SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

January 4, 2019

Seattle Center Redevelopment
305 Harrison Street, Suite 109
Seattle, WA 98109

Attn: Mr. Ned Dunn

RE: AUGUST 2018 (1ST BI-ANNUAL) GROUNDWATER AND COMPLIANCE MONITORING, FORMER SEATTLE CENTER LOT NUMBER 2, SEATTLE, WASHINGTON

This letter report summarizes the status of groundwater monitoring activities at the former Seattle Center Lot Number 2 property, Iris Holdings LLC, 500 5th Ave North in Seattle, Washington (Site). Remediation of gasoline-contaminated groundwater at the Site through the use of an active in situ treatment system was conducted by the City of Seattle in conjunction with redevelopment of the property by IRIS Holdings, LLC, a wholly owned entity of the Bill & Melinda Gates Foundation. The goal of the remediation was to remove gasoline-range total petroleum hydrocarbons (TPH-G) in groundwater and meet cleanup levels in groundwater at a conditional point of compliance. Monitoring activities have consisted of quarterly and bi-annual groundwater sampling. The groundwater remediation system was turned off in March 2016. To determine if remediation of the source areas was completed or if rebound would occur, and to evaluate if monitored natural attenuation (MNA) of the remaining contamination was sufficient to be the final groundwater treatment method. This letter report presents groundwater monitoring results from August 2018, the 1st bi-annual event of the Rebound Monitoring Component 2 in accordance with the Post-Construction Groundwater Monitoring Plan.[1]

BACKGROUND

Previous environmental studies have identified gasoline- and benzene-impacted groundwater that originates primarily from two hot spot areas: a former fueling area in the north-central portion of

[1] Shannon & Wilson Inc., 2017, Post-construction groundwater monitoring plan Seattle Center lot number 2 (IRIS Holding LLC 500 5th Ave North) Seattle, Washington: Report prepared by Shannon & Wilson, Inc., Seattle, Wash., 21-1-12176-046, for Seattle Center Redevelopment, Seattle, Wash, June 9, 2017.

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the property and a former gasoline underground storage tank location in the central portion of the Site. In general, groundwater flow direction is to the south-southwest (Figure 3).

To facilitate cleanup of gasoline- and benzene-contaminated groundwater at the Site, a two-phase remediation plan was developed.[2] Each phase consisted of a system of soil vapor extraction (SVE) and air sparging (AS) wells (Figure 1). Phase I was installed in 2006 to 2007 and operated from June 2007 to June 2008. Phase I was discontinued when redevelopment activities required removal of the equipment.

Phase II of the remediation included reinstalling the AS/SVE system after the current property was completed. The reinstalled system commenced operation in November 2010. The first part of Phase II was completed in March 2016, and the system was shut down to conduct a rebound test following an analysis of groundwater data that indicated decreasing trends in concentrations of contaminants in source area wells and an absence of contaminants in point-of-compliance wells. Additional analyses were added to the monitoring program to assist with the evaluation of the feasibility of MNA as a final treatment method. Groundwater monitoring procedures and methods are discussed in the Post-Construction Groundwater Monitoring Plan, and results of the groundwater monitoring for the rebound test and the evaluation of the feasibility of MNA as a final treatment method are discussed below along with current monitoring results.

The Washington State Department of Ecology (Ecology) issued a No Further Action for the Site on October 17, 2017.[3] The site is currently operating within the post-cleanup controls and monitoring guidelines/restrictions established by Ecology.

GROUNDWATER MONITORING

Groundwater monitoring for the 1st round of bi-annual sampling was conducted to analyze for the contaminants of concern, evaluate the effects (if any) of the rebound test, and evaluate the feasibility of MNA as a final groundwater treatment method.

[2] Shannon & Wilson, Inc., 2009, Groundwater remediation plan, Phase II remediation design, Seattle Center lot no. 2, Seattle, Washington: Report prepared by Shannon & Wilson, Inc., Seattle, Wash., and Aspect Consulting LLC, Seattle, Wash., 21-1-12176-018, for Seattle Center Redevelopment, Seattle, Wash., June 11.
[3] Washington State Department of Ecology, 2017, No further action at the following site: Letter prepared by the Washington State Department of Ecology, Olympia, Wash., for IRIS Holdings LLC, Seattle, Wash., October 17.

Groundwater sampling was conducted on August 23 and 28, 2018. Sampled wells included compliance wells SW-26 and SW-27 and wells SVE-23, SVE-24, and SVE-25, in accordance with the Post Construction Groundwater Monitoring Plan approved by Ecology.

Prior to sampling, approximately 1 to 2.5 gallons of groundwater were purged from each well until water quality parameters stabilized. Each monitoring well was sampled using low-flow techniques.

The groundwater samples were transported under chain-of-custody protocols to OnSite Environmental, Inc. in Redmond, Washington, to analyze for Northwest TPH-G, benzene, toluene, ethylbenzene, and xylenes by U.S. Environmental Protection Agency Method 8021. Depth to groundwater measurements were recorded for the wells using an electronic water level indicator.

Investigation-Derived Waste Disposal

Groundwater purged from wells during sampling was contained on Site in a 200-gallon water collection tank. The tank is located near the wells in east end of the parking garage.

