2.0	1.0	0.32	1	12/18/18 21:15	
Lactic Acid	**1.3**	**J**	2.0	1.0	0.14	1	12/18/18 21:15	
Propionic Acid	ND	U	2.0	1.0	0.19	1	12/18/18 21:15	

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1811942
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	12/10/18 10:15
Sample Matrix:	Water	**Date Received:**	12/11/18 10:10
Sample Name:	35AWW24_121018	**Units:**	mg/L
Lab Code:	R1811942-002	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	12/18/18 22:08	
Acetic Acid	ND U	4.0	2.0	1.0	1	12/18/18 22:08	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	12/18/18 22:08	
Lactic Acid	ND U	2.0	1.0	0.14	1	12/18/18 22:08	
Propionic Acid	ND U	2.0	1.0	0.19	1	12/18/18 22:08	

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1811942
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	12/10/18 11:15
Sample Matrix:	Water	**Date Received:**	12/11/18 10:10
Sample Name:	35AWW19_121018	**Units:**	mg/L
Lab Code:	R1811942-003	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result	LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND U	0.20	0.10	0.016	1	12/18/18 23:05	
Acetic Acid	ND U	4.0	2.0	1.0	1	12/18/18 23:05	
Butanoic Acid (Butyric Acid)	ND U	2.0	1.0	0.32	1	12/18/18 23:05	
Lactic Acid	ND U	2.0	1.0	0.14	1	12/18/18 23:05	
Propionic Acid	ND U	2.0	1.0	0.19	1	12/18/18 23:05	

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1811942
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	12/10/18 12:30
Sample Matrix:	Water	**Date Received:**	12/11/18 10:10
Sample Name:	35AWW23_121018	**Units:**	mg/L
Lab Code:	R1811942-004	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND	U	2.0	1.0	0.16	10	12/20/18 03:28	
Acetic Acid	**570**		40	20	10	10	12/20/18 03:28	
Butanoic Acid (Butyric Acid)	**140**		20	10	3.2	10	12/20/18 03:28	
Lactic Acid	ND	U	20	10	1.4	10	12/20/18 03:28	
Propionic Acid	**850**		20	10	1.9	10	12/20/18 03:28	

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Analytical Report

Client:	ALS Environmental - US	**Service Request:**	R1811942
Project:	LHAAP / Site 58/NWO1312.0150	**Date Collected:**	12/10/18 13:30
Sample Matrix:	Water	**Date Received:**	12/11/18 10:10
Sample Name:	LHSMW07_121018	**Units:**	mg/L
Lab Code:	R1811942-005	**Basis:**	NA

Organic Acids in Aqueous Matrices by High Performance Liquid Chromatography (HPLC) 28 Day Hold Time

Analysis Method: Organic Acids

Analyte Name	Result		LOQ	LOD	MDL	Dil.	Date Analyzed	Q
Pyruvic Acid	ND	U	0.20	0.10	0.016	1	12/19/18 00:53	
Acetic Acid	ND	U	4.0	2.0	1.0	1	12/19/18 00:53	
Butanoic Acid (Butyric Acid)	ND	U	2.0	1.0	0.32	1	12/19/18 00:53	
Lactic Acid	**1.3**	**J**	2.0	1.0	0.14	1	12/19/18 00:53	
Propionic Acid	ND	U	2.0	1.0	0.19	1	12/19/18 00:53	

General Chemistry

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