



March 3, 2020

Mr. Todd A. Pitsenberger
Petroleum Program Manager
Virginia Department of Environmental Quality
Valley Regional Office
4411 Early Road
P.O. Box 3000
Harrisonburg, Virginia 22801

ECS Project No. 47-9894

Re: Subphase-5 Groundwater Monitoring Report
Ivy Exxon - 4260 Ivy Road, Charlottesville, Virginia
PC 2013-6113

Dear Mr. Pitsenberger,

On behalf of our client, Mr. Roger Gibson, we are pleased to submit this monitoring report with the results of the monitoring well gauging and sampling that was conducted at the Ivy Exxon site on February 13, 2020. All groundwater data and sampling data collected to date are presented in this report.

Background

In 2013, Analytical Services, Inc. (ASI) conducted a Phase I Environmental Site Assessment (ESA) on the Ivy Exxon, located at 4260 Ivy Road in Charlottesville, Virginia. The ESA revealed that the site has been used as a gasoline station since at least the 1950s. It also revealed that there have been two documented past releases from underground storage tanks (USTs) at the site. The first release was reported in February 1997 and the second release was reported in November 1998 following the removal of three 6,000-gallon gasoline USTs. Both releases have since been closed. ASI also conducted a Phase II Subsurface Investigation in 2013. The Phase II Subsurface Investigation revealed that the area near the site's gasoline UST basin had been impacted by a petroleum release. An elevated concentration of total petroleum hydrocarbons (TPH) gasoline range organics (GRO) above Virginia Department of Environmental Quality (DEQ) reporting limits was detected in a soil sample collected from a boring located down-gradient from the UST basin. Elevated concentrations of benzene, toluene, ethylbenzene, and xylenes (BTEX) were detected in a groundwater sample collected from the same boring above Virginia Voluntary Remediation Program (VRP) Tier III screening levels.

On April 17, 2013, the DEQ directed that a Site Characterization Report (SCR) study be conducted at the site. The SCR study concluded that contaminant concentrations at the site posed a potential threat to human and environmental receptors, as the subject site's domestic well was found to be impacted by MTBE and the potential existed for impact to Little Ivy Creek. Two addendums were written for the SCR to further assess petroleum contamination at the site and the site was monitored quarterly in 2014.

Carbon filtration was installed in the onsite supply well and in the supply wells at the business to the west of the site and the Sponski-Lucas residence to the east of the site. Culligan has been monitoring these supply wells on behalf of the DEQ since the installation of the carbon treatment systems. The treatment systems at the business to the west of the site and the Sponski-Lucas residence were removed during the summer of 2018, as contaminant levels had decreased to the point that carbon filtration was determined to no longer be necessary. A carbon treatment system is still used by the subject site's supply well, although petroleum concentrations have steadily decreased in the well since release case inception such that no contamination was detected in the April and October 2019 sampling events completed by Culligan. On February 3, 2020, DEQ requested that ECS complete a round of gauging and groundwater monitoring of the site's monitoring wells to evaluate the possibility of modifying the sampling interval and use of carbon filtration at the site's supply well.

Site Location, Hydrology, and Regional Geology

The Ivy Exxon site is located at 4260 Ivy Road in Charlottesville, Virginia (Figure 1). The elevation of the study area portion of the subject site is approximately 514 feet above mean sea level (amsl). The subject site slopes gently to the east toward Little Ivy Creek. The site is within the western portion of the Piedmont Physiographic Province, and is underlain by crystalline rock of the Blue Ridge Anticlinorium. Bedrock lithology beneath the site is porphyroblastic-biotite-plagioclase-augen gneiss (stratigraphic symbol Ybg), which is Middle Proterozoic (Grenville) in age (Virginia Division of Mineral Resources, 2003).

Storm water drainage from the site drains to the southeast toward Little Ivy Creek, which is located immediately adjacent to the site's southeastern boundary at a distance of 120 feet from the subject site's UST basin (Figure 1). Little Ivy Creek flows to the northeast, where it becomes a tributary to the Rivanna River. The Rivanna River supplies water to the Rivanna River Reservoir, which provides water to the City of Charlottesville, Virginia. The Rivanna River converges with the James River, which is a major tributary of the Chesapeake Bay, after flowing out of the Rivanna River Reservoir. No surface water bodies exist on the site.

Monitoring Well Gauging, Purging, and Sampling

Monitoring well gauging and sampling was performed on February 13, 2020. ECS collected well gauging data from overburden monitoring wells MW-1, MW-2, MW-3, MW-6, MW-7, MW-8, piezometer P-1, and bedrock monitoring well BW-2. ECS did not collect a sample from MW-4, MW-5, and BW-1. The well casing at MW-4 was caved in approximately 7 feet below ground surface (bgs) and the well cap and manway had been removed. ECS was unable to locate monitoring well MW-5 and bedrock well BW-1 within the parking area.

The well gauging data is presented below in Table 1. Depth-to-groundwater measurements recorded during this monitoring event and past monitoring events are presented in Table A-1 within Attachment A. Groundwater elevation values are approximated based on topographic mapping. Laboratory reports are included as Attachment B. Locations of the wells at the site and groundwater equipotential mapping are depicted on Figure 2.

Table 1 - Monitoring Well Gauging Results from February 13, 2020.

