

Shell Oil Products US

Groundwater Monitoring Report Semi-Annual Second Quarter 2019

Shell Branded Wholesale Facility

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4409 Lake Otis Parkway

Anchorage, Alaska

May 24, 2019

Version 1.0





**Groundwater Monitoring Report -
Second Quarter 2019**

Shell Branded Wholesale Facility

4409 Lake Otis Parkway

Anchorage, Alaska 99508

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A handwritten signature in blue ink, appearing to read "Mark C. Peterson", written over a horizontal line.

Mark C. Peterson, PG , CEG
Principal Hydrogeologist

A handwritten signature in black ink, appearing to read "Anthony Ferrell", written over a horizontal line.
Anthony Ferrell
Associate Geologist



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ACRONYMS AND ABBREVIATIONS

µg/L	Micrograms per Liter
Bgs	Below ground surface
CRA	Conestoga-Rovers & Associates
DEC	Alaska Department of Environmental Conservation
DRO	Diesel Range Organics
EPA	United States Environmental Protection Agency
ESC	ESC Lab Sciences
GAC	Granular Activated Carbon
GES	Groundwater & Environmental Services, Inc.
GRO	Gasoline Range Organics
LCS	Laboratory Control Spike
LCSD	Laboratory Control Spike Duplicate
MS	Matrix Spike
MSD	Matrix Spike Duplicate
PAH	Polycyclic Aromatic Hydrocarbon(s)
PQL	Practical Quantitation Limit
RL	Laboratory Reporting Limit
RPD	Relative Percent Difference
RRO	Residual Range Organics
SOPs	Standard Operating Procedures
SOPUS	Shell Oil Products US
TOC	Top of Casing
TPH	Total Petroleum Hydrocarbons
VOC	Volatile Organic Compounds



1 Introduction

Groundwater & Environmental Services, Inc. (GES) is pleased to present this Second Quarter 2019 Semi-Annual Groundwater Monitoring Report to the Alaska Department of Environmental Conservation (DEC) on behalf of Shell Oil Products US (SOPUS) summarizing the April 2019 groundwater monitoring and sampling event related to the former service station at 4409 Lake Otis Parkway, Anchorage, Alaska (**Figure 1**). The site description and background, groundwater monitoring and sampling details, results and findings, data quality, and conclusions are presented below.

1.1 Site Description and Background

Based on previous subsurface investigations, the site is limited to off-property impacts in the eastern right-of-way of Lake Otis Parkway and beneath Lake Otis Parkway. The former service station property at 4409 Lake Otis Parkway, Anchorage, Alaska, is not included in the new site definition. The 4409 Lake Otis Parkway property has been redeveloped as a Walgreens pharmacy.

In June 2014, Conestoga-Rovers & Associates (CRA) conducted a site investigation that included the installation of three monitoring wells. One monitoring well (MW-1A) was installed on the offsite parcel to the west of Lake Otis Parkway to define the lateral extent of impacts to the west. A second monitoring well (MW-2A) was installed to define the extent of groundwater impacts to the north. Groundwater impacts above the DEC's Table C groundwater cleanup levels were only identified at monitoring well MW-3A, which was installed in the center of Lake Otis Parkway near the source area identified during a subsurface investigation in October 2012.

Currently MW-1A is the only remaining groundwater monitoring well related to the site. MW-1A is located in the parking lot of a retail shopping center across Lake Otis Parkway from the former Shell station property. MW-1A is scheduled to be sampled on a semi-annual basis using low flow bladder pump techniques. The locations of the present and former site monitoring wells are depicted on **Figure 2**.

1.2 Site Hydrogeology

Historical groundwater flow direction has been reported to the north-northeast. Historical static groundwater depths at the site have ranged from approximately 15 to 24 feet below ground surface (bgs). Static groundwater depth was measured at 16.90 feet below top of casing (TOC) in MW-1A on April 5, 2019. Given that MW-1A is the last monitoring well at the site, no groundwater flow direction or gradient has been calculated.

2 Groundwater Monitoring and Sampling

GES gauged and sampled monitoring well MW-1A on April 5, 2019. The monitoring well was sampled using a bladder pump and low flow methodologies consistent with DEC guidance and GES standard operating procedures (SOPs) included in **Appendix B**. The pump intake was set



within the upper foot of the water column for collection of the groundwater samples in well MW-1A.

Sample was collected for analysis of total petroleum hydrocarbons (TPH) as gasoline range organics (GRO), diesel range organics (DRO), and residual range organics (RRO). The groundwater sample was submitted under chain of custody to Pace Analytical (Pace) laboratory. GES's gauging and well sampling forms are presented as **Appendix A**.

Purge water was transported under a ADEC permit (approved March 26, 2019) to 810 W. Tudor Road. All waste purge water was filtered through a portable granular activated carbon (GAC) filter and discharged in an approved designated location offsite (810 W. Tudor Road). The volume of water treated by the GAC filter during the event was recorded on both the groundwater monitoring and sampling field notes and the Portable GAC Volume Tracking Log, which is kept with the portable GAC bucket at all times. This method of purge water treatment was approved by Robert Weimer on September 29, 2016 via email.

2.1 Groundwater Analytical Methods

Collected groundwater sample was analyzed for GRO via Alaska Series Method AK 101, and DRO and RRO via Alaska Series Method AK 102/103.

2.2 Groundwater Analytical Results

The following is a summary of the analytical results from April 2019:

All analytical concentrations in the well were below the DEC Table C cleanup level and/or laboratory reporting limits (RL). Current and historical groundwater analytical results are summarized in **Table 1** and current analytical data is shown on **Figure 4**. A copy of the laboratory analytical report is presented as **Appendix C**.

3 Data Quality

Groundwater & Environmental Services, Inc. (GES) reviewed the analytical data from the Shell-4409 Lake Otis, Anchorage, AK (site) April 5, 2019 sampling event in order to determine accuracy and precision for each analysis as well as to determine overall data usability. Organic data were reviewed for holding times, method and field blank results, surrogate or system monitoring compound recoveries, Matrix Spike/Matrix Spike Duplicate (MS/MSD) and LCS recoveries. All data necessary to complete the data review were provided by the laboratory.

The collection of aqueous samples from one location, an original and a duplicate sample, occurred on April 5, 2019.

The samples were sent to Pace Analytical Laboratories and analyzed by the following methodologies as requested on the Chain of Custody:

- Volatile Organic Compounds (GC) by Method AK101



- Semi-Volatile Organic Compounds (GC) by Method AK102/103

The analytical results were reviewed using laboratory acceptance criteria and procedures and guidelines contained in the USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, revised January 2017.

Data was overall of good quality and usable.

Holding Times

Analytical holding times were met.

Blank Results

There were no analytes reported above the reporting detection limit (RDL).

Laboratory Control Spike

All laboratory control spike recoveries were within laboratory-specified criteria.

Preservation

Samples were collected and subsequently stored in amber sample bottles and stored at $1.2^{\circ}\text{C} \pm 2^{\circ}\text{C}$ until prepared and analyzed. The temperature of the samples upon receipt by the laboratory were recorded. Samples were stored in appropriate bottleware.

Surrogates Recoveries and Accuracy

The surrogate recoveries were all within laboratory-specified ranges.

Duplicate Analyses and Precision

A field duplicate (DUP-1) from the MW-1A sampling location was collected and submitted blind to the laboratory for analysis. All detections in the sample and the duplicate were below reporting limits, and precision could not be accurately calculated.

Precision is the distribution of a set of reported values about the mean, or the closeness of agreement between individual test results obtained under prescribed and similar conditions. Precision is best expressed in terms of RPD.

Analysis of the laboratory precision employed evaluation of laboratory spike/laboratory spike duplicate (LCS/LCSD) and matrix spike/matrix spike duplicates (MS/MSD) relative percent difference (RPD) precision calculations. The overall precision within compliance was 100%.

Accuracy

Accuracy is a measure of the closeness of an observed value to the "true" value, e.g., theoretical or reference value, or population mean. Accuracy includes a combination of random error and systematic error (bias) that result from sampling and analytical operations. Analytical batch accuracy is measured through the analyses of recoveries in LCSs and MS/MSDs. Sample specific accuracy is measured with surrogate recovery. All surrogate recoveries and all



recoveries reported in the LCS, and site associated MS/MSD pair were within laboratory-specified criteria with the exceptions noted above. Accuracy for this sampling event and report is 95%.

Sensitivity

Sensitivity is the measure of how low a concentration can be detected/reported. Sensitivity is measured using practical quantitation limits (PQLs) or reporting limits (RLs).

All limits reported are below the DEC clean-up levels for groundwater.

Summary

Groundwater analytical data are usable and considered definitive data and suitable for comparison to regulatory standards. The DEC Laboratory Data Review Checklist and Memorandum are presented as Appendix D.

4 CONCLUSIONS

During the April 2019 groundwater monitoring event, GRO concentrations in MW-1A have remained below the laboratory reporting limits and the DEC's Table C cleanup levels. DRO concentration has decreased to levels below the laboratory reporting limits and well below the DEC's Table C cleanup levels since the April 2018 sampling event. RRO concentrations in MW-1A and DUP-1 decreased to levels below DEC's Table C cleanup levels.

GES' opinion is that the RRO and possibly the DRO range constituents have been the result of surface water runoff from the parking lot entering the well vault and impacting the groundwater in MW-1A. Following the repair of the casing and cap, previously damaged from frost heave, the concentrations have continued to decline. As such, GES plans to sample MW-1A in the 4th quarter of 2019 to observe trends for DRO and RRO. If both constituents are still below the ADEC Table C cleanup levels, GES plans to request closure of this environmental case.