Groundwater Results

TPH-G was detected above the Model Toxics Control Act (MTCA) cleanup criteria of 1,000 micrograms per liter at SVE-23 and SVE-25. Benzene was detected above the MTCA cleanup criteria of 5 micrograms per liter at SVE-25 (Table 1). SVE-23 has historically exceeded the cleanup criteria for TPH-G since the implementation of the Phase II remediation, with the exception of the 9th, 10th, and 20th quarters (Table 2). SVE-25 concentrations of TPH-G and benzene were the highest detected since August 2015.

Compliance wells (SW-26 and SW-27) have not been detected for contaminants since May 2012.

A summary of the analytical groundwater results is presented in Figure 2 and Table 1. The analytical laboratory report from this groundwater sampling event is contained in Appendix A.

Natural Attenuation Evaluation

In general, according to the guidance provided by Ecology,[4] the analysis of the primary and secondary geochemical parameters (Table 1) show that groundwater conditions support the use of MNA through biodegradation as a final treatment method. In accordance with the Post-Construction Groundwater Monitoring Plan, future monitoring events will include analysis of TPH-G and benzene to continue to evaluate plume status.

CONCLUSIONS

The detection of TPH-G in SVE-23 is consistent with historical trends. The detection of TPH-G and benzene in SVE-25 suggests a potential rebound in contamination, but there is not sufficient evidence to determine the status of the plume. Continued monitoring and data collection, in accordance with the Post Construction Monitoring Plan, will provide a better understanding of the conditions at the Site. Analytical results for the two compliance wells remain non-detect for the contaminants of concern.

The Site is within compliance of the No Further Action post-cleanup controls and monitoring plan set by the Ecology in October 2017. Continued bi-annual monitoring will include an evaluation of TPH-G and benzene in three of the southern plume source wells and two downgradient compliance wells.

LIMITATIONS

The data presented in this letter report are based on sampling at the Site and should be considered representative of our observations at the time. We also note that the facts and conditions referenced in this letter report may change over time and that those set forth here are applicable to the facts and conditions as described only at the time this letter report was written. We believe that the conclusions stated here are factual, but no guarantee is made or implied.

This letter report was prepared for the exclusive use of Seattle Center Redevelopment and its representatives and in no way guarantees that any agency or its staff will reach the same conclusions as Shannon & Wilson, Inc. Shannon & Wilson has prepared the enclosed Appendix B, “Important Information About Your Geotechnical/Environmental Report,” to help you and others in understanding our reports.

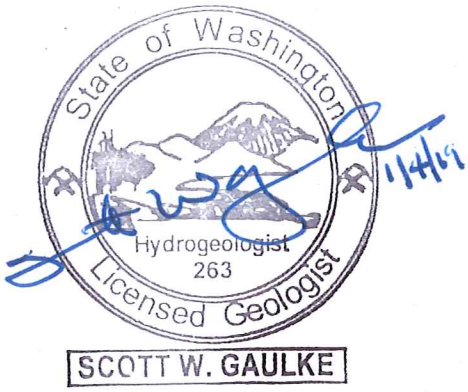
[4] Ibid.

If you have any questions regarding the findings presented herein, please call me at (206) 632-8020.

Sincerely,

SHANNON & WILSON, INC.

Christian T. Canfield
Environmental Staff



Scott W. Gaulke, PE, LHG
Vice President

CTC:SWG/ctc

Enc: Table 1 – Groundwater Analytical Results for August 2018
Table 2 – Historical Groundwater Analytical Results (3 pages)
Figure 1 – Site Plan
Figure 2 – TPH-G and Benzene Concentrations in Groundwater
Figure 3 – Groundwater Contour Map
Appendix A – Groundwater Analytical Laboratory Reports
Appendix B – Important Information About Your Geotechnical/Environmental Report

TABLE 1
GROUNDWATER ANALYTICAL RESULTS FOR AUGUST 2018

Well Number	Bi-Annual Event	Date Collected	BTEX (µg/L)				TPH - Gasoline (µg/L)	Primary Geochemical Indicators				
			Benzene	Toluene	Ethylbenzene	Xylenes		ORP (mV)	DO (mg/L)	pH	Specific Conductivity (µS/cm)	Temperature (°C)
Soil Vapor Extraction Wells												
SVE-23	BA1	8/23/2018	< 4.0	**9**	**68**	**164**	**3,100**	99.9	0.39	6.54	479.1	15.1
SVE-24	BA1	8/28/2018	< 1.0	< 1.0	< 1.0	< 1.0	< 100	518.4	0.30	6.24	2349	15.3
SVE-25	BA1	8/28/2018	**20**	**14**	**45**	**97**	**1,200**	276.2	0.19	6.36	726	15.1
Compliance Wells												
SW-26	BA1	8/23/2018	< 1.0	< 1.0	< 1.0	< 1.0	< 100	500.4	0.24	6.60	651	15.1
SW-27	BA1	8/23/2018	< 1.0	< 1.0	< 1.0	< 1.0	< 100	278.0	1.17	6.50	383.1	16.0
MTCA Method A Cleanup Levels			5	1,000	700	1,000	800/1,000[1]	NA	NA	NA	NA	NA

Notes:

[1] Cleanup level for gasoline is 800 micrograms per liter (µg/L) if benzene is present; 1,000 µg/L if no detectable benzene in groundwater.

Bolded text indicates analyte detected.

Shaded text indicates concentration exceeds cleanup levels.