Monitoring Well	Monitoring Well Type	Total Well Depth ^a (feet btoc ^b)	TOC ^c Elevation (feet amsl ^d)	Depth to Water (feet btoc)	Groundwater Elevation (feet amsl)
MW-1	Overburden	15	514.29	9.20	505.09
MW-2	Overburden	14	513.25	8.31	504.94
MW-3	Overburden	13	513.39	8.42	504.97
MW-4	Overburden	14	513.15	-- ^e	--
MW-5	Overburden	20	512.23	--	--
MW-6	Overburden	15	513.20	8.17	505.03
MW-7	Overburden	15	514.29	9.38	504.91
MW-8	Overburden	15	514.14	8.08	506.06
P-1	Streambank Piezometer	6.78	509.83	5.26	504.57
P-2	Streambank Piezometer	8.27	509.85	--	--
BW-1	Bedrock	60	513.95	--	--
BW-2	Bedrock	70	513.07	8.21	504.86

^aAs measured during previous monitoring events.

^bbtoc = below top of casing.

^cTOC = top of casing.

^damsl = above mean sea level.

^e--- no data collected.

ECS purged approximately three well volumes from each well prior to completing sampling. The water was removed from the well with a dedicated disposable bailer and twine. Free product was not observed in any of the monitoring wells. The purge water was dumped on the ground. Approximately 3.5 gallons of water were removed from MW-1, MW-2, MW-3, MW-6, MW-7, and MW-8. Approximately 0.5 gallons of water were removed from P-1 and approximately 30 gallons of water were removed from BW-2. ECS collected a sample from MW-1, MW-2, MW-3, MW-6, MW-7, MW-8, P-1, and BW-2 and submitted the samples for laboratory analysis of BTEX and methyl tert-butyl ether (MTBE) via U.S. Environmental Protection Agency (EPA) Method 8021B. Groundwater samples were placed on ice and submitted for laboratory analysis to Pace Analytical in Mount Juliet, Tennessee.

Groundwater Analytical Results

Analytical results of all detected constituents from the February 13, 2020 monitoring event are shown in Table 2 below. Groundwater analytical data recorded during this monitoring event and past monitoring events are presented in Table A-2 within Attachment A and a map showing groundwater petroleum concentrations is included as Figure 3.

Table 2 - Groundwater Analytical Results from February 13, 2020.

Well ID	Benzene (µg/L ^a)	Toluene (µg/L)	Ethyl- benzene (µg/L)	Total Xylenes (µg/L)	MTBE ^b (µg/L)
MW-1	30.2	18.9	508	59.6	<1.0
MW-2	17.7	<1.0	1.27	11.1	<1.0
MW-3	20.9	5.96	19.2	17.1	<1.0
MW-6	5.88	<1.0	2.12	4.19	<1.0
MW-7	4.33	<1.0	14.0	13.3	<1.0
MW-8	<0.5	<1.0	<0.5	<1.5	<1.0
P-1	<0.5	<1.0	<0.5	<1.5	<1.0
BW-2	<0.5	<1.0	<0.5	<1.5	628
<i>Virginia VRP^c Tier II Residential Intrusion Groundwater Screening Level</i>	5.0	1,000.0	700.0	10,000.0	140.0

^aµg/L – micrograms per liter

^bMTBE – methyl tert-butyl ether

^cVRP – Voluntary Remediation Program


Benzene was detected in five of the eight monitoring wells at concentrations between 4.33 and 30.2 micrograms per liter (µg/L). Four of the five detected concentrations of benzene were above the Virginia VRP Tier II Residential Groundwater Screening Level of 5.0 µg/L. Toluene was detected in two of the eight groundwater wells (MW-1 at 18.9 µg/L and MW-3 at 5.96 µg/L). The detected concentrations of toluene were below the Virginia VRP Tier II Residential Groundwater Screening Level of 1,000.0 µg/L. Ethylbenzene was detected in five of the eight monitoring wells between 1.27 and 508 µg/L. The detected concentrations of ethylbenzene were below the Virginia VRP Tier II Residential Groundwater Screening Level of 700.0 µg/L. Total xylenes were detected in five of the eight monitoring wells between 4.19 and 59.6 µg/L. The detected concentrations of total xylenes were below the Virginia VRP Tier II Residential Groundwater Screening Level of 10,000.0 µg/L. MTBE was detected in one of the eight groundwater wells (BW-2 at 628 µg/L). The detected concentration of MTBE was above the Virginia VRP Tier II Residential Groundwater Screening Level of 140.0 µg/L.


The concentrations of toluene, ethylbenzene, total xylenes, and MTBE in MW-1 and MW-2 on February 13, 2020 were less than the concentrations of these constituents during the previous monitoring event completed in December 2014. The concentrations of benzene had increased in MW-1 and MW-2 from December 2014 to February 2020. The concentrations of ethylbenzene, total xylenes, and MTBE in MW-3 on February 13, 2020 were less than the concentrations of these constituents in December 2014. The concentrations of toluene and benzene had increased in MW-3 from December 2014 to February 2020. The concentrations of BTEX and MTBE in MW-6, MW-7, MW-8, P-1, and BW-2 on February 13, 2020 were less than the concentrations of these constituents in December 2014. Overall, the data collected during this monitoring event appear to indicate that petroleum concentrations in the site's overburden and bedrock aquifer have generally declined over the past five years.