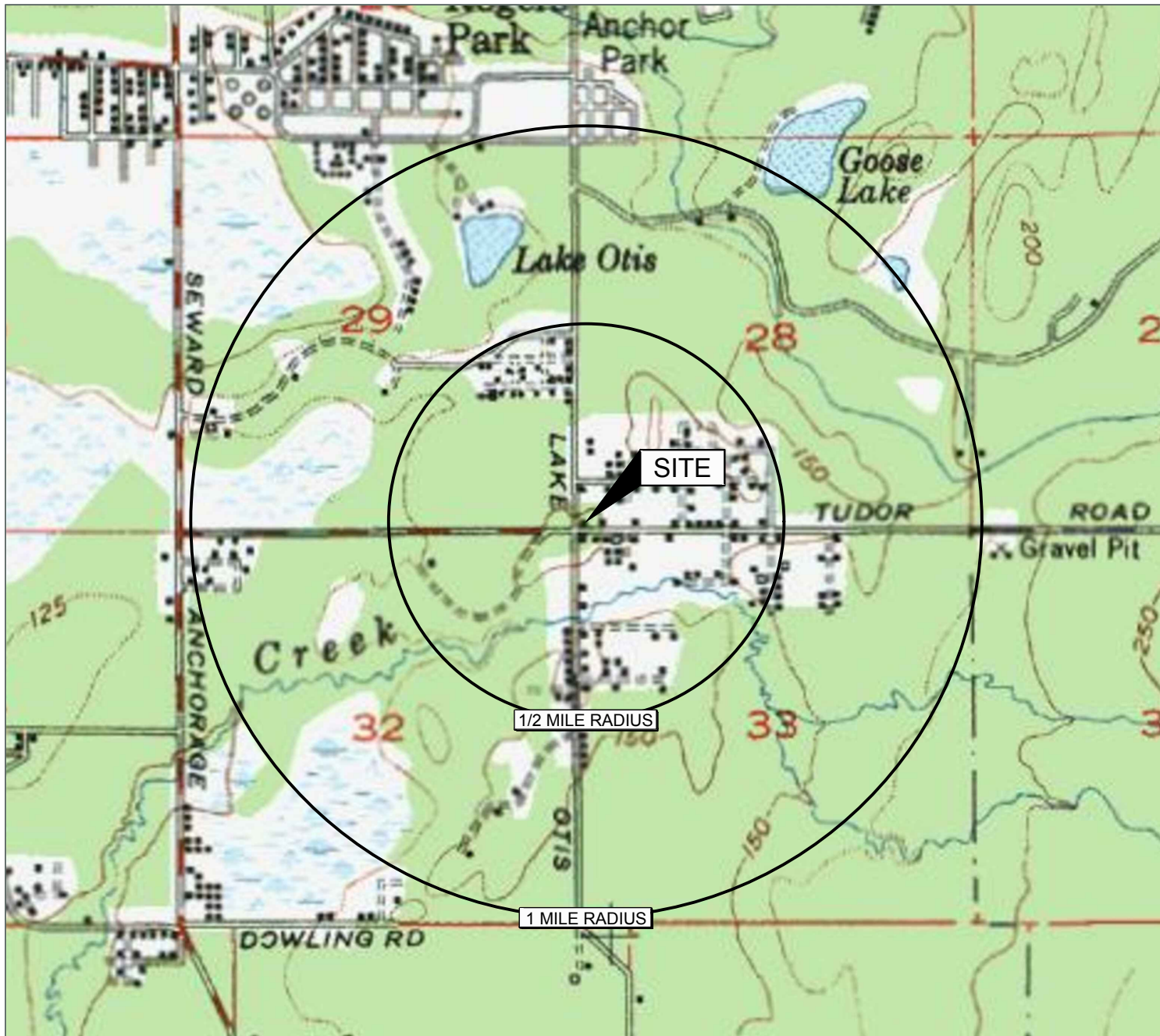
Figures

Figure 1: Site Location Map

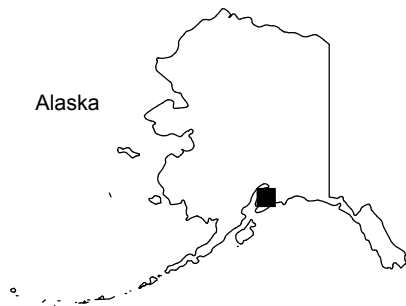
Figure 2: Site Map

Figure 3: Groundwater Analytical Concentrations Map

M:\Graphics\3000-CA-North\Shell\Alaska\121262 Anchorage (Lake Otis)\121262 Anchorage SLM.dwg, SLM, 11/14/2018 10:20:22 AM, wwesterlund



Source:
USGS 7.5 Minute Series
Topographic Quadrangle, 1963
Anchorage A-8, Alaska
Contour Interval = 50'



Quadrangle Location
LAT. 061° 10' 50.01" N
LONG. 149° 50' 17.17" W
(Approximate Site Coordinates)

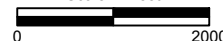
Site Location Map

Shell Oil Products US
Station #121262
4409 Lake Otis Parkway
Anchorage, Alaska

Drawn
W.A.W.
Designed
S.P.
Approved
M.C.P.

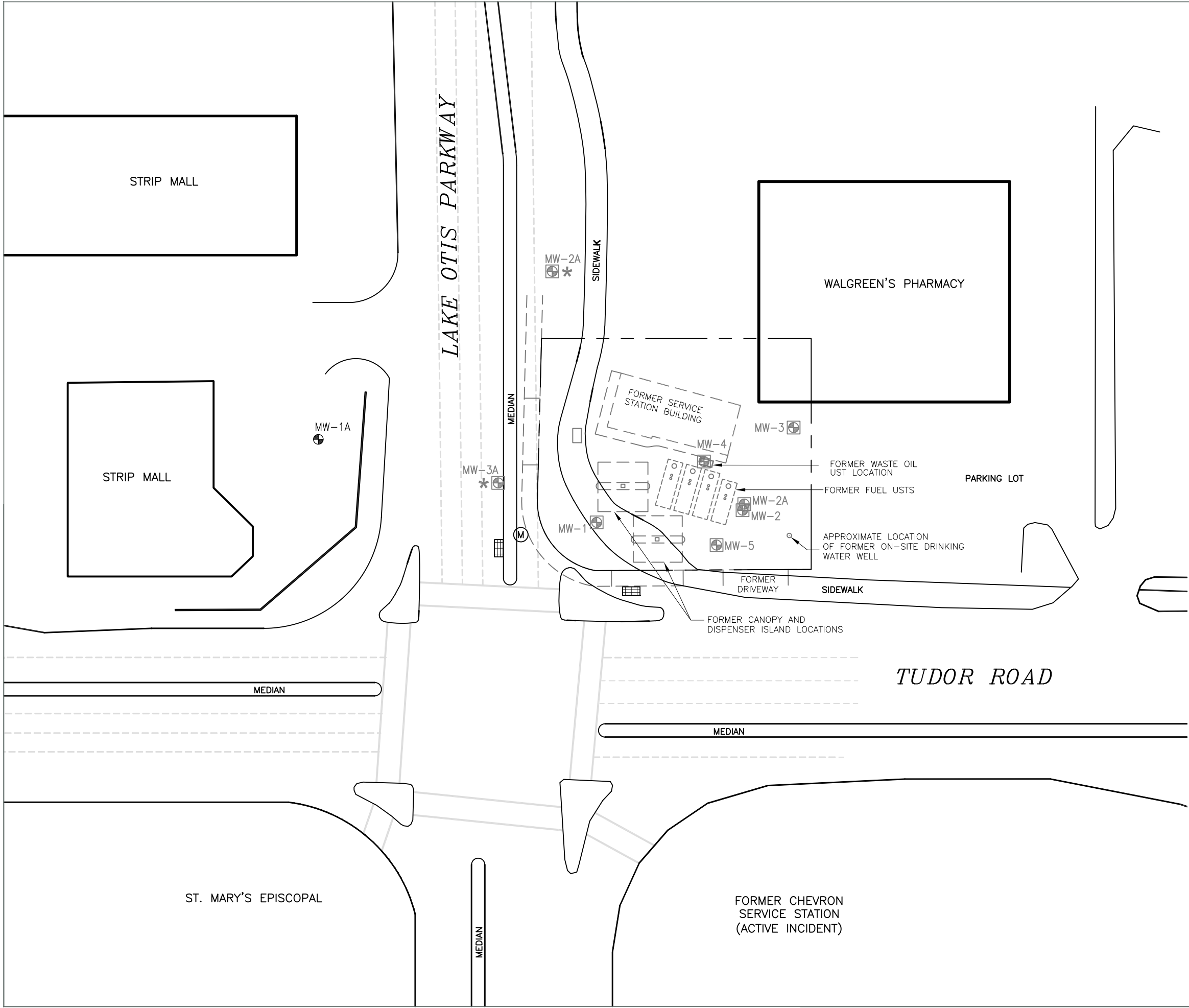


Scale In Feet



Date
11/14/18
Figure
1

M:\Graphics\3000-CA-North\Shell\Alaska\121262 Anchorage SM.dwg, B-50, 11/14/2018 10:18:48 AM, wwesterlund



LEGEND

- FORMER SHELL STATION PROPERTY BOUNDARY
- (M) UTILITY MANHOLE
- [Grid] CATCH BASIN
- ⊕ MONITORING WELL
- ⊕ DESTROYED/ABANDONED MONITORING WELL
- * ABANDONED APRIL 2018

Site Map

Shell Oil Products US
Station #121262
4409 Lake Otis Parkway
Anchorage, Alaska

Drawn
W.A.W.
Designed
S.P.
Approved
M.C.P.