< = less than reporting limit indicated

°C = degrees Celsius

BTEX = benzene, toluene, ethylbenzene, and xylenes

DO = dissolved oxygen

mg/L = milligrams per liter

mV = millivolt

NA = not applicable

ORP = oxygen reduction potential in millivolts

SVE = soil vapor extraction

TPH = total petroleum hydrocarbons

µS/cm = microSiemens per centimeter

µg/L = micrograms per liter

TABLE 2
HISTORICAL GROUNDWATER ANALYTICAL RESULTS

Well Number	Quarter or Bi-Annual Event	Date Collected	BTEX				TPH - Gasoline (µg/L)	Field Measurements	
			Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)		ORP (mV)	DO (mg/L)
SVE-23	BA1	8/28/2018	< 4.0	**9**	**68**	**164**	**3,100**	99.9	0.39
	Q29	2/23/2018	**2.6**	**18**	**100**	**238**	**4,400**	-40	0.15
	Q28	11/28/2017	**3.5**	**20**	**110**	**300**	**5,400**	-164	0.14
	Q27	8/29/2017	< 4.0	**9.6**	**93**	**195**	**3,800**	169	0.41
	Q26	5/25/2017	< 4.0	**12**	**110**	**216**	**4,100**	-92.4	0.10
	Q25	2/23/2017	< 4.0	**10**	**86**	**177**	**2,700**	-99.7	0.08
	Q24	11/17/2016	< 4.0	**11.0**	**89**	**218**	**3,100**	-110.8	0.12
	Q23	8/26/2016	< 4.0	**12.0**	**86**	**218**	**3,100**	248.3	0.21
	Q22	5/25/2016	**3.2**	**11.0**	**78**	**185**	**3,700**	-74.3	0.02
	Q21	2/25/2016	< 1.0	**8.8**	**69**	**175**	**2,800**	-113.7	0.08
	Q20	11/19/2015	< 1.0	< 1.0	< 1.0	< 1.0	< 100	-44.6	0.54
	Q19	8/26/2015	**2.1**	**7.2**	**49**	**87**	**2,200**	-47.5	0.67
	Q18	5/28/2015	**1.8**	< 1.0	**45**	**3.8**	**2,200**	-12.4	0.68
	Q17	2/26/2015	**2.7**	**8.2**	**62.0**	**143**	**2,800**	-75.9	4.93
	Q16	11/19/2014	< 4.0	**8.8**	**85.0**	**210**	**3,500**	-31.4	0.16
	Q15	8/28/2014	< 4.0	**6.8**	**81**	**185**	**3,500**	-64.2	0.14
	Q14	5/27/2014	**2.9**	**9.8**	**74**	**125**	**2,800**	-56.1	1.03
	Q13	2/24/2014	**2.0**	**4.2**	**44**	**43**	**1,400**	-40.3	0.46
	Q12	11/25/2013	**4.4**	**11**	**67**	**125**	**2,500**	-92.3	0.37
	Q11	8/29/2013	**5.3**	**12**	**67**	**135**	**3,100**	-51.3	0.14
	Q10	5/29/2013	**1.1**	**1.5**	**9.8**	**15.1**	**460**	43.1	0.26
	Q9	2/26/2013	< 1.0	< 1.0	**3.3**	**5.6**	**230**	82.4	0.30
	Q8	11/26/2012	**5.0**	**8.0**	**56**	**89**	**2,400**	-55.5	0.05
	Q7	8/30/2012	**8.2**	**11**	**75**	**126**	**3,300**	-27.4	0.23
	Q6	5/31/2012	**3.9**	**3.1**	**27**	**30**	**1,200**	-232.1	0.54
	Q5	2/29/2012	**3.3**	**2.5**	**27**	**24**	**880**	57.4	0.58
	Q4	11/29/2011	**6.9**	**6.5**	**53**	**47**	**1,600**	-42.5	0.47
	Q3	8/30/2011	**13**	**8**	**78**	**73**	**2,600**	-39.5	5.11
	Q2	5/27/2011	**21**	**10**	**100**	**176**	**4,200**	-48.7	0.42
	Q1	2/24/2011	**27**	**7.4**	**130**	**197**	**6,000**	-68.9	0.85
	Interim	5/20/2010	**47**	**19**	**250**	**820**	**7,700**	-44.1	0.25
SVE-24	BA1	8/28/2018	< 1.0	< 1.0	< 1.0	< 1.0	< 100	518.4	0.30
	Q29	2/22/2018	< 1.0	< 1.0	< 1.0	< 1.0	< 100	41	0.31
	Q28	11/28/2017	< 1.0	< 1.0	< 1.0	< 1.0	< 100	-89	0.21
	Q27	8/29/2017	< 1.0	< 1.0	< 1.0	< 1.0	< 100	113	0.21
	Q26	5/24/2017	< 1.0	< 1.0	< 1.0	< 1.0	< 100	223.6	0.18
	Q25	2/22/2017	**2.9**	< 1.0	**2.3**	< 1.0	**160**	18.9	0.20
	Q24	11/17/2016	**38**	4.5	**18**	20.5	**680**	-80.4	0.20
	Q23	8/25/2016	**13**	< 4.0	**6.3**	< 4.0	**440**	48.3	0.16
	Q22	5/24/2016	< 1.0	**1.0**	< 1.0	< 1.0	< 100	-35.4	0.18
	Q21	2/25/2016	< 1.0	< 1.0	< 1.0	< 1.0	< 100	-4.9	0.24
	Q20	11/19/2015	< 1.0	< 1.0	< 1.0	< 1.0	< 100	150.0	16.80
	Q19	8/26/2015	< 1.0	< 1.0	< 1.0	< 1.0	< 100	-1.6	0.38
	Q18	5/28/2015	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-28.1	0.34
	Q17	2/26/2015	< 1.0	< 1.0	< 1.0	< 2.0	**150**	-96.8	1.41
	Q16	11/19/2014	**2.0**	< 1.0	**3.7**	< 2.0	**330**	-21.4	0.13
	Q15	8/28/2014	< 1.0	< 1.0	< 1.0	< 2.0	**190**	-70.1	0.12
	Q14	5/27/2014	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-33.2	1.01
	Q13	2/24/2014	< 1.0	< 1.0	< 1.0	< 2.0	**110**	-39.8	0.77
	Q12	11/25/2013	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-34.0	0.35
	Q11	8/29/2013	< 1.0	< 1.0	**2.5**	< 2.0	**210**	-34.2	0.21
	Q10	5/29/2013	< 1.0	< 1.0	**2.4**	< 2.0	**180**	-48.1	0.28
	Q9	2/26/2013	**14**	< 1.0	**6.8**	< 2.0	**310**	-38.8	0.33
	Q8	11/26/2012	**31**	**1.4**	**9.5**	**3.4**	**500**	-71.1	0.15
	Q7	8/29/2012	**3.1**	< 1.0	**2.8**	< 2.0	**260**	-15.7	0.27
	Q6	5/30/2012	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-250.0	0.30
	Q5	2/29/2012	**1.1**	< 1.0	< 1.0	**1.8**	**140**	-33.3	3.65
	Q4	11/29/2011	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-71.0	0.70
	Q3	8/30/2011	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-11.9	0.15
	Q2	5/31/2011	< 4.0	< 4.0	< 4.0	< 4.0	< 400	-11.4	0.19
	Q1	2/24/2011	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-42.6	0.68
	Interim	5/20/2010	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-273.6	0.63