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Please feel free to contact me at (540) 785-6624 if you have any comments or questions regarding this report.

Sincerely,
ECS Mid-Atlantic, LLC


Michael L. Maloy, CPG
Principal Geologist


Abby Conklin-Muchnick, EIT
Environmental Project Manager


Thomas P. Nelson, CPG
Senior Hydrogeologist

cc: Mr. Roger Gibson, by mail




FIGURES



Figure 1: Site Layout Map

Ivy Exxon Site
4260 Ivy Road
Charlottesville, VA

Legend

-  Subject Site
-  Subject Site Supply Well
-  Stream



0 50 100 200
Feet



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Figure 2: Site Monitoring Wells and Groundwater Elevations

Legend

- Subject Site
- Groundwater Equipotential Contour (C.I. = 0.2 ft.)
- Stream

Monitoring Well

- + Overburden Monitoring Well
- Bedrock Monitoring Well
- Streambank Piezometer

Ivy Exxon Site
4260 Ivy Road
Charlottesville, VA

0 20 40 80
Feet



Map Notes:
(1) Groundwater elevations measured on 2/13/2020 in units of feet amsl;
(2) Only overburden and piezometer monitoring well data were used to generate groundwater equipotential contours.



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Legend

- Subject Site
- UST Basin

Monitoring Well

- ⊕ Overburden Monitoring Well
- ⊙ Bedrock Monitoring Well
- ⊙ Streambank Piezometer

0 20 40 80 Feet

Figure 3: Groundwater Sampling Results

Ivy Exxon Site
4260 Ivy Road
Charlottesville, VA



Map Notes:
 (1) Sampling data from 2/13/2020;
 (2) Units are micrograms per liter;
 (3) B = benzene, T = toluene,
 E = ethylbenzene, X = total xylenes,
 M = methyl tert-butyl ether.



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ATTACHMENT A

DATA TABLES

Table A-1
Historical Groundwater Elevation Data
Ivy Exxon

Well Identification	Total Well Depth (feet bgs ^a)	TOC ^b Elevation (feet amsl ^c)	Date Gauged	Depth to Water from TOC (feet)	Product Thickness (feet)	Groundwater Elevation (feet amsl)
MW-1	15	514.29	5/16/2013	9.55	0	504.74
			5/28/2013	9.82	0.01	504.47
			7/23/2013	9.29	0	505
			9/9/2013	9.98	0	504.31
			2/6/2014	8.9	0	505.39
			5/20/2014	7.88	0	506.41
			9/5/2014	10.54	0	503.75
			12/4/2014	9.88	0	504.41
			2/13/2020	9.20	0	505.09
MW-2	14	513.25	5/16/2013	8.78	0	504.47
			5/28/2013	9.08	0	504.17
			7/23/2013	8.54	0	504.71
			9/9/2013	9.17	0	504.08
			2/6/2014	8.14	0	505.11
			5/20/2014	7.17	0	506.08
			9/5/2014	9.69	0	503.56
			12/4/2014	9.04	0	504.21
			2/13/2020	8.31	0	504.94
MW-3	13	513.39	5/16/2013	8.66	0	504.73
			5/28/2013	9.07	0	504.32
			7/23/2013	8.57	0	504.82
			2/6/2014	8.16	0	505.23
			5/20/2014	7.29	0	506.1
			9/5/2014	9.69	0	503.7
			12/4/2014	9.08	0	504.31
			2/13/2020	8.42	0	504.97
MW-4	14	513.15	5/16/2013	9.09	0	504.06
			5/28/2013	9.32	0	503.83
			7/23/2013	8.89	0	504.26
			9/9/2013	9.39	0	503.76
			2/6/2014	8.46	0	504.69
			5/20/2014	7.88	0	505.27
			9/5/2014	9.82	0	503.33

Well Identification	Total Well Depth (feet bgs ^a)	TOC ^b Elevation (feet amsl ^c)	Date Gauged	Depth to Water from TOC (feet)	Product Thickness (feet)	Groundwater Elevation (feet amsl)
			12/4/2014	9.25	0	503.9
			2/13/2020	-- ^d	--	--
MW-5	20	512.23	7/23/2013	7.3	0	505.85
			9/9/2013	8.29	0	504.86
			2/6/2014	6.84	0	506.31
			5/20/2014	5.27	0	507.88
			9/5/2014	9.08	0	504.07
			12/4/2014	8.11	0	505.04
			2/13/2020	--	--	--
MW-6	15	513.20	7/23/2013	8.26	0	504.94
			2/6/2014	7.91	0	505.29
			5/20/2014	6.92	0	506.28
			9/5/2014	9.52	0	503.68
			12/4/2014	8.87	0	504.33
			2/13/2020	8.17	0	505.03
MW-7	15	514.29	7/23/2013	9.43	0	504.86
			9/9/2013	10.00	0	504.29
			2/6/2014	9.03	0	505.26
			5/20/2014	8.22	0	506.07
			9/5/2014	10.42	0	503.87
			12/4/2014	9.84	0	504.45
			2/13/2020	9.38	0	504.91
MW-8	15	514.14	7/23/2013	7.93	0	506.21
			9/9/2013	9.05	0	505.09
			2/6/2014	7.48	0	506.66
			5/20/2014	6.07	0	508.07
			9/5/2014	9.90	0	504.24
			12/4/2014	8.87	0	505.27
			2/13/2020	8.08	0	506.06
P-1	6.78	509.83	7/23/2013	5.81	0	504.02
			7/31/2013	5.96	0	503.87
			8/16/2013	6.07	0	503.76
			9/9/2013	6.18	0	503.65
			2/6/2014	5.33	0	504.50
			5/20/2014	4.86	0	504.97
			9/5/2014	6.59	0	503.24