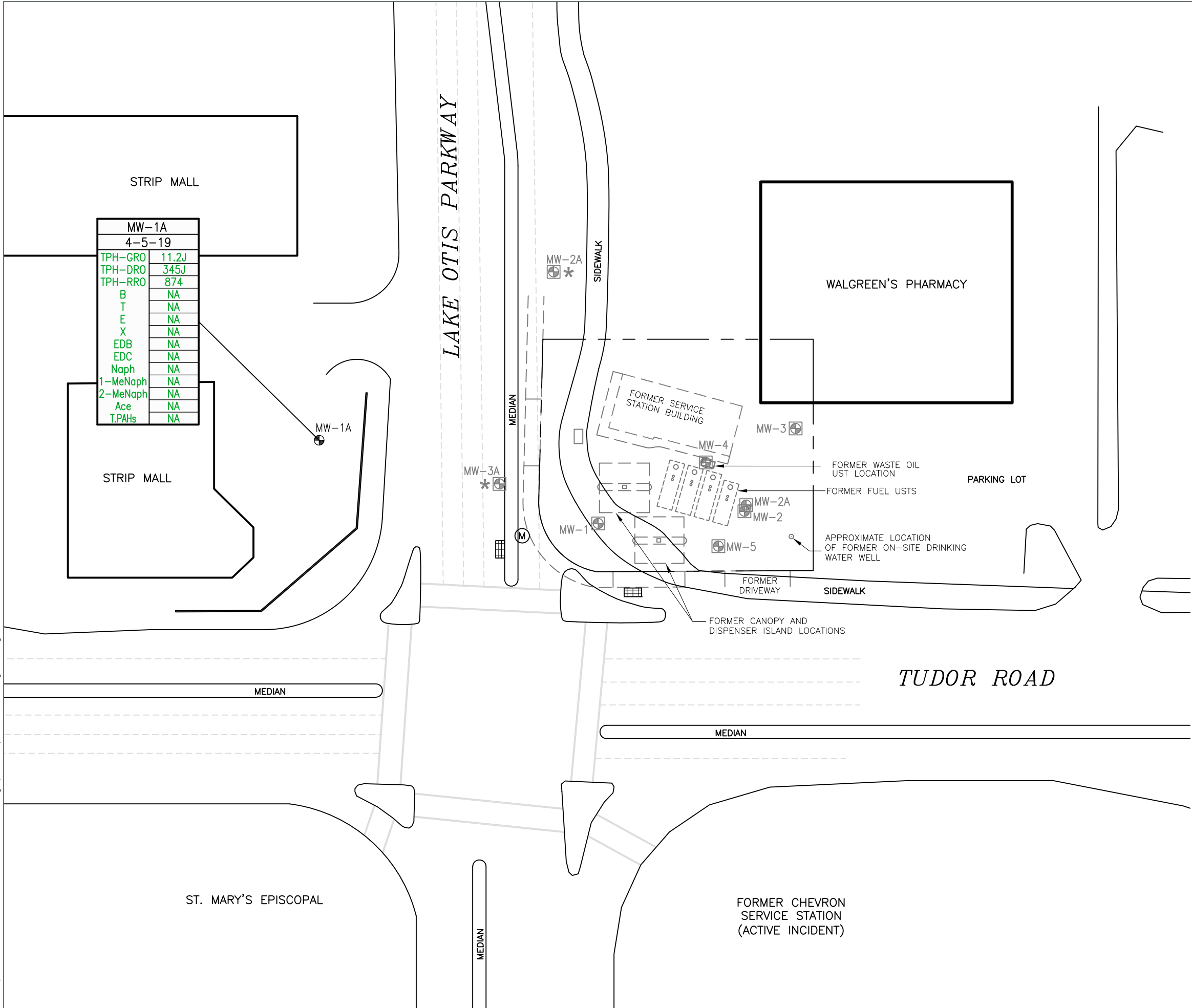
Scale In Feet (Approximate)

0 50

Groundwater & Environmental Services, Inc.

Date
11/14/18
Figure
2

M:\Graphics\3000-CA-North\Shell\Alaska\121262 Anchorage (Lake Otis)\121262 Anchorage SM.dwg, B-50, wshea



LEGEND

- FORMER SHELL STATION PROPERTY BOUNDARY
- (M) UTILITY MANHOLE
- [Grid] CATCH BASIN
- ⊙ MONITORING WELL
- ⊙ DESTROYED/ABANDONED MONITORING WELL
- * ABANDONED APRIL 2018

MW-1A		SAMPLE DATE
4-5-19		SAMPLE DATE
TPH-GRO	11.2J	TPH-GRO CONCENTRATION (ug/L)
TPH-DRO	345J	TPH-DRO CONCENTRATION (ug/L)
TPH-RRO	874	TPH-RRO CONCENTRATION (ug/L)
B	NA	BENZENE CONCENTRATION (ug/L)
T	NA	TOLUENE CONCENTRATION (ug/L)
E	NA	ETHYLBENZENE CONCENTRATION (ug/L)
X	NA	TOTAL XYLENES CONCENTRATION (ug/L)
EDB	NA	EDB CONCENTRATION (ug/L)
EDC	NA	EDC CONCENTRATION (ug/L)
Naph	NA	NAPHTHALENE CONCENTRATION (ug/L)
1-MeNaph	NA	1-MeNaph CONCENTRATION (ug/L)
2-MeNaph	NA	2-MeNaph CONCENTRATION (ug/L)
Ace	NA	ACENAPHTHENE CONCENTRATION (ug/L)
T.PAHs	NA	TOTAL PAHs CONCENTRATION (ug/L)

ug/L MICROGRAMS PER LITER

TPH TOTAL PETROLEUM HYDROCARBONS

GRO GASOLINE RANGE ORGANICS

DRO DIESEL RANGE ORGANICS

RRO RESIDUAL RANGE ORGANICS

EDB 1,2 DIBROMOETHANE

EDC 1,2 DICHLOROETHANE

1-MeNaph 1-METHYLNAPHTHALENE

2-MeNaph 2-METHYLNAPHTHALENE

T.PAHs SUM OF NON-NAPHTHALENE POLYCYTCLIC AROMATIC HYDROCARBONS

NA NOT ANALYZED

J ESTIMATED VALUE, BETWEEN LABORATORY REPORTING LIMIT AND METHOD DETECTION LIMIT

NOTE:

BOLD VALUE INDICATES RESULT ABOVE DEC TABLE C CLEANUP LEVELS.

Groundwater Analytical Data Map
April 5, 2019

Shell Oil Products US
Station #121262
4409 Lake Otis Parkway
Anchorage, Alaska

Drawn
W.G.S.
Designed
S.P.
Approved
M.C.P.

Scale In Feet (Approximate)
0 50

Groundwater & Environmental Services, Inc.

Date
5/2/19
Figure
3



Tables

Table 1: Current and Historical Groundwater Monitoring Data Summary



Table 1

Summary of Historical Groundwater Analytical Data
Lake Otis Parkway Right-Of-Way,
Anchorage, Alaska