TABLE 2
HISTORICAL GROUNDWATER ANALYTICAL RESULTS

Well Number	Quarter or Bi-Annual Event	Date Collected	BTEX				TPH - Gasoline (µg/L)	Field Measurements	
			Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)		ORP (mV)	DO (mg/L)
SVE-25	BA1	8/28/2018	**20**	**14**	**45**	**97**	**1,200**	276.2	0.19
	Q29	2/22/2018	< 1.0	< 1.0	< 1.0	**2.7**	< 100	119.0	0.21
	Q28	11/28/2017	**2.5**	< 1.0	**3.5**	**2.7**	**100**	-7.0	0.19
	Q27	8/30/2017	< 4.0	< 4.0	< 4.0	< 1.0	< 400	229.0	0.38
	Q26	5/25/2017	< 4.0	< 4.0	< 4.0	< 1.0	< 400	43.8	0.28
	Q25	2/23/2017	**10**	< 4.0	**7.8**	**8.1**	< 400	-48.4	0.14
	Q24	11/17/2016	< 1.0	< 1.0	**1.4**	< 1.0	< 100	38.4	0.18
	Q23	8/25/2016	< 1.0	< 1.0	**1.9**	< 1.0	< 100	343.9	0.18
	Q22	5/24/2016	**4**	**1.2**	**14**	**1.6**	**270**	-11.9	0.14
	Q21	2/25/2016	< 1.0	< 1.0	**9.5**	< 2.0	< 100	-62.4	0.14
	Q20	11/20/2015	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-39.5	0.59
	Q19	8/26/2015	**43**	**8.5**	**130**	**47**	**2,000**	-56.0	0.23
	Q18	5/28/2015	**68**	< 4.0	**160**	**12**	**3,000**	-4.1	0.29
	Q17	2/26/2015	**120**	**13**	**190**	**106**	**2,900**	-137.1	4.39
	Q16	11/19/2014	**250**	**40**	**300**	**140**	**3,800**	-57.5	0.07
	Q15	8/28/2014	**170**	**85**	**220**	**281**	**4,400**	-98.4	0.16
	Q14	5/27/2014	**91**	**19**	**200**	**158**	**3,500**	-68.8	1.04
	Q13	2/24/2014	**120**	**52**	**260**	**257**	**4,800**	-53.1	0.77
	Q12	11/25/2013	**100**	**28**	**200**	**113**	**3,200**	-90.3	0.26
	Q11	8/29/2013	**93**	**7.5**	**130**	**71**	**2,200**	-53.2	0.21
	Q10	5/29/2013	**68**	**4.6**	**82**	**40**	**1,300**	-56.9	0.28
	Q9	2/27/2013	**190**	**29**	**150**	**180**	**3,200**	-68.1	0.20
	Q8	11/26/2012	**380**	**160**	**270**	**580**	**7,200**	-107.6	0.01
	Q7	8/29/2012	**200**	**160**	**180**	**377**	**5,300**	-21.3	0.39
	Q6	5/30/2012	**79**	**20**	**63**	**160**	**1,600**	-218.5	0.25
	Q5	2/29/2012	**400**	**230**	**330**	**498**	**6,600**	-83.2	1.11
	Q4	11/29/2011	**290**	**230**	**240**	**480**	**5,800**	-114	0.60
	Q3	8/30/2011	**430**	**220**	**250**	**591**	**6,700**	-74.5	0.08
	Q2	5/31/2011	**390**	**330**	**200**	**490**	**6,100**	-46.8	0.17
	Q1	2/24/2011	**400**	**370**	**200**	**440**	**6,900**	-82.5	0.34
	Interim	5/20/2010	**360**	**130**	**150**	**109**	**2,800**	-177.9	0.91
SW-26	BA1	8/23/2018	< 1.0	< 1.0	< 1.0	< 1.0	< 100	500.4	0.24
	Q29	2/22/2018	< 1.0	< 1.0	< 1.0	< 1.0	< 100	133.0	0.57
	Q28	11/27/2017	< 1.0	< 1.0	< 1.0	< 1.0	< 100	53.0	0.34
	Q27	8/29/2017	< 1.0	< 1.0	< 1.0	<1.0	< 100	171.0	0.43
	Q26	5/24/2017	< 1.0	< 1.0	< 1.0	< 1.0	< 100	231.4	0.42
	Q25	2/22/2017	< 1.0	< 1.0	< 1.0	< 1.0	< 100	55.2	0.15
	Q24	11/16/2016	< 1.0	< 1.0	< 1.0	< 1.0	< 100	-38.7	0.38
	Q23	8/25/2016	< 1.0	< 1.0	< 1.0	< 1.0	< 100	479.4	0.68
	Q22	5/24/2016	< 1.0	**2.9**	< 1.0	< 1.0	< 100	-3.4	0.24
	Q21	2/25/2016	< 1.0	< 1.0	< 1.0	< 1.0	< 100	-21.7	0.19
	Q20	11/19/2015	< 1.0	< 1.0	< 1.0	< 1.0	< 100	-31.0	3.35
	Q19	8/26/2015	< 1.0	< 1.0	< 1.0	< 1.0	< 100	-30.0	0.66
	Q18	5/28/2015	< 1.0	< 1.0	< 1.0	< 2.0	< 100	26.4	0.68
	Q17	2/26/2015	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-51.9	6.01
	Q16	11/19/2014	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-4.8	0.20
	Q15	8/28/2014	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-57.8	0.17
	Q14	5/27/2014	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-50.1	1.03
	Q13	2/25/2014	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-50.2	0.75
	Q12	11/25/2013	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-52.0	5.71
	Q11	8/29/2013	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-18.1	5.51
	Q10	5/29/2013	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-48.2	5.63
	Q9	2/27/2013	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-70.2	1.32
	Q8	11/26/2012	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-37.6	5.18
	Q7	8/29/2012	< 1.0	< 1.0	< 1.0	< 2.0	< 100	21.0	5.15
	Q6	5/30/2012	**3.1**	< 1.0	**2.2**	**1.1**	**230**	-206.7	2.86
	Q5	2/29/2012	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-69.6	1.15
	Q4	11/29/2011	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-93.0	0.70
	Q3	8/30/2011	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-11.5	4.08
	Q2	5/31/2011	< 1.0	< 1.0	< 1.0	< 2.0	< 100	20.8	0.8
	Q1	2/24/2011	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-66.3	2.22
	Interim	11/5/2010	**5.5**	< 1.0	**1.0**	< 2.0	< 100	-103	1.09
	Interim	4/30/2010	**5.5**	< 4.0	< 4.0	< 8.0	< 400	-152	0.85

TABLE 2
HISTORICAL GROUNDWATER ANALYTICAL RESULTS

Well Number	Quarter or Bi-Annual Event	Date Collected	BTEX				TPH - Gasoline (µg/L)	Field Measurements	
			Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)		ORP (mV)	DO (mg/L)
SW-27	BA1	8/23/2018	< 1.0	< 1.0	< 1.0	< 1.0	< 100	278.0	1.17
	Q29	2/22/2018	< 1.0	< 1.0	< 1.0	< 1.0	< 100	74	0.71
	Q28	11/28/2017	< 1.0	< 1.0	< 1.0	< 1.0	< 100	-58	0.27
	Q27	8/30/2017	< 1.0	< 1.0	< 1.0	< 1.0	< 100	250	1.84
	Q26	5/24/2017	< 1.0	< 1.0	< 1.0	< 1.0	< 100	309.4	0.31
	Q25	2/22/2017	< 1.0	< 1.0	< 1.0	< 1.0	< 100	-5.7	0.30
	Q24	11/17/2016	< 4.0	< 4.0	< 4.0	< 4.0	< 400	8.3	2.14
	Q23	8/25/2016	< 4.0	< 4.0	< 4.0	< 4.0	< 400	*	*
	Q22	5/24/2016	< 1.0	< 1.0	< 1.0	< 1.0	< 100	*	*
	Q21	2/25/2016	< 1.0	< 1.0	< 1.0	< 1.0	< 100	*	*
	Q20	11/19/2015	< 1.0	< 1.0	< 1.0	< 1.0	< 100	*	*
	Q19	8/26/2015	< 1.0	< 1.0	< 1.0	< 1.0	< 100	*	*
	Q18	5/28/2015	< 1.0	< 1.0	< 1.0	< 2.0	< 100	*	*
	Q17	2/26/2015	< 1.0	< 1.0	< 1.0	< 2.0	< 100	*	*
	Q16	11/19/2014	< 1.0	< 1.0	< 1.0	< 2.0	< 100	*	*
	Q15	8/28/2014	< 4.0	< 4.0	< 4.0	< 8.0	< 400	*	*
	Q14	5/27/2014	< 1.0	< 1.0	< 1.0	< 2.0	< 100	*	*
	Q13	2/24/2014	< 1.0	< 1.0	< 1.0	< 2.0	< 100	*	*
	Q12	11/25/2013	< 1.0	< 1.0	< 1.0	< 2.0	< 100	*	*
	Q11	8/29/2013	< 1.0	< 1.0	< 1.0	< 2.0	< 100	*	*
	Q10	5/29/2013	< 1.0	< 1.0	< 1.0	< 2.0	< 100	79.1	8.72
	Q9	2/27/2013	< 1.0	< 1.0	< 1.0	< 2.0	< 100	22.4	4.56
	Q8	11/27/2012	< 1.0	< 1.0	< 1.0	< 2.0	< 100	15.4	0.41
	Q7	8/29/2012	< 1.0	< 1.0	< 1.0	< 2.0	< 100	19.3	3.38
	Q6	5/31/2012	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-165.8	2.3
	Q5	2/29/2012	< 1.0	< 1.0	< 1.0	< 2.0	< 100	24.2	1.93
	Q4	11/29/2011	< 1.0	< 1.0	< 1.0	< 2.0	< 100	-1.0	6.2
	Q3	8/30/2011	< 1.0	< 1.0	< 1.0	< 2.0	< 100	39.9	4.41
	Q2	5/31/2011	**1.5**	< 1.0	< 1.0	< 2.0	< 100	32.7	0.6
	Q1	2/24/2011	**2.1**	< 1.0	< 1.0	< 2.0	< 100	-26.4	0.33
	Interim	11/5/2010	**8.0**	< 1.0	< 1.0	< 2.0	< 100	-157	0
	Interim	4/30/2010	**4.5**	< 1.0	< 1.0	< 2.0	< 100	-99.2	0.67
MTCA Method A Cleanup Levels			5	1,000	700	1,000	800/1,000 [1]	NA	NA

Notes:

[1] Cleanup level for gasoline is 800 micrograms per liter (µg/L) if benzene is present; 1,000 µg/L if no detectable benzene in groundwater.

* Parameters could not be collected due to pump modification; bailer used to collect samples.

Bolded text indicates analyte detected.

Shaded text indicates concentration exceeds state cleanup criterion.

< = less than reporting limit indicated

BTEX = benzene, toluene, ethylbenzene, and xylenes

DO = dissolved oxygen in milligrams per liter

MTCA = Model Toxics Control Act

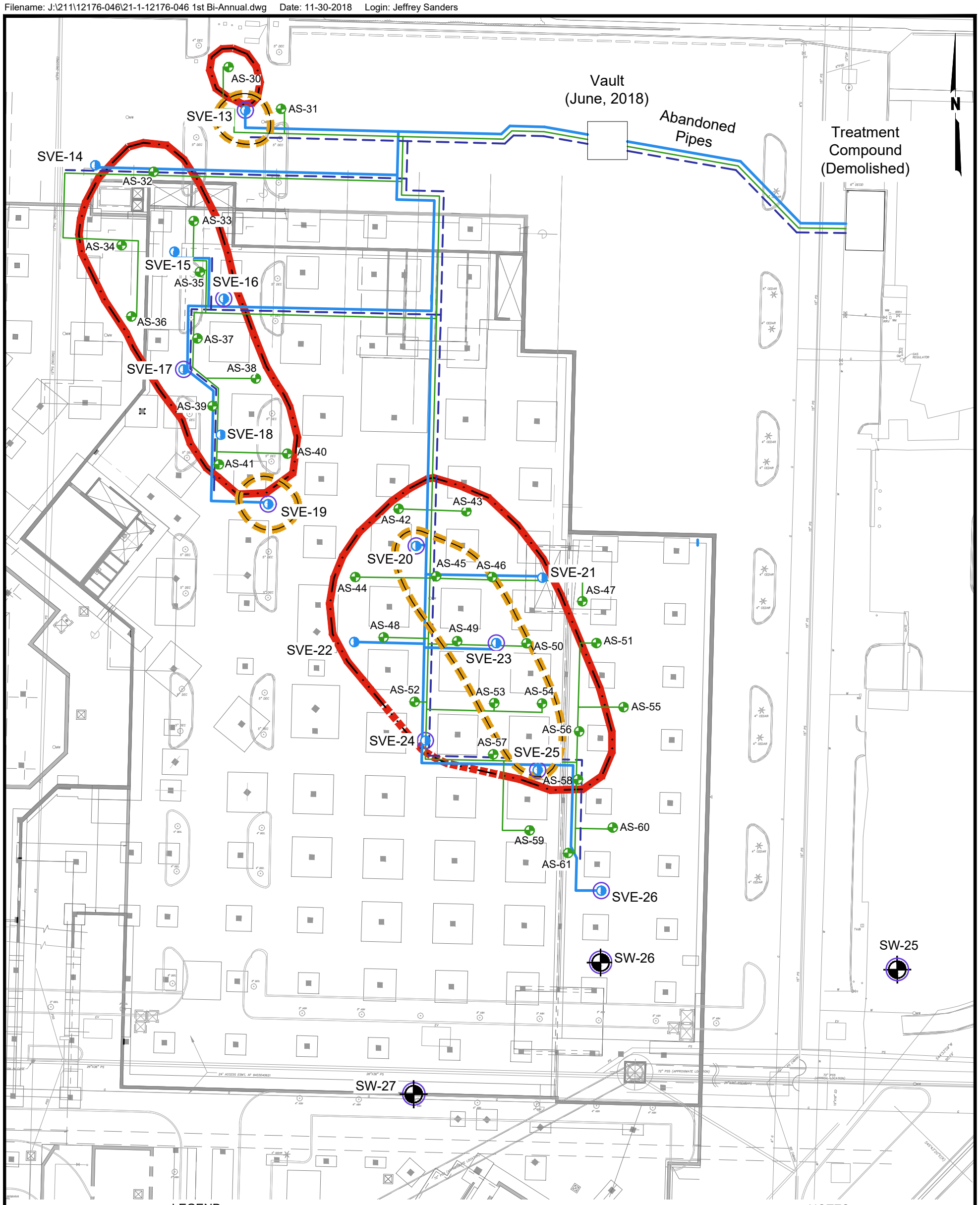
NA = not applicable

ORP = oxygen reduction potential in millivolts

SVE = soil vapor extraction

TPH = total petroleum hydrocarbons

Filename: J:\211\12176-046\21-1-12176-046 1st Bi-Annual.dwg Date: 11-30-2018 Login: Jeffrey Sanders



LEGEND

- SVE (Soil Vapor Extraction) Well
- AS (Air Sparging) Well
- Well Selected for Groundwater Monitoring
- Compliance Monitoring Well
- Estimated Baseline Extent of Benzene in Soil >0.3 mg/kg (January-March 2008)
- Estimated Extent of TPH-G and Benzene Contamination (December 2018)
- SVE Piping (Multiple Pipes)
- AS Piping (Multiple Pipes)
- Fugitive Vapor Collection Piping

0 40 80

Scale in Feet

NOTES

1. Well locations and piping are adapted from as-built drawing provided by Sellen Construction, received 5-18-2011.
2. Figure adapted from electronic files provided by Aspect Consulting and KPFF, dated March 2008 and March 2011.
3. Well AS-30 was decommissioned in May 2013.

Phase 2 Remediation Monitoring - 1st Bi-Annual
Former Seattle Center Lot No. 2
Seattle, Washington

SITE PLAN

January 2019 21-1-12176-046

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 1

Filename: J:\211\12176-046\21-1-12176-046 1st Bi-Annual.dwg Date: 11-30-2018 Login: Jeffrey Sanders

AS-30
SVE-13
AS-31
Vault
(June, 2018)
Abandoned
Pipes
Treatment
Compound
(Demolished)
N
SVE-14
AS-32
AS-33
AS-34
SVE-15
AS-35
SVE-16
AS-36
AS-37
SVE-17
AS-38
AS-39
SVE-18
AS-40
AS-41
SVE-19
AS-42
AS-43
SVE-20
AS-45
AS-46
SVE-21
AS-44
AS-47
AS-48
AS-49
AS-50
AS-51
SVE-22
SVE-23
AS-52
AS-53
AS-54
AS-55
AS-56
SVE-24
AS-57
SVE-25
AS-58
AS-59
AS-60
AS-61
SVE-26
SW-25
SW-26
SW-27

SVE-23	08-23-18
TPH-G	3100
B	ND

SVE-24	08-28-18
TPH-G	ND
B	ND

SVE-25	08-28-18
TPH-G	1200
B	20

SW-26	08-23-18
TPH-G	ND
B	ND

SW-27	08-23-18
TPH-G	ND
B	ND

LEGEND

- SVE (Soil Vapor Extraction) Well
- AS (Air Sparging) Well
- Well Selected for Groundwater Monitoring
- Compliance Monitoring Well
- Estimated Baseline Extent of Benzene in Soil >0.3 mg/kg (January-March 2008)
- SVE Piping (Multiple Pipes)
- AS Piping (Multiple Pipes)
- Fugitive Vapor Collection Piping

CONCENTRATIONS LEGEND

TPH-G	Gasoline-Range Hydrocarbons
B	Benzene
µg/L	Micrograms per Liter
ND	Not Detected
*	Not Sampled in February 2017

0 40 80

Scale in Feet

NOTES

1. Well locations and piping are adapted from as-built drawing provided by Sellen Construction, received 5-18-2011.
2. Figure adapted from electronic files provided by Aspect Consulting and KPFF, dated March 2008 and March 2011.
3. Well AS-30 was decommissioned in May 2013.

Phase 2 Remediation Monitoring - 1st Bi-Annual
Former Seattle Center Lot No. 2
Seattle, Washington

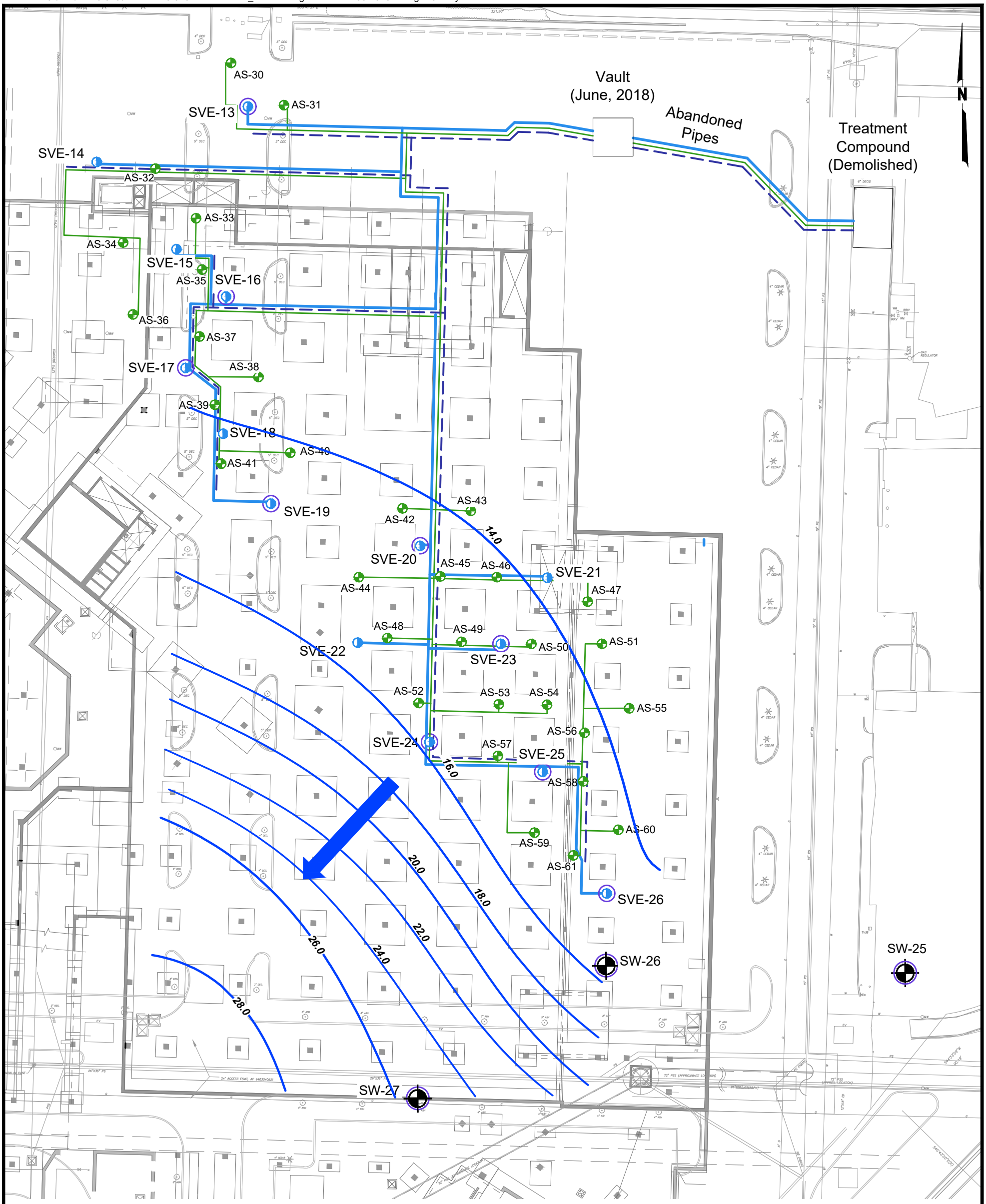
TPH-G AND BENZENE CONCENTRATIONS IN GROUNDWATER

January 2019 21-1-12176-046

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 2

Filename: J:\211\12176-046\21-1-12176-046 1st Bi-Annual_recover.dwg Date: 11-30-2018 Login: Jeffrey Sanders



LEGEND

- SVE (Soil Vapor Extraction) Well
- AS (Air Sparging) Well
- Well Selected for Groundwater Monitoring
- Compliance Monitoring Well
- —48.0— Approximate Groundwater Elevation (in feet) (Dashed where inferred)
- Approximate Groundwater Flow Direction

0 40 80

Scale in Feet

NOTES

1. Well locations and piping are adapted from as-built drawing provided by Sellen Construction, received 5-18-2011.
2. Figure adapted from electronic files provided by Aspect Consulting and KPFF, dated March 2008 and March 2011.
3. Well AS-30 was decommissioned in May 2013.

Phase 2 Remediation Monitoring - 1st Bi-Annual
Former Seattle Center Lot No. 2
Seattle, Washington

GROUNDWATER CONTOUR MAP

January 2019 21-1-12176-046

SHANNON & WILSON, INC. GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 3

FIG. 3

APPENDIX A

GROUNDWATER ANALYTICAL LABORATORY REPORTS

OnSite Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

August 31, 2018

Christian Canfield
Shannon & Wilson, Inc.
400 N 34th Street, Suite 100
Seattle, WA 98103

Re: Analytical Data for Project 21-1-12176-046
Laboratory Reference No. 1808-281

Dear Christian:

Enclosed are the analytical results and associated quality control data for samples submitted on August 24, 2018.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: August 31, 2018
Samples Submitted: August 24, 2018
Laboratory Reference: 1808-281
Project: 21-1-12176-046

Case Narrative

Samples were collected on August 23, 2018 and received by the laboratory on August 24, 2018. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: August 31, 2018
Samples Submitted: August 24, 2018
Laboratory Reference: 1808-281
Project: 21-1-12176-046

GASOLINE RANGE ORGANICS/BTEX
NWTPH-Gx/EPA 8021B

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**082318-SW-27:GW**					
Laboratory ID:	08-281-01					
Benzene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
Toluene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
Ethyl