Well Identification	Total Well Depth (feet bgs ^a)	TOC ^b Elevation (feet amsl ^c)	Date Gauged	Depth to Water from TOC (feet)	Product Thickness (feet)	Groundwater Elevation (feet amsl)
			12/4/2014	6.00	0	503.83
			2/13/2020	5.26	0	504.57
P-2	8.27	509.85	7/23/2013	6.51	0	503.34
			7/31/2013	6.45	0	503.40
			8/16/2013	6.50	0	503.35
			9/9/2013	6.56	0	503.29
			2/6/2014	6.00	0	503.85
			5/20/2014	5.87	0	503.98
			9/5/2014	6.75	0	503.10
			12/4/2014	6.43	0	503.42
			2/13/2020	--	--	--
BW-1	60	513.95	9/9/2013	9.11	0	504.84
			9/24/2013	9.49	0	504.46
			2/6/2014	7.79	0	506.16
			5/20/2014	6.70	0	507.25
			9/5/2014	6.75	0	507.2
			12/4/2014	6.43	0	507.52
			2/13/2020	--	--	--
BW-2	70	513.07	9/9/2013	9.01	0	504.06
			9/24/2013	9.27	0	503.8
			2/6/2014	7.96	0	505.11
			5/20/2014	7.03	0	506.04
			9/5/2014	9.53	0	503.54
			12/4/2014	8.91	0	504.16
			2/13/2020	8.21	0	504.86

^abgs = below ground surface

^bDepth to water values are expressed as feet below top of well casing

^camsl = above mean sea level

^d-- = no data collected

Table A-2
Historical Groundwater Quality Data

Well ID	Sampling Date	Benzene (µg/L ^a)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	Total BTEX ^b (µg/L)	TPH-GRO ^c (µg/L)	MTBE ^d (µg/L)	Chloro-methane (µg/L)	Notes
MW-1	5/16/2013	73	<10	4,700	510	5,283	17,000	95	NA ^e	Method 8021B
	7/23/2013	58	11	3,900	520	4,489	18,000	65	NA	
	2/6/2014	67	<25	3,500	410	3,977	NA	86	NA	
	5/20/2014	62	8.7	1,500	214	1,784.70	NA	78	NA	
	9/5/2014	74	46	3,000	293	3,413	NA	440	NA	
	12/4/2014	27	27	2,300	220	2,574	NA	45	NA	
	2/13/2020	30.2	18.9	508	59.6	NA	NA	<1.0	NA	
MW-2	5/16/2013	4.0	<1.0	10.0	6.4	20.4	520	8.5	NA	Method 8021B
	7/23/2013	4.3	<1.0	1.0	5.1	10.4	780	10	NA	
	2/6/2014	3.6	1.2	<1.0	8.2	13	NA	11	NA	
	5/20/2014	<1.0	<1.0	9.8	3.9	13.7	NA	6.5	NA	
	9/5/2014	6.0	2.8	3.2	7.2	19.2	NA	9.8	NA	
	12/4/2014	8.0	1.8	6.0	18.3	34.1	NA	9.2	NA	
	2/13/2020	17.7	<1.0	1.27	11.1	NA	NA	<1.0	NA	
MW-3	5/16/2013	21	<1.0	47	16.2	84.2	1,800	25	NA	Method 8021B
	7/23/2013	13	<1.0	53	15.1	81.1	1,600	14	NA	
	2/6/2014	15	3.8	51	31.1	100.9	NA	17	NA	
	5/20/2014	7.0	2.8	20	10.7	40.5	NA	12	NA	
	9/5/2014	29	4.0	50	40.4	123.4	NA	24	NA	
	12/4/2014	19	2.8	50	32.8	104.6	NA	25	NA	
	2/13/2020	20.9	5.96	19.2	17.1	NA	NA	<1.0	NA	
MW-4	5/16/2013	31	<1.0	33	15.5	79.5	1,600	14	NA	Method 8021B
	7/23/2013	30	<1.0	25	15.8	70.8	2,400	15	NA	
	2/6/2014	18	2.6	7.2	13.3	41.1	NA	14	NA	
	5/20/2014	3.1	1.2	1.6	5.5	11.4	NA	9.4	NA	
	9/5/2014	19	3.5	15	15.6	54.1	NA	11	NA	
	12/4/2014	17	6.2	9.2	12.1	44.5	NA	11	NA	