Sample ID		Date	TOC	SPH Thickness	DTW	GWE	HYDROCARBONS			PRIMARY VOCs					OXYGENATES					Metals																
							TPH-GRO	TPH-DRO	TPH-RRO	B	T	E	X	EDB	EDC	MTBE	DIPE	Ethanol	ETBE	TBA	TAME	Dissolved Arsenic	Total Aresnic	Dissolved Barium	Total Barium	Dissolved Cadmium	Total Cadmium	Dissolved Chromium	Total Chromium	Dissolved Lead	Total Lead	Dissolved Nickel	Total Nickel	Dissolved Vanadium	Total Vanadium	
DEC Cleanup Levels (µg/L)							2,200	1,500	1,100	4.6	1,100	15	190	0.075	1.7	140	NE	NE	NE	NE	NE	0.52	0.52	3,770	3,770	9.21	9.21	22,500	22,500	15	15	392	392	86.4	86.4	
MW-1A	d	08/06/14	163.66	---	15.75	147.91	<100	<792	61.3 J	<1.00	<1.00	<1.00	<2.00	<1.00	<1.00	<1.00	---	---	---	---	---	2.98	---	70.2	---	<1.00	---	2.99	---	1.57 J	---	6.49	---	7.39 B	---	
MW-1A	d	10/23/14	163.66	---	15.83	147.83	<100	<769	56.7 JB	<1.00	<1.00	<1.00	<2.00	<0.0197	<1.00	<1.00	---	---	---	---	---	---	1.70 J	---	69.8	---	<1.00	---	2.74	---	0.860 J	---	4.93	---	4.94 B	---
MW-1A	d	06/27/15	163.66	---	16.13	147.53	<50	173	379	<1.0	<1.0	<1.0	<2.0	<0.020	<1.0	<1.0	---	---	---	---	---	2.4	---	63.5	---	<1.0	---	<2.0	---	<1.0	---	2.7	---	<4.0	---	
MW-1A	d	08/30/15	163.66	---	15.96	147.70	<50	2,720	3,050	<1.0	<1.0	<1.0	<2.0	<0.020	<1.0	<1.0	---	---	---	---	---	2.8	---	29.6	---	<1.0	---	2.0	---	1.0	---	5.0	---	<8.0	---	
MW-1A	d	10/24/15	163.66	---	15.64	148.02	<50	536	1,310	<1.0	<1.0	<1.0	<2.0	<0.019	<1.0	<1.0	---	---	---	---	---	1.8	---	24.6	---	<1.0	---	<2.0	---	<1.0	---	5.4	---	<4.0	---	
MW-1A		04/01/16	163.66	---	Unable to gauge		---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
MW-1A		10/05/16	163.66	---	16.08	147.58	<100	1,490	1,100	<1.0	2.1	<1.0	<3.0	---	<1.0	<1.0	<1.0	<200	<2.0	<20	<2.0	---	---	---	---	---	---	---	---	---	---	---	---	---		
MW-1A		10/02/17	163.66	---	16.03	147.63	<100	884	2,470	<0.500	0.784 J	<0.500	<1.50	<1.00	<1.00	<5.00	<1.00	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
MW-1A DUP		10/02/17	163.66	---	16.03	147.63	<100	814	2,010	<0.500	0.787 J	<0.500	<1.50	<1.00	<1.00	<5.00	<1.00	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
MW-1A		04/26/18	163.66	---	15.70	147.96	50.6J	1,800	4,150	<0.500	18.3	<0.500	<1.50	<1.00	<1.00	<5.00	<1.00	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
MW-1A-DUP		04/26/18	163.66	---	15.70	147.96	49.4J	1,740	3,260	<0.500	18.3	<0.500	<1.50	<1.00	<1.00	<5.00	<1.00	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
MW-1A		10/03/18	163.66	---	16.06	147.60	12.9 J	564 J	1,460	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
MW-1A-DUP		10/03/18	163.66	---	16.06	147.60	12.5 J	589 J	1,670	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
MW-1A		04/05/19	163.66	---	16.90	146.76	11.2 J	345 J	874	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
MW-1A-DUP		04/05/19	163.66	---	16.90	146.76	<100	379 J	1,060	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
MW-2A	d	08/06/14	162.28	---	23.89	138.39	<100	164 J	113 J	<1.00	<1.00	<1.00	<2.00	<1.00	<1.00	<1.00	---	---	---	---	---	3.57	---	60.0	---	<1.00	---	11.5	---	7.74	---	11.3	---	11.1 B	---	
MW-2A	d	10/23/14	162.28	---	23.79	138.49	<100	<766	51.6 JB	<1.00	<1.00	<1.00	<2.00	<0.0198	<1.00	<1.00	---	---	---	---	---	---	1.19 J	---	25.8	---	<1.00	---	5.62	---	0.0453 J	---	3.05	---	3.03 B	---
MW-2A	d	06/27/15	162.28	---	23.83	138.45	<50	70 J	132 J	<1.0	<1.0	<1.0	<2.0	<0.019	<1.0	<1.0	---	---	---	---	---	1.5	---	22.1	---	<1.0	---	<2.0	---	<1.0	---	<2.0	---	<4.0	---	
MW-2A	d	08/30/15	162.28	---	23.73	138.55	<50	175	205 J	<1.0	<1.0	<1.0	<2.0	<0.020	<1.0	<1.0	---	---	---	---	---	1.0	---	20.6	---	<1.0	---	<2.0	---	<1.0	---	2.1	---	<8.0	---	
MW-2A	d	10/18/15	162.28	---	22.25	140.03	<50	84.7 J	129 J	<1.0	<1.0	<1.0	<2.0	<0.019	<1.0	<1.0	---	---	---	---	---	<1.0	---	20.9	---	<1.0	---	2.0	---	1.1	---	<2.0	---	5.3	---	
MW-2A		04/01/16	162.28	---	23.56	138.72	<50	42.9 J	67.0 J	<1.0	<1.0	<1.0	<2.0	<0.0097	<1.0	<1.0	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
MW-2A		10/05/16	162.28	---	23.10	139.18	<100	<190	445	<1.0	<1.0	<1.0	<3.0	---	<1.0	<1.0	<1.0	<200	<2.0	<20	<2.0	---	---	---	---	---	---	---	---	---	---	---	---	---		
MW-2A		04/23/18	162.28	---	23.10	139.18	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
MW-2A		10/03/18	Well decommissioned on April 23, 2018				---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
MW-3A	d	08/06/14	165.86	---	18.91	146.95	2,840	332 J	58.2 J	72.2	176	98.0	497	<1.00	<1.00	<1.00	---	---	---	---	---	50.2	---	117	---	<1.00	---	14.7	---	5.5	---	16.6	---	11.6 B	---	
MW-3A DUP	d	08/06/14	165.86	---	18.91	146.95	3,300	368 J	57.3 J	74.8	189	107	523	<1.00	<1.00	<1.00	---	---	---	---	---	47.8	---	115	---	<1.00	---	7.65	---	5.6	---	17.3	---	14.1 B	---	
MW-3A	d	10/23/14	165.86	---	18.74	147.12	4,810	395 J	49.7 JB	92.9	51.3	180	619	0.115	48.5	<1.00	---	---	---	---	---	---	46	---	110	---	<1.00	---	2.79	---	1.04 J	---	4.81	---	3.30 B	---
MW-3A DUP	d	10/23/14	165.86	---	18.74	147.12	4,600	391 J	66.8 JB	93.5	57.4	187	602	0.123	48.9	<1.00	---	---	---	---	---	---	47.5	---	111	---	<1.00	---	1.93 J	---	1.02 J	---	4.84	---	3.36 B	---
MW-3A	d	06/27/15	165.86	---	19.25	146.61	892	268	<200	51.8	1.1	99.1	98.3	0.029	80.9	<1.0	---	---	---	---	---	14.5	---	80.7	---	<1.0	---	<2.0	---	<1.0	---	<2.0	---	<4.0	---	
MW-3A DUP	d	06/27/15	165.86	---	19.25	146.61	1,140	253	<190	52.9	1.2	70.1	101	0.028	83.0	<1.0	---	---	---	---	---	18.1	---	88.5	---	<1.0	---	<2.0	---	<1.0	---	<2.0	---	<4.0	---	
MW-3A	d	08/30/15	165.86	---	18.80	147.06	812	410	62.6 J	80.3	38.2	131	286	0.065	55.4	<1.0	---	---	---	---	---	44.3	---	136	---	<1.0	---	<2.0	---	<1.0	---	4.4	---	<8.0	---	
MW-3A DUP	d	08/30/15	165.86	---	18.80	147.06	283	459	58.0 J	80.7	34.4	130	278	0.064	54.9	<1.0	---	---	---	---	---	44.6	---	137	---	<1.0	---	<2.0	---	<1.0	---	4.6	---	<8.0	---	
MW-3A	d	10/18/15	165.86	---	18.48	147.38	1,820	451	<190	75.1	13.8	174	314	0.063	75.2	<2.0	---	---	---	---	---	9.4	---	98.5	---	<1.0	---	<2.0	---	<1.0	---	3.4	---	4.0	---	
MW-3A DUP	d	10/18/15	165.86	---	18.48	147.38	1,820	512	<190	72.8	14.9	174</																								



Appendix A – Field Sheets

P. 1/2
SAMPLING EVENT DATASHEETProject Name: **4409 Lake Otis Pkwy.**Well No: **MW-1A** Date: **4/5/19**Project No: **3016007**Personnel: **Amy Zablocki****GAUGING DATA**Water Level Measuring Method: **WLM** / **IP** **S# 091013**Measuring Point Description: **TOC**

WELL PURGE VOLUME CALCULATION	Total Depth (feet)	Depth to Water (feet)	Water Column (feet)	Multiplier for Casing Diameter	Casing Volume (gal)	Total Purge Volume (gal)								
	30.96	16.90	14.06	<table><tr><td>1</td><td>2</td><td>4</td><td>6</td></tr><tr><td>0.04</td><td>0.16</td><td>0.64</td><td>1.44</td></tr></table>	1	2	4	6	0.04	0.16	0.64	1.44	2.25	225
1	2	4	6											
0.04	0.16	0.64	1.44											

PURGING DATAPurge Method: **bladder** **WATERRA / BAILER / SUB**Purge Depth: **17.75**Purge Rate: **0.042** (gpm)

Time	2004	2025	2030	2035	2040	2045	2050
Volume Purge (gal)	0.25	0.5	0.75	1.0	1.4	1.625	
Temperature (C)	5.92	6.09	6.03	6.22	6.24	6.27	
pH	7.34	7.34	7.33	7.34	7.34	7.34	
Spec. Cond. (umhos/cm)	457	460	462	465	464	465	
Turbidity/Color	cloudy / gray	→	→	→	→	→	
Odor (Y/N)	N	N	N	N	N	N	
Dewatered (Y/N)	N	N	N	N	N	N	

Comments/Observations: **0.0 ppm PID increase pump pressure at 2040****SAMPLING DATA**Time Sampled: **2110**Approximate Depth to Water During Sampling: **16.92** (feet)Comments: **parameters stabilized. sample collected via pump set at 17.75 ft bix**

Sample Number	Number of Containers	Container Type	Preservative	Volume Filled (mL or L)	Turbidity/ Color	Analysis Method
MW-1A	5	VOA / push	HCL	40ML / 100m		SEE COC
AAO DUB-1	5	"	"	40 ML / 100m	"	"

Total Purge Volume: **2.5** (gallons)Disposal: **Carbon bucket**Weather Conditions: **40° overcast**BOLTS **(Y)** / NCondition of Well Box and Casing at Time of Sampling: **OK**CAP & LOCK **(Y)** / NWell Head Conditions Requiring Correction: **none**GROUT **(Y)** / NProblems Encountered During Purging and Sampling: **slow recovery (pumping)**WELL BOX **(Y)** / NComments: **pulled pump to check**SECURED **(Y)** / N



SAMPLING EVENT DATASHEET

P. 2/2

Project Name: **4409 Lake Otis Pkwy.**

Well No: **MW-1A**

Date: **4/5/19**

Project No: **3016007**

Personnel: **(cont)**

Amy Zabolack

GAUGING DATA

Water Level Measuring Method: **WLM / IP**

Measuring Point Description: **TOC**

WELL PURGE VOLUME CALCULATION	Total Depth (feet)	Depth to Water (feet)	Water Column (feet)	Multiplier for Casing Diameter				Casing Volume (gal)	Total Purge Volume (gal)
See p. 1	1	=	X	1	2	4	6	=	
				0.04	0.16	0.64	1.44		

PURGING DATA

Purge Method: **WATERRA / BAILER / SUB**

Purge Depth:

Purge Rate:

(gpm)

Time	2055	2105				
Volume Purge (gal)	2.0	2.5				
Temperature (C)	6.29	6.30				
pH	7.35	7.36				
Spec. Cond. (umhos/cm)	465	466				
Turbidity/Color	cloudy/gray	→				
Odor (Y/N)	N	N				
Dewatered (Y/N)	N	N				

Comments/Observations:

See p. 1

SAMPLING DATA

Time Sampled:

Approximate Depth to Water During Sampling:

(feet)

Comments:

Sample Number	Number of Containers	Container Type	Preservative	Volume Filled (mL or L)	Turbidity/ Color	Analysis Method
		VOA	HCL	40ML		SEE COC

Total Purge Volume: (gallons)

Disposal: **Carbon bucket**

Weather Conditions:

BOLTS Y / N

Condition of Well Box and Casing at Time of Sampling:

CAP & LOCK Y / N

Well Head Conditions Requiring Correction:

GROUT Y / N

Problems Encountered During Purging and Sampling:

WELL BOX Y / N

Comments:

SECURED Y / N



Appendix B – Standard Field Procedures for Groundwater Monitoring

STANDARD OPERATING PROCEDURES



Section: FM-8.5 Revision #:
Date: 01-Aug-05

TITLE: LOW FLOW GROUNDWATER SAMPLING

PURPOSE / SCOPE

This SOP describes procedures for sampling groundwater using low-flow purging and sampling techniques. The purpose is to obtain samples that are representative of existing groundwater conditions, or samples that retain the physical and chemical properties of the groundwater within an aquifer. Improper sampling and transport procedures may cause compounds of interest to be removed from or added to the sample prior to analysis.

Note:** The importance of proper and consistent field sampling methods, as well as proper documentation, **CANNOT BE OVER-EMPHASIZED.

This SOP shall be used in conjunction with an approved Health and Safety Plan (HASP). Also, consult the HASP for information on the selection and use of PPE.