Well ID	Sampling Date	Benzene (µg/L ^a)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	Total BTEX ^b (µg/L)	TPH-GRO ^c (µg/L)	MTBE ^d (µg/L)	Chloro-methane (µg/L)	Notes
MW-5	7/23/2013	<1.0	<1.0	<1.0	<3.0	<6.0	<100	<1.0	NA	Method 8021B
	2/6/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	1.0	NA	
MW-6	7/23/2013	<1.0	<1.0	<1.0	<3.0	<6.0	<100	5.7	NA	Method 8021B
	2/6/2014	1.7	<1.0	1.7	<3.0	<7.4	NA	9.6	NA	
	5/20/2014	2.7	<1.0	<1.0	<3.0	2.7	NA	9.3	NA	
	9/5/2014	9.1	2.9	22	34.6	68.6	NA	14	NA	
	12/4/2014	6.7	1.3	13	23.2	44.2	NA	13	NA	
	2/13/2020	5.88	<1.0	2.12	4.19	NA	NA	<1.0	NA	
MW-7	7/23/2013	44	14	110	135.8	303.8	3,600	21	NA	Method 8021B
	2/6/2014	20	2.8	59	75.4	157.2	NA	16	NA	
	5/20/2014	55	15	150	227.6	447.6	NA	16	NA	
	9/5/2014	25	1.5	45	48.6	120.1	NA	13	NA	
	12/4/2014	5.2	1.2	16	18	40.4	NA	7.2	NA	
	2/13/2020	4.33	<1.0	14.0	13.3	NA	NA	<1.0	NA	
MW-8	7/23/2013	<1.0	<1.0	<1.0	<3.0	<6.0	<100	<1.0	NA	Method 8021B
	2/6/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	<1.0	NA	
	2/13/2020	<0.5	<1.0	<0.5	<1.5	NA	NA	<1.0	NA	
P-1	7/23/2013	<1.0	<1.0	<1.0	<3.0	<6.0	NA	<1.0	<1.0	Method 8260B
	2/6/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	<1.0	<1.0	
	2/13/2020	<0.5	<1.0	<0.5	<1.5	NA	NA	<1.0	<1.0	Method 8021B
P-2	7/23/2013	<1.0	<1.0	<1.0	<3.0	<6.0	NA	1.1	<1.0	Method 8260B
	2/6/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	<1.0	<1.0	
BW-1	9/9/2013	<1.0	<1.0	<1.0	<3.0	<6.0	390	360	<1.0	Method 8260B
	2/6/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	320	<1.0	
	5/20/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	330	<1.0	
	9/5/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	250	<1.0	
	12/4/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	310	<1.0	
BW-2	9/9/2013	<1.0	<1.0	<1.0	<3.0	<6.0	1,700	1,600	<1.0	Method

Well ID	Sampling Date	Benzene (µg/L ^a)	Toluene (µg/L)	Ethyl-benzene (µg/L)	Total Xylenes (µg/L)	Total BTEX ^b (µg/L)	TPH-GRO ^c (µg/L)	MTBE ^d (µg/L)	Chloro-methane (µg/L)	Notes
	2/6/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	1,000	<1.0	8260B
	5/20/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	22	<1.0	
	9/5/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	1,200	<1.0	
	12/4/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	1,500	<1.0	
	2/13/2020	<0.5	<1.0	<0.5	<1.5	NA	NA	628	NA	Method 8021B
Scott's Ivy Domestic Well	5/28/2013	<1.0	<1.0	<1.0	<3.0	<6.0	NA	20	<1.0	Method 8260B
	7/23/2013	<1.0	<1.0	<1.0	<3.0	<6.0	NA	<1.0	2.9	Sample collected after installation of water treatment system using Method 8260B
Richmond Domestic Well	7/31/2013	<1.0	<1.0	<1.0	<3.0	<6.0	NA	6	<1.0	Method 8260B, western adjoining property
Eaton Domestic Well	2/6/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	<1.0	<1.0	Method 8260B, 4222 Ivy Road
Sponski Domestic Well	2/6/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	11	<1.0	Method 8260B, 4226 Ivy Road
Hammond Domestic Well	2/6/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	<1.0	<1.0	Method 8260B, 727 Pine Hill Lane. Note: detection of acetone
	5/20/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	<1.0	<1.0	
	9/5/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	<1.0	<1.0	

Well ID	Sampling Date	Benzene (µg/L ^a)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	Total BTEX ^b (µg/L)	TPH-GRO ^c (µg/L)	MTBE ^d (µg/L)	Chloromethane (µg/L)	Notes
	12/4/2014	<1.0	<1.0	<1.0	<3.0	<6.0	NA	<1.0	<1.0	of 16 µg/L on May 20, 2014

^a µg/L – micrograms per liter

^b BTEX – benzene, toluene, ethylbenzene, and xylenes

^c TPH-GRO – total petroleum hydrocarbons gasoline range organics

^d MTBE – methyl tert-butyl ether

^e NA – constituent not analyzed

ATTACHMENT B
LABORATORY REPORT

ECS Mid-Atlantic LLC - Charl. Va

Sample Delivery Group: L1189664

Samples Received: 02/14/2020

Project Number:

Description: Scott's Ivy Exxon

Report To: Mr. Tom Nelson

4004 Hunterstand Court; Ste 102

Charlottesville, VA 22911

Entire Report Reviewed By:



Heather J Wagner

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 Analytical National is performed per guidance provided in laboratory standard operating procedures ENV-SOP-MTJL-0067 and ENV-SOP-MTJL-0068. Where sampling conducted by the customer, results relate to the accuracy of the information provided, and as the samples are received.



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Cn: Case Narrative	4
Sr: Sample Results	5
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SAMPLE SUMMARY

ONE LAB. NATIONWIDE.



MW-1 L1189664-01 GW

				Collected by	Collected date/time	Received date/time
					02/13/20 14:50	02/14/20 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method 8021	WG1428932	1	02/16/20 17:34	02/16/20 17:34	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8021	WG1431581	10	02/20/20 21:34	02/20/20 21:34	ADM	Mt. Juliet, TN

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

MW-2 L1189664-02 GW

				Collected by	Collected date/time	Received date/time
					02/13/20 14:40	02/14/20 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method 8021	WG1428932	1	02/16/20 17:56	02/16/20 17:56	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8021	WG1431581	1	02/20/20 21:57	02/20/20 21:57	ADM	Mt. Juliet, TN

MW-3 L1189664-03 GW

				Collected by	Collected date/time	Received date/time
					02/13/20 14:40	02/14/20 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method 8021	WG1428932	1	02/16/20 18:19	02/16/20 18:19	BMB	Mt. Juliet, TN

MW-6 L1189664-04 GW

				Collected by	Collected date/time	Received date/time
					02/13/20 14:55	02/14/20 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method 8021	WG1428932	1	02/16/20 18:41	02/16/20 18:41	BMB	Mt. Juliet, TN

MW-7 L1189664-05 GW

				Collected by	Collected date/time	Received date/time
					02/13/20 14:30	02/14/20 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method 8021	WG1428932	1	02/16/20 19:03	02/16/20 19:03	BMB	Mt. Juliet, TN

MW-8 L1189664-06 GW

				Collected by	Collected date/time	Received date/time
					02/13/20 14:35	02/14/20 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method 8021	WG1428932	1	02/16/20 19:25	02/16/20 19:25	BMB	Mt. Juliet, TN

BW-2 L1189664-07 GW

				Collected by	Collected date/time	Received date/time
					02/13/20 15:05	02/14/20 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method 8021	WG1428932	1	02/16/20 19:48	02/16/20 19:48	BMB	Mt. Juliet, TN
Volatile Organic Compounds (GC) by Method 8021	WG1431581	10	02/20/20 22:19	02/20/20 22:19	ADM	Mt. Juliet, TN

P-1 L1189664-08 GW

				Collected by	Collected date/time	Received date/time
					02/13/20 14:15	02/14/20 08:45
Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst	Location
Volatile Organic Compounds (GC) by Method 8021	WG1428932	1	02/16/20 20:10	02/16/20 20:10	BMB	Mt. Juliet, TN

ACCOUNT:

ECS Mid-Atlantic LLC - Charl. Va

PROJECT:

SDG:

L1189664

DATE/TIME:

02/21/20 17:00

PAGE:

3 of 19



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.

Heather J Wagner
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 8021

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Benzene	0.0302		0.000500	1	02/16/2020 17:34	WG1428932
Toluene	0.0189		0.00100	1	02/16/2020 17:34	WG1428932
Ethylbenzene	0.508		0.00500	10	02/20/2020 21:34	WG1431581
Total Xylene	0.0596		0.00150	1	02/16/2020 17:34	WG1428932
Methyl tert-butyl ether	ND		0.00100	1	02/16/2020 17:34	WG1428932
(S) a,a,a-Trifluorotoluene(PID)	122		79.0-125		02/16/2020 17:34	WG1428932
(S) a,a,a-Trifluorotoluene(PID)	101		79.0-125		02/20/2020 21:34	WG1431581

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc



Volatile Organic Compounds (GC) by Method 8021

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Benzene	0.0177		0.000500	1	02/16/2020 17:56	WG1428932
Toluene	ND		0.00100	1	02/16/2020 17:56	WG1428932
Ethylbenzene	0.00127		0.000500	1	02/20/2020 21:57	WG1431581
Total Xylene	0.0111		0.00150	1	02/16/2020 17:56	WG1428932
Methyl tert-butyl ether	ND		0.00100	1	02/16/2020 17:56	WG1428932
(S) a,a,a-Trifluorotoluene(PID)	105		79.0-125		02/16/2020 17:56	WG1428932
(S) a,a,a-Trifluorotoluene(PID)	105		79.0-125		02/20/2020 21:57	WG1431581

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc



Volatile Organic Compounds (GC) by Method 8021

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Benzene	0.0209		0.000500	1	02/16/2020 18:19	WG1428932
Toluene	0.00596		0.00100	1	02/16/2020 18:19	WG1428932
Ethylbenzene	0.0192		0.000500	1	02/16/2020 18:19	WG1428932
Total Xylene	0.0171		0.00150	1	02/16/2020 18:19	WG1428932
Methyl tert-butyl ether	ND		0.00100	1	02/16/2020 18:19	WG1428932
(S) a,a,a-Trifluorotoluene(PID)	109		79.0-125		02/16/2020 18:19	WG1428932

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Volatile Organic Compounds (GC) by Method 8021

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Benzene	0.00588		0.000500	1	02/16/2020 18:41	WG1428932
Toluene	ND		0.00100	1	02/16/2020 18:41	WG1428932
Ethylbenzene	0.00212		0.000500	1	02/16/2020 18:41	WG1428932
Total Xylene	0.00419		0.00150	1	02/16/2020 18:41	WG1428932
Methyl tert-butyl ether	ND		0.00100	1	02/16/2020 18:41	WG1428932
(S) a,a,a-Trifluorotoluene(PID)	101		79.0-125		02/16/2020 18:41	WG1428932

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc



Volatile Organic Compounds (GC) by Method 8021

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Benzene	0.00433		0.000500	1	02/16/2020 19:03	WG1428932
Toluene	ND		0.00100	1	02/16/2020 19:03	WG1428932
Ethylbenzene	0.0140		0.000500	1	02/16/2020 19:03	WG1428932
Total Xylene	0.0133		0.00150	1	02/16/2020 19:03	WG1428932
Methyl tert-butyl ether	ND		0.00100	1	02/16/2020 19:03	WG1428932
(S) a,a,a-Trifluorotoluene(PID)	104		79.0-125		02/16/2020 19:03	WG1428932

¹ Cp² Tc³ Ss⁴ Cn⁵ Sr⁶ Qc⁷ Gl⁸ Al⁹ Sc

Volatile Organic Compounds (GC) by Method 8021

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Benzene	ND		0.000500	1	02/16/2020 19:25	WG1428932
Toluene	ND		0.00100	1	02/16/2020 19:25	WG1428932
Ethylbenzene	ND		0.000500	1	02/16/2020 19:25	WG1428932
Total Xylene	ND		0.00150	1	02/16/2020 19:25	WG1428932
Methyl tert-butyl ether	ND		0.00100	1	02/16/2020 19:25	WG1428932
(S) a,a,a-Trifluorotoluene(PID)	99.6		79.0-125		02/16/2020 19:25	WG1428932

1Cp

2Tc

3Ss

4Cn

5Sr

6Qc

7Gl

8Al

9Sc



Volatile Organic Compounds (GC) by Method 8021

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Benzene	ND		0.000500	1	02/16/2020 19:48	WG1428932
Toluene	ND		0.00100	1	02/16/2020 19:48	WG1428932
Ethylbenzene	ND		0.000500	1	02/16/2020 19:48	WG1428932
Total Xylene	ND		0.00150	1	02/16/2020 19:48	WG1428932
Methyl tert-butyl ether	0.628		0.0100	10	02/20/2020 22:19	WG1431581
(S) a,a,a-Trifluorotoluene(PID)	87.2		79.0-125		02/16/2020 19:48	WG1428932
(S) a,a,a-Trifluorotoluene(PID)	100		79.0-125		02/20/2020 22:19	WG1431581

1
Cp2
Tc3
Ss4
Cn5
Sr6
Qc7
Gl8
Al9
Sc



Volatile Organic Compounds (GC) by Method 8021

Analyte	Result mg/l	Qualifier	RDL mg/l	Dilution	Analysis date / time	Batch
Benzene	ND		0.000500	1	02/16/2020 20:10	WG1428932
Toluene	ND		0.00100	1	02/16/2020 20:10	WG1428932
Ethylbenzene	ND		0.000500	1	02/16/2020 20:10	WG1428932
Total Xylene	ND		0.00150	1	02/16/2020 20:10	WG1428932
Methyl tert-butyl ether	ND		0.00100	1	02/16/2020 20:10	WG1428932
(S) a,a,a-Trifluorotoluene(PID)	99.0		79.0-125		02/16/2020 20:10	WG1428932

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Method Blank (MB)

(MB) R3501672-2 02/16/20 15:19

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Benzene	U		0.000190	0.000500
Toluene	U		0.000412	0.00100
Ethylbenzene	U		0.000160	0.000500
Total Xylene	U		0.000510	0.00150
Methyl tert-butyl ether	U		0.000340	0.00100
(S) a,a,a-Trifluorotoluene(PID)	101			79.0-125

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

Laboratory Control Sample (LCS)

(LCS) R3501672-1 02/16/20 14:11

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Benzene	0.0500	0.0536	107	77.0-122	
Toluene	0.0500	0.0535	107	80.0-121	
Ethylbenzene	0.0500	0.0508	102	80.0-123	
Total Xylene	0.150	0.147	98.0	47.0-154	
Methyl tert-butyl ether	0.0500	0.0492	98.4	68.0-122	
(S) a,a,a-Trifluorotoluene(PID)			102	79.0-125	

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc



Method Blank (MB)

(MB) R3501989-3 02/20/20 17:57

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Ethylbenzene	U		0.000160	0.000500
Methyl tert-butyl ether	U		0.000340	0.00100
(S) a,a,a-Trifluorotoluene(PID)	99.3			79.0-125

¹ Cp

² Tc

³ Ss

⁴ Cn

⁵ Sr

⁶ Qc

⁷ Gl

⁸ Al

⁹ Sc

Laboratory Control Sample (LCS)

(LCS) R3501989-1 02/20/20 16:50

Analyte	Spike Amount mg/l	LCS Result mg/l	LCS Rec. %	Rec. Limits %	LCS Qualifier
Ethylbenzene	0.0500	0.0508	102	80.0-123	
Methyl tert-butyl ether	0.0500	0.0473	94.6	68.0-122	
(S) a,a,a-Trifluorotoluene(PID)			101	79.0-125	



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.

Results Disclaimer - Information that may be provided by the customer, and contained within this report, include Permit Limits, Project Name, Sample ID, Sample Matrix, Sample Preservation, Field Blanks, Field Spikes, Field Duplicates, On-Site Data, Sampling Collection Dates/Times, and Sampling Location. Results relate to the accuracy of this information provided, and as the samples are received.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
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

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

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

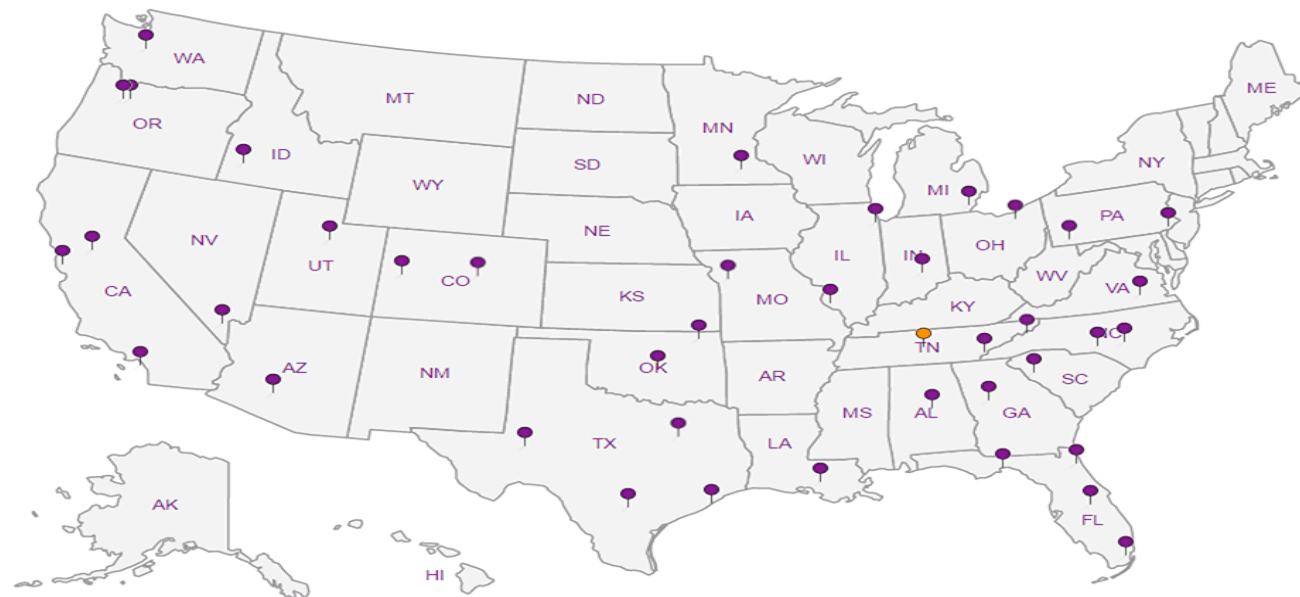
Third Party Federal Accreditations

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.

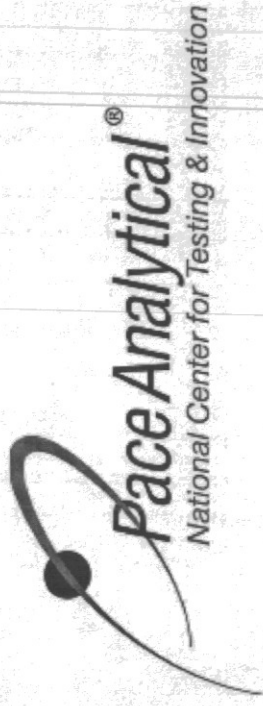


7 NCF

Pace Analytical National Center for Testing & Innovation
Cooler Receipt Form

Client: <u>ECSCCA</u>		1189664	
Cooler Received/Opened On: <u>2/4/20</u>		Temperature: <u>6.5</u>	
Received By: <u>Tanner L</u>			
Signature: <u>[Signature]</u>			
Receipt Check List		NP	Yes
COC Seal Present / Intact?		/	
COC Signed / Accurate?			/
Bottles arrive intact?			/
Correct bottles used?			/
Sufficient volume sent?			/
If Applicable			
VOA Zero headspace?			/
Preservation Correct / Checked?			

Kelsey Stephenson



Login #: L1189664	Client: ECSCCVA	Date: 02/14	Evaluated by: Kelsey S
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Non-Conformance (check applicable items)

Sample Integrity	Chain of Custody Clarification	If Broken Container:
Parameter(s) past holding time	Login Clarification Needed	Insufficient packing material around container
Temperature not in range	Chain of custody is incomplete	Insufficient packing material inside cooler
Improper container type	Please specify Metals requested.	Improper handling by carrier (FedEx / UPS / Courier)
pH not in range.	Please specify TCLP requested.	Sample was frozen
Insufficient sample volume.	Received additional samples not listed on coc.	Container lid not intact
Sample is biphasic.	Sample ids on containers do not match ids on coc	If no Chain of Custody:
Vials received with headspace.	Trip Blank not received.	Received by:
X Broken container	Client did not "X" analysis.	Date/Time:
Broken container:	Chain of Custody is missing	Temp./Cont. Rec./pH:
Sufficient sample remains		Carrier:
		Tracking#

Login Comments: Received 1 of 2 broken vials for MW-1

Client informed by:	Call	Email	Voice Mail	Date:	Time:
TSR Initials:	Client Contact:				

Login Instructions: proceed with unbroken vial