REFERENCE

ASTM D5903: Guide for Planning and Preparing for a Groundwater Sampling Event

ASTM D4448: Standard Guide for Sampling Groundwater Wells

ASTM D5979: Guide for Conceptualization and Characterization of Groundwater Systems

EPA, *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*, (ORD/ OSWER, Washington D.C., 1996) (EPA-540/S-95/504).

EPA Region III, *Recommended Procedure For Low-Flow Purging and Sampling of Groundwater Monitoring Wells*. (Waste and Chemicals Management Division, 1997.)

RESPONSIBILITIES

4.1 Project Manager

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The responsibility of the Project Manager (PM) is to ensure that all activities performed by site personnel are performed: safely; in compliance with all pertinent regulations and procedures; and with the necessary equipment and resources to accomplish the tasks described in the Work Plan.

4.2 Local Health and Safety Officer (LHSO)

The Local Health and Safety Officer (LHSO), in consultation with the Corporate HSO and State project representatives, will designate the appropriate level of personnel protective equipment (PPE) for field personnel to safely accomplish their work.

4.3 Case Manager

The Case Manager (CM) is responsible for providing Field Personnel with a sampling or work plan/schedule. In addition, the PM or CM will provide field personnel with enough information to perform the work safely and correctly. This information should include the operational and safety procedures that are applicable to the work being performed.

4.4 Field Personnel

Field personnel are responsible for the safe completion of assigned tasks as described in the SOPs, Health and Safety Plan (HASP) and appropriate site-specific work plans and procedures. They are required to document the work performed and to alert their immediate supervisors of any variances from procedures established in the above documents.

EQUIPMENT / MATERIALS

A basic checklist of suggested equipment and supplies needed to implement this SOP include, but is not limited to:

- Personnel protective equipment as outlined in the site-specific HASP
- Adjustable rate, positive displacement pump (low flow-rate stainless steel submersible pump recommended) or pre-cleaned stainless steel bladder pump
- Electronic, audible (or visual identification) water level meter (0.01 feet accuracy), or interface probe if needed
- Teflon or Teflon-lined polyethylene tubing (3/8 to 1/2 inch, inside diameter)
- Flow measurement supplies (graduated cylinder and stop watch).
- Properly sized generator to operate pump

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- In-line flow-through cell capable of measuring pH, specific conductance, and temperature
- Nylon cable-ties
- Decontamination supplies
- Distilled water
- Polyethylene sheeting/cloth/paper towels/garbage bags
- Transportable, purged water storage container
- Well construction log details and historical groundwater gauging data
- Photoionization detector (PID)
- Secondary containment for the flow-through cell
- Field book
- Well Purging Record Form

***Note:** Gas powered equipment at sampling sites require special care to ensure that GES staff handling these units do not contaminate down-hole equipment. Frequent disposable glove changes are required, as well as strict separation of sampling crew tasks (e.g., those handling pumps and hoses do not conduct fueling activities).*

PREPARATION

***Note:** Pre-plan the schedule of sampling activities so that sample collection progresses from “clean” to “dirty” areas to minimize the potential for cross contamination.*

PROCEDURE

Prior to low-flow purging and sampling activities, all measuring devices must be calibrated daily in accordance with equipment vendor recommendations and recorded on a calibration log sheet. Purging and sampling activities should occur in a progression from the “cleanest” to the “dirtiest” well.

7.1 Well Set-Up Activities

The following steps are required to properly set up for sampling:

1. Properly identify and inspect each well.
2. Wear appropriate PPE during set-up activities.

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3. Place a sheet of polyethylene adjacent to the well to keep sampling and monitoring equipment from touching the ground.
4. Remove the well cap slowly (positive pressure inside may blow cap off).
5. Measure the VOC concentration at the top of the casing and in the breathing zone using a PID—record reading in field book.
6. Measure and record the depth to water (to within 0.01 feet) using a water level meter or interface probe, if applicable (the water level measurement should be taken from a permanent reference point scribed on top of the well casing).
7. To minimize turbidity in the well, use total well depth information obtained from the well construction logs to calculate one casing volume.¹
8. Attach and secure Teflon or Teflon-lined polyethylene tubing to low-flow (0.10 to 0.50 L/min) stainless steel submersible pump.
9. Lower the submersible pump slowly and gently into the monitoring well to minimize aquifer agitation and mixing of the stagnant well casing water, and then secure the safety drop cable or nylon rope and tubing together with nylon cable-ties.
10. Place the intake of the submersible pump within the upper 12 inches of the water column. The intake of the pump should be placed at an elevation above dense non-aqueous phase liquid (DNAPL), if applicable.
11. Plumb the in-line flow-through cell to the discharge tubing from the well.
12. Plumb a discharge line from the effluent of the flow-through cell to a transportable, purged water storage container.
13. Position a power source (e.g., a generator) for operation of the submersible pump down gradient of the well to be purged.

¹ Multiply the total water column thickness (ft) by the cross-sectional area of the well (ft²) and record in field book and on Well Purging Record form. One cubic foot (ft³) is equivalent to 7.48 gallons.

7.2 Low Flow Purging and Sampling

Once you have completed the well set up activities above, follow these steps to purge and sample using low-flow techniques:

1. Put on new nitrile gloves. Change nitrile gloves any time the integrity of the glove is compromised during the purging and sampling activities.
2. Activate the low-flow submersible pump and begin extracting groundwater at a rate between 0.10 and 0.50 L/min.

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3. Measure the water level approximately every 10 seconds and adjust extraction rate to obtain minimal drawdown in the well of 0.2 feet, but no more than 0.3 feet maximum.
4. Once drawdown is stabilized, begin monitoring water quality indicators (pH, specific conductance, and temperature) using the in-line flow-through cell. Record observations in field book and on the attached Well Purging Record form. *Note: while purging, the pumping rate and groundwater level are measured and recorded every 10 minutes (or as appropriate).*
5. Monitor the water level and extraction rate, in addition to monitoring water quality indicators, and make periodic adjustments to flow rates to ensure steady flow and minimal drawdown.
6. Water quality readings will be monitored every five minutes (or as appropriate) until stabilization criteria are achieved.
7. Stabilization is achieved when a minimum of three (minimum of four if using temperature as an indicator) successive readings for each parameter, collected 3-5 minutes apart, are within the following criteria:

Water Quality Indicator Parameter	Stabilization Criteria
pH	± 0.1 s.u.
Specific Conductance	$\pm 3\%$
Temperature	$\pm 3\%$ (minimum of $\pm 0.2^{\circ}\text{C}$)
Oxidation-reaction potential (ORP)	± 10 mV
Turbidity	$\pm 10\%$
Dissolved Oxygen	$\pm 10\%$

***Note:** Stabilization criteria is achieved when the average value of three readings are within each parameter criteria limits.*

8. Collect the necessary samples once purging activities are complete and the groundwater stabilization/clarity is acceptable according to applicable protocol described above.
9. If a well is low yield and purged dry, do not collect a sample until it has recharged to approximately 80% of its pre-purge volume, when practical.
10. Collect samples directly from the pump or bailer into the appropriate sample container under typical circumstances. Take care to avoid handling the interior of the bottle or cap. **Do not** place the bottle cap on the ground or in a pocket to avoid contamination.
11. Fill all sampling containers for each well in a manner that minimizes aeration and turbulence. Put on a new pair of nitrile gloves before filling each container.

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12. Disconnect or bypass the flow-through cell prior to obtaining each sample. The first volume of groundwater in the tubing is to be discarded and treated according to the waste management section described below. Place the discharge line in position at the base of the sample bottle. Fill the sample bottle from the bottom to the top, allowing it to overflow before sealing. *Note: do not overflow if the sample bottles contain preservatives.*
13. Place samples immediately on ice and store at 4° C.
14. Obtain final water level and flow rate measurements and enter in field book and on the Well Purging Record form.

7.3 Decontamination Procedures

Clean all equipment that will enter the well or come into contact with groundwater prior to each low-flow purging and sampling activity with a stiff brush and a solution of water and laboratory-grade detergent. All decontamination fluids will be disposed of in accordance with the site's waste management plan.

7.4 Documentation

Document all the events, equipment used, and measurements collected during the sampling activities in the field notes. Make all entries in black indelible ink and strike out any corrections with a single line. Initial and date corrections.

Record all manually-measured data and procedural descriptions in a field notebook and on well purging forms (**Attachment 1**). Maintain detailed notes regarding field calibration events, purging or PID anomalies, and volumes of extracted groundwater.

7.5 Waste Management

Transfer all purged water to the hazardous waste accumulation area where it will be pumped through a 20 and 50 micron filter prior to transfer into 6,000-gallon wastewater storage tank. A record of the total gallons will be maintained in the field book.

Porous materials (PPE, rags, etc.) contaminated with groundwater and non-porous materials that cannot be decontaminated will be managed as hazardous waste. Porous and non-porous materials not contaminated with groundwater will be disposed of as residual waste.

RECORDS

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1.0 TITLE: **FLUID LEVEL GAUGING**

2.0 PURPOSE / SCOPE

The purpose of this SOP is to provide general instructions to all GES personnel concerning fluid level gauging activities. The measurement of fluid levels (groundwater or phase-separated compounds) in monitor wells, piezometers, extraction wells, and/or boreholes is required in geotechnical, hydrogeologic, and waste management investigations to determine the presence and condition of the groundwater, or the presence and thickness of phase-separated compounds. Water level measurements (hydraulic head) are used to determine: hydraulic gradients and the direction of groundwater flow; the effectiveness of groundwater extraction systems; and the volume of water required for well purging prior to groundwater sampling. The measurement of the thickness of phase-separated compounds provides a qualitative (not quantitative) monitoring of this form of contamination.

In order to provide reliable data, water levels must be determined over the shortest period of time possible. Barometric pressure can affect groundwater levels and, therefore, observation of significant weather changes during the period of water level measurements must be noted. Tidal fluctuations, navigation controls on rivers, rainfall events and groundwater pumping can also affect groundwater level measurements. Personnel collecting water level data must note if any of these controls are in effect during the groundwater level collection period. Due to possible changes during the groundwater level determination period, it is imperative that the time of data collection at each station be accurately recorded.

In conjunction with groundwater level measurements, surface water (e.g., ponds, lakes, rivers, and lagoons) must be monitored as well. This information is critical in understanding the hydrogeologic setting of the site and, most importantly, how contaminants may move beneath the site.

Note: *The importance of proper and consistent field methods, as well as proper documentation, **CANNOT BE OVER-EMPHASIZED.***

This SOP shall be used in conjunction with an approved Health and Safety Plan (HASP). Also, consult the HASP for information on the selection and use of PPE.

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3.0

REFERENCE

ASTM 4750 —Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)

ASTM D6000 —Guide for Presentation of Water-Level Information from Ground-Water Sites

U.S. EPA (1986), RCRA Ground water Monitoring Technical Enforcement Guidance Document, Washington, D.C.

U.S. EPA (1992), RCRA Ground water Monitoring: Draft Technical Guidance, Washington, D.C. (EPA/530-R-93-001).

4.0

RESPONSIBILITIES

4.1 Project Manager

The Project Manager (PM) is responsible to ensure that all activities performed by site personnel are performed safely, in compliance with all pertinent regulations and procedures, and provide the necessary equipment and resources to accomplish the tasks described in this procedure.

4.2 Local Health and Safety Officer (LHSO)

The Local Health and Safety Officer (LHSO), in consultation with the Corporate HSO and State project representatives, will designate the appropriate level of personnel protective equipment (PPE) for field personnel to safely accomplish their work.

4.3 Case Manager

The Case Manager (CM) is responsible for providing field personnel with a comprehensive fluid level gauging work plan/schedule. In addition, the PM or CM will provide field personnel with enough information to perform the work safely and correctly. This information should include the operational and safety procedures that are applicable to the work being performed.

4.4 Field Personnel

Field personnel are responsible for the safe completion of assigned tasks as described in the SOPs, Health and Safety Plan (HASP) and appropriate site-specific work plans and procedures. They are required to document the work

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performed and to alert their immediate supervisors of any variances from procedures established in the above documents.

5.0 EQUIPMENT / MATERIALS

A number of devices are used by GES to collect water level measurements. Typical devices used are:

- Calibrated electronic water level indicators (e.g., solinst or slope indicator)
- Tape/ploppers
- Pressure transducers and dataloggers (generally for pumping tests and long-term monitoring)
- Stevens recorders for long-term monitoring

Devices typically used by GES to measure phase-separated compounds are:

- Electronic audible interface probe
- Clear bottom-loading bailers
- Weighted cotton string or cord

The pressure transducers, Stevens recorders, and oil/water interface probes have manuals which describe their use. This procedure will focus on an overview of this equipment and other methods which have more widespread use in fluid level measurement.

***Note:** Since many decisions concerning the distribution, transport, and remediation of groundwater contamination will be made on the basis of fluid level monitoring, the accuracy of the measurements made at an appropriate level of precision is very important.*

Typically, the precision required is ± 0.01 foot (± 1 mm); the majority of GES' measuring devices are graduated to this precision level. To ensure accuracy, double check all fluid level readings; it is very easy to misread a tape or transpose figures when recording the data.

6.0 PREPARATION

Review and perform preparation activities per SOP FM 1.5, *General Instructions for Field Personnel*.

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If the water-level data are being collected for the entire site, the Water-Level Measurement Field Sheet, obtained from the PM/CM, should be used (Attachment A). If the data are being collected during low flow ground water sampling, SOP FM 8.5, *Low Flow Groundwater Sampling Procedures* should be followed. If gauging activities are associated with other Site investigation activities the appropriate SOP will be reference accordingly.

Obtain a copy of previous water levels from the PM or CM.

The device used to measure water levels should attain an accuracy of 0.01 ft. A steel tape or an electric sounder can be used to measure water levels, but this SOP only concerns the use of an electric sounder.

When practical, the same portable water-level measurement device should be used for all measurements. However, in order to prevent cross contamination between monitor wells, the water-level indicators must be decontaminated according to SOP FM 14.1, *Decontamination of Dedicated Sampling Equipment*. If an indicator is dedicated to a particular section of the site, or a particular well, it should be marked accordingly.

Obtain and complete the Equipment Checklist (SOP FM 1.5, Attachment A) to confirm that all the necessary materials are available before proceeding.

Make sure water-level measuring equipment is in good operating condition.

Whenever possible, start at those wells that are the least contaminated and work towards more contaminated areas as indicated by the PM or CM.

Clean all equipment per SOP FM 14.1 before the initial and between each use.

7.0

PROCEDURE

Water-Level Measurement Procedure

Once the prior planning and preparation activities are completed, fluid level measurements can proceed. The typical series of events which will take place are:

- Well identification/inspection
- Air monitoring
- Reference point determination
- Level measurements
- Equipment decontamination

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- Field note completion, review, and checking
- Equipment return
- Documentation submitted to appropriate staff and files

***Note:** Similar to sampling sequence, fluid level measurements should follow a logical order from the least known or suspected level of contamination to the greatest. This will minimize the potential for cross-contamination between wells/monitoring locations.*

Well Identification/Inspection

Once at the site and prior to fluid level measurements, confirm that the well to be measured has been correctly identified and located. Frequently sites under evaluation have numerous wells, or wells located in clusters such that identification errors can easily occur. The monitoring personnel should be alert to potential cap switching, mislabeled locations or unlabeled wells.

Proper well locations can be determined by comparison of the well log details to measured well details (i.e., total well depth, casing diameter, casing stick-up or stick-down distances), field ties and site plans.

Once the correct monitor well is identified, a thorough inspection shall be completed, and recorded in the field book. Determine if the cap and lock are secure or if they have been tampered with. If the well is unlocked, replace the lock. Any cracks in the protective casing and/or surface seal should be noted, as well as any subsidence or surface water ponding in the vicinity of the well.

Note the results of the well inspection (even if the well is in perfect condition) and inform the Project Coordinator of any well repairs required. Arrange to have any unmarked wells permanently stamped for proper identification. (A temporary marking at the time of monitoring should also be performed.)

Air Monitoring

Unlock and open the protective casing. Remove the well casing cap and monitor the breathing zone directly above the open cap with an organic vapor meter (SOP FM 16.4). Record vapor readings on the Water Level Measurement Field Sheet (Attachment A). Refer to the site-specific HASP if vapor readings are detected above 1.0 parts per million for more than a five minute period. Recording of extended air monitoring activities shall be conducted with the Air Monitoring Record, Real-Time Monitoring sheet (SOP FM 16.4).

Reference Point Determination

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Use the top of the reference point as imprinted on the top of the well casing as the measuring reference point. If a reference point is not present, the north side of the well casing will be used as the reference point and marked on the well casing in a manner that can be referred to during future monitoring events (e.g., notch piping or write with permanent marker). This will be the point of measure (POM) to be used when obtaining water-level measurements. Any deviation from this measuring point must be documented on the Water-Level Measurement Field Sheet (Attachment A) and reported to PM or CM.

Level measurements

Measure the distance from the water surface to the POM by placing a steel indicator reference bar (or something comparatively straight and rigid) over the top of the well casing, then lower an electronic water-level indicator or equivalent (i.e., steel tape) into the sounding port as marked. When water is encountered, a light (usually red) will shine on the reel of the water-level indicator, and an intermittent beeping sound will be heard. Slowly move the line up and down along the side of the reference bar until the exact point at which the buzz is heard is located. A continuous beeping sound indicates a phase layer is confirmed. Using the bottom of the reference bar as the measuring point, obtain the depth-to-water measurement and phase layer measurement, if encountered, by referencing the markings on the water-level indicator line to the buzzing tone, red indicator light, or audible beeping sound. Note the reading. Compare the new measurement to previously measured water levels.

Note: *Beware of watertight caps which provide an airtight seal on the casing end and the water level is positioned within the casing area (i.e., not within the screened interval). Often if this condition exists, a vacuum or pressurized zone is created within the casing section which supports or depresses the water column within the well casing, creating an artificially high or low water column. This effect can cause a few inches or feet of error in the static water level. Two or three water level measurements will confirm water level stability or changing conditions. Once the water level has stabilized (i.e., static) the proper measurement may be taken.*

Equipment decontamination

The water level indicator may then be removed and decontaminated in accordance to the Work Plan requirements.

Field note completion, review, and checking

Record measurement, date, and any notes next to the previous month's water level on the Water-Level Measurement Field Sheet (Attachment A). If the water-

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level measurement seems suspect or if there is a 0.5 ft difference from the last reading, then re-check water-level measurement. Place a check mark next to the well ID on the Water-Level Measurement Field Sheet to indicate that the measurement was verified.

Report any measurement anomalies to the PM or CM. Secure well cap and lock the protective casing or cap.

Equipment return

After all equipment has been thoroughly cleaned and decontaminated, return to proper location and complete any necessary equipment forms.

Store water-level indicator in a clean, protected area during transport to the next well and after work is completed.

Documentation submitted to appropriate staff and files

Forward original Water-Level Measurement Field Sheet to PM or CM.

8.0

RECORDS

Field Notes

The field notes must document all the events, equipment used, and measurements collected during the sampling activities. The field notes must be legible and concise so that the entire sample event can be reconstructed later for future reference.

Record field notes in a standard bound survey-type field book issued for general note taking/field records and available from all GES equipment administrators. Make all field book entries black ink and make any changes/corrections with a single strikethrough line. Initial and date to indicate who made the change/correction and when it was made.

Complete and submit a Water-Level Measurement Field Sheet.

9.0

FOLLOW-UP ACTIVITIES

Perform the following once field activities are complete.



Appendix C – Laboratory Reports

May 22, 2019

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

GES, Inc. - Concord, CA

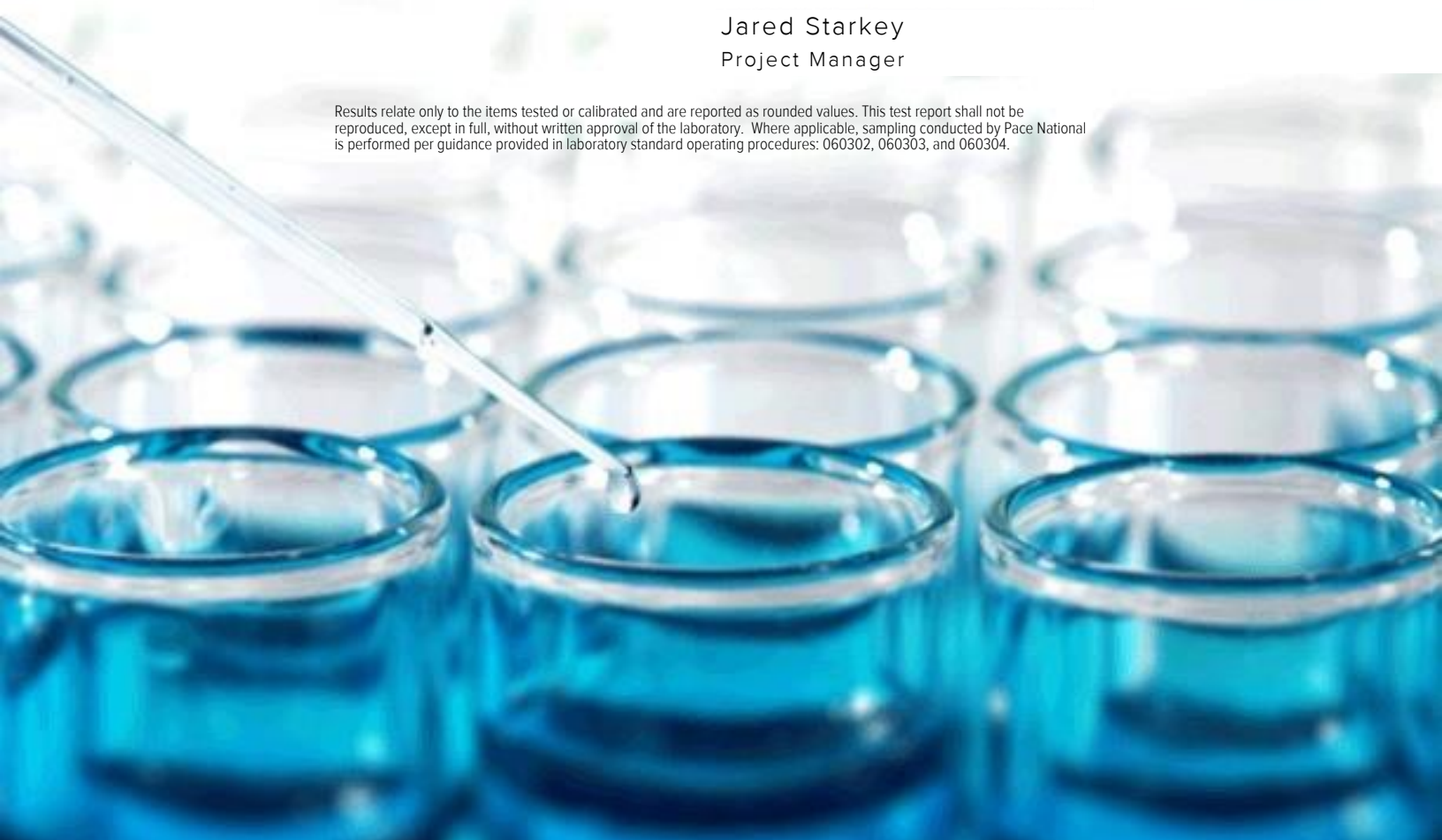
Sample Delivery Group: L1086723
Samples Received: 04/08/2019
Project Number: 3016007-800013-206
Description: 4409 Lake Otis Pkwy
Site: 4409 LAKE OTIS
Report To: Mark Peterson
5046 Commercial Circle, Ste. F
Concord, CA 94520

Entire Report Reviewed By:



Jared Starkey
Project Manager

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by Pace National is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.





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MW-1A L1086723-01 GW

Collected by
Amy ZablockiCollected date/time
04/05/19 21:10Received date/time
04/08/19 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method AK101	WG1263653	1	04/10/19 18:11	04/10/19 18:11	BMB	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method AK102/103	WG1266280	1	04/16/19 06:11	04/16/19 16:25	FM	Mt. Juliet, TN

DUP-1 L1086723-02 GW

Collected by
Amy ZablockiCollected date/time
04/05/19 21:10Received date/time
04/08/19 09:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method AK101	WG1263653	1	04/10/19 18:35	04/10/19 18:35	BMB	Mt. Juliet, TN
Semi-Volatile Organic Compounds (GC) by Method AK102/103	WG1266280	1	04/16/19 06:11	04/16/19 16:47	FM	Mt. Juliet, TN

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Jared Starkey
Project Manager

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



Volatile Organic Compounds (GC) by Method AK101

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
TPHGAK C6 to C10	11.2	J	10.0	100	1	04/10/2019 18:11	WG1263653
(S) a,a,a-Trifluorotoluene(FID)	99.0			50.0-150		04/10/2019 18:11	WG1263653

Semi-Volatile Organic Compounds (GC) by Method AK102/103

Analyte	Result ug/l	Qualifier	MDL ug/l	RDL ug/l	Dilution	Analysis date / time	Batch
AK102 DRO C10-C25	345	J	170	800	1	04/16/2019 16:25	WG1266280
AK103 RRO C25-C36	874		460	800	1	04/16/2019 16:25	WG1266280
(S) o-Terphenyl	76.8			50.0-150		04/16/2019 16:25	WG1266280
(S) n-Triacontane d62	92.1			50.0-150		04/16/2019 16:25	WG1266280

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Volatile Organic Compounds (GC) by Method AK101

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
TPHGAK C6 to C10	U		10.0	100	1	04/10/2019 18:35	WG1263653
(S) a,a,a-Trifluorotoluene(FID)	100			50.0-150		04/10/2019 18:35	WG1263653

Semi-Volatile Organic Compounds (GC) by Method AK102/103

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
AK102 DRO C10-C25	379	J	170	800	1	04/16/2019 16:47	WG1266280
AK103 RRO C25-C36	1060		460	800	1	04/16/2019 16:47	WG1266280
(S) o-Terphenyl	78.1			50.0-150		04/16/2019 16:47	WG1266280
(S) n-Triacontane d62	89.9			50.0-150		04/16/2019 16:47	WG1266280

1	Cp
2	Tc
3	Ss
4	Cn
5	Sr
6	Qc
7	Gl
8	Al
9	Sc



Method Blank (MB)

(MB) R3400905-2 04/10/19 11:16

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
TPHGAK C6 to C10	U		10.0	100
(S) a,a,a-Trifluorotoluene(FID)	100			50.0-150

1
Cp

2
Tc

3
Ss

4
Cn

5
Sr

6
Qc

7
Gl

8
Al

9
Sc

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3400905-1 04/10/19 10:26 • (LCSD) R3400905-3 04/10/19 22:05

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
TPHGAK C6 to C10	400	374	375	93.4	93.8	60.0-120			0.436	20
(S) a,a,a-Trifluorotoluene(FID)				101	98.4	50.0-150				

Semi-Volatile Organic Compounds (GC) by Method AK102/103

L1086723-01,02

Method Blank (MB)

(MB) R3402334-1 04/16/19 13:51

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
AK102 DRO C10-C25	U		170	800
AK103 RRO C25-C36	U		460	800
(S) n-Triacontane d62	78.1			50.0-150
(S) o-Terphenyl	67.0			50.0-150

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3402334-2 04/16/19 14:13 • (LCSD) R3402334-3 04/16/19 14:35

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
AK102 DRO C10-C25	3000	2670	2670	89.0	89.0	75.0-125			0.000	20
(S) n-Triacontane d62				72.1	62.0	50.0-150				
(S) o-Terphenyl				76.3	75.8	50.0-150				

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3402334-4 04/16/19 14:57 • (LCSD) R3402334-5 04/16/19 15:19

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
AK103 RRO C25-C36	3000	2900	2890	96.7	96.3	60.0-120			0.345	20
(S) n-Triacontane d62				96.1	101	50.0-150				
(S) o-Terphenyl				70.0	74.3	50.0-150				

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDL	Method Detection Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
(S)	Surrogate (Surrogate Standard) - Analytes added to every blank, sample, Laboratory Control Sample/Duplicate and Matrix Spike/Duplicate; used to evaluate analytical efficiency by measuring recovery. Surrogates are not expected to be detected in all environmental media.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Uncertainty (Radiochemistry)	Confidence level of 2 sigma.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier Description

J	The identification of the analyte is acceptable; the reported value is an estimate.
---	---

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gi

8 Ai

9 Sc



Pace National is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

* Accreditation is only applicable to the test methods specified on each scope of accreditation held by Pace National.

State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey–NELAP	TN002
California	2932	New Mexico ¹	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina ¹	DW21704
Georgia	NELAP	North Carolina ³	41
Georgia ¹	923	North Dakota	R-140
Idaho	TN00003	Ohio–VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky ^{1 6}	90010	South Carolina	84004
Kentucky ²	16	South Dakota	n/a
Louisiana	AI30792	Tennessee ^{1 4}	2006
Louisiana ¹	LA180010	Texas	T104704245-18-15
Maine	TN0002	Texas ⁵	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP, LLC EMLAP	100789
A2LA – ISO 17025 ⁵	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA–Crypto	TN00003		

¹ Drinking Water ² Underground Storage Tanks ³ Aquatic Toxicity ⁴ Chemical/Microbiological ⁵ Mold ⁶ Wastewater n/a Accreditation not applicable

Our Locations

Pace National has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. Pace National performs all testing at our central laboratory.





Appendix D – DEC Laboratory Data Review Checklist



MEMORANDUM

TO: Mark C. Peterson, Project Manager

FROM: Bonnie Janowiak, Ph.D.

**RE: Data Evaluation Narrative
Project: Shell-4409 Lake Otis, Anchorage, AK
Groundwater and Environmental Services
Matrix: Groundwater –Sampled April 5, 2019
Pace Analytical SDG Number: L1086723**

Review completed May 1, 2019

1. Data Review Criteria

Groundwater & Environmental Services, Inc. (GES) reviewed the analytical data from the **Shell-4409 Lake Otis, Anchorage, AK** (site) April 5, 2019 sampling event in order to determine accuracy and precision for each analysis as well as to determine overall data usability. Organic data were reviewed for holding times, method and field blank results, surrogate or system monitoring compound recoveries, Matrix Spike/Matrix Spike Duplicate (MS/MSD) and LCS recoveries. All data necessary to complete the data review were provided by the laboratory.

The collection of aqueous samples from one location, an original and a duplicate sample, occurred on April 5, 2019.

The samples were sent to Pace Analytical laboratories and analyzed for the following methodologies as requested on the Chain of Custody:

- Volatile Organic Compounds (GC) by Method 8021/AK101,
- Semi-Volatile Organic Compounds (GC) by Method AK102/103,

The analytical results were reviewed using laboratory acceptance criteria and procedures and the guidelines contained in the USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, revised January 2017.

2. Data Qualifiers Assigned

Data was overall of good quality and usable. No data was qualified pursuant to this validation effort.

2.1. Holding Times

Analytical holding times were met.

2.2. Blank Results

There were no analytes reported above the practical quantitation limit (PQL).

2.3. Laboratory Control Spike (LCS)

All LCS recoveries were within laboratory-specified criteria.

2.4. Preservation

Samples were collected and subsequently stored in amber sample bottles and stored $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$ until prepared and analyzed. The temperature of the samples upon receipt by the laboratory were recorded. The initial cooler was received below the acceptable range at 1.2°C . The cooler samples were unfrozen, so the below optimal temperature does not affect the data results. Samples were stored in appropriate and properly preserved.

2.5. Surrogates Recoveries and Accuracy

The surrogate recoveries were all within laboratory-specified ranges.

2.6. Duplicate Analyses and Precision

A field duplicate (DUP-1) from the MW-1A sampling location was collected and submitted blind to the laboratory for analysis. By EPA guidance, only analytes with concentrations $>5\text{X}$ the PQL should be used to determine precision. The RPDs for all detections are presented in **Table 2**.

Table 2. Field Duplicate Precision

Field Identification	Analyte	Sample Result	Duplicate Result	RPD ⁽¹⁾	Qualified
MW-1A DUP-1	TPHGAK	11.2	ND at 10	NC	A
	AK102 DRO C10-C25	345J	379J	NC	A
	AK103 RRO C25-C36	874	1060	19	A

⁽¹⁾ Relative percent difference = $|((\text{SR}-\text{DR}) * 200) / (\text{SR} + \text{DR})|$

RPD = relative percent difference (RPD $\leq 30\%$ is considered acceptable)

A - Acceptable data

mg/L = milligrams per liter

J = below PQL above MDL

Precision is the distribution of a set of reported values about the mean, or the closeness of agreement between individual test results obtained under prescribed and similar conditions. Precision is best expressed in terms of RPD.

Analysis of the laboratory precision employed evaluation of laboratory spike/laboratory spike duplicate (LCS/LCSD) and matrix spike/matrix spike duplicates (MS/MSD) relative percent difference (RPD) precision calculations. The overall precision within compliance was 100%.

2.7. Accuracy

Accuracy is a measure of the closeness of an observed value to the “true” value, e.g., theoretical or reference value, or population mean. Accuracy includes a combination of random error and systematic error (bias) that result from sampling and analytical operations. Analytical batch accuracy is measured through the analyses of recoveries in LCSs and MS/MSDs. Sample specific accuracy is measured with surrogate recovery. All surrogate recoveries and all recoveries reported in the LCS, and site associated MS/MSD pair were within laboratory-specified criteria. Accuracy for this sampling event and report is 100%.

2.8. Sensitivity

Sensitivity is the measure of how low a concentration can be detected/reported. Sensitivity is measured using practical quantitation limits (PQLs) or reporting limits (RLs).

All reported compounds had PQLs below the DEC clean-up standard and were reliable data.

2.9. Summary

Groundwater analytical data are usable and considered definitive data and suitable for comparison to regulatory standards.

Please do not hesitate to contact me if you have comments or questions.

Sincerely,

A handwritten signature in blue ink, appearing to read "B Janowiak", with a long horizontal flourish extending to the right.

Bonnie Janowiak, Ph.D.
Senior Chemist
708 North Main, Suite 201
Blacksburg, VA 24060

Laboratory Data Review Checklist

Completed by:	Bonnie Janowiak		
Title:	Project Chemist	Date:	May 1, 2019
CS Report Name:	Groundwater Monitoring Report Semi-Annual 2nd Quarter 2019	Report Date:	Apr 17, 2019
Consultant Firm:	Groundwater & Environmental Services		
Laboratory Name:	Pace Analytical	Laboratory Report Number:	L1086723
ADEC File Number:	2100.38.542	ADEC RecKey Number:	N/A

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

☒ Yes ☐ No ☐ NA (Please explain.) Comments:

--

b. If the samples were transferred to another "network" laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

☐ Yes ☐ No ☒ NA (Please explain) Comments:

No samples were transferred or subcontracted.

2. Chain of Custody (COC)

a. COC information completed, signed, and dated (including released/received by)?

☒ Yes ☐ No ☐ NA (Please explain) Comments:

--

b. Correct analyses requested?

☒ Yes ☐ No ☐ NA (Please explain) Comments:

--

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt ($4^{\circ} \pm 2^{\circ} \text{C}$)?

☒ Yes ☒ No ☐ NA (Please explain) Comments:

1.2 Degrees Celsius. Sample was unfrozen. Data was not impacted.
--

b. Sample preservation acceptable - acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

c. Sample condition documented - broken, leaking (Methanol), zero headspace (VOC vials)?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

d. If there were any discrepancies, were they documented? - For example, incorrect sample containers/preservation, sample temperature outside of acceptance range, insufficient or missing samples, etc.?

☐ Yes ☒ No ☐ NA (Please explain)

Comments:

The laboratory does not have a sample specific case narrative. The laboratory provides a liability statement indicating that all data has been reviewed and all issues have been identified.

e. Data quality or usability affected? (Please explain)

Comments:

No.

4. Case Narrative

a. Present and understandable?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

b. Discrepancies, errors or QC failures identified by the lab?

☐ Yes ☒ No ☐ NA (Please explain)

Comments:

The laboratory does not have a sample specific case narrative. The laboratory provides a liability statement indicating that all data has been reviewed and all issues have been identified.

c. Were all corrective actions documented?

☐ Yes ☒ No ☐ NA (Please explain)

Comments:

The laboratory does not have a sample specific case narrative. The laboratory provides a liability statement indicating that all data has been reviewed and all issues have been identified.

d. What is the effect on data quality/usability according to the case narrative?

Comments:

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

b. All applicable holding times met?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

c. All soils reported on a dry weight basis?

☐ Yes ☐ No ☒ NA (Please explain)

Comments:

Aqueous samples only.

d. Are the reported PQLs less than the Cleanup Level or the minimum required detection level for the project?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

e. Data quality or usability affected? (Please explain)

Comments:

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

ii. All method blank results less than PQL?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

iii. If above PQL, what samples are affected?

Comments:

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No ☒ NA (Please explain) Comments:

No blank impact on data.

v. Data quality or usability affected? (Please explain) Comments:

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics - One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

☒ Yes ☐ No ☐ NA (Please explain) Comments:

ii. Metals/Inorganics - One LCS and one sample duplicate reported per matrix, analysis and 20 samples?

☐ Yes ☐ No ☒ NA (Please explain) Comments:

No metals or inorganics reported

iii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

☒ Yes ☐ No ☐ NA (Please explain) Comments:

All data associated with the site is reported within method or laboratory limits.

iv. Precision - All relative percent differences (RPD) reported and less than method or laboratory limits? And project specified DQOs, if applicable. RPD reported from LCS/LCSD, MS/DMSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

☒ Yes ☐ No ☐ NA (Please explain) Comments:

All data associated with the site is reported within method or laboratory limits.

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

vi. Do the affected samples(s) have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No ☒ NA (Please explain) Comments:

No impacted samples.

vii. Data quality or usability affected? (Please explain)

Comments:

c. Surrogates - Organics Only

i. Are surrogate recoveries reported for organic analyses - field, QC and laboratory samples?

☒ Yes ☐ No ☐ NA (Please explain) Comments:

ii. Accuracy - All percent recoveries (%R) reported and within method or laboratory limits? And project specified DQOs, if applicable. (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

☒ Yes ☐ No ☐ NA (Please explain) Comments:

iii. Do the sample results with failed surrogate recoveries have data flags? If so, are the data flags clearly defined?

☐ Yes ☐ No ☒ NA (Please explain) Comments:

iv. Data quality or usability affected? (Use the comment box to explain.).

Comments:

d. Trip Blank - Volatile analyses only (GRO, BTEX, Volatile Chlorinated Solvents, etc.): Water and Soil

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)

☐ Yes ☒ No ☐ NA (Please explain.) Comments:

No trip blank was noted on the COC, and no trip blank was reported. Data requested does not require a trip blank to be analyzed.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

☐ Yes ☐ No ☒ NA (Please explain.) Comments:

iii. All results less than PQL?

☐ Yes ☐ No ☒ NA (Please explain.)

Comments:

iv. If above PQL, what samples are affected?

Comments:

v. Data quality or usability affected? (Please explain.)

Comments:

e. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

ii. Submitted blind to lab?

☒ Yes ☐ No ☐ NA (Please explain.)

Comments:

iii. Precision - All relative percent differences (RPD) less than specified DQOs?
(Recommended: 30% water, 50% soil)

$$\text{RPD (\%)} = \text{Absolute Value of: } \frac{(R_1 - R_2)}{((R_1 + R_2)/2)} \times 100$$

Where R_1 = Sample Concentration

R_2 = Field Duplicate Concentration

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

All RPDs where the concentrations are > 2x the PQL were within DQO.

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

☐ Yes ☒ No ☐ NA (Please explain)

Comments:

f. Decontamination or Equipment Blank (if applicable)

☐ Yes ☒ No ☐ NA (Please explain)

Comments:

i. All results less than PQL?

☐ Yes ☐ No ☒ NA (Please explain)

Comments:

No equipment blank in the analytical batch.

ii. If above PQL, what samples are affected?

Comments:

iii. Data quality or usability affected? (Please explain.)

Comments:

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

☒ Yes ☐ No ☐ NA (Please explain)

Comments:

Reset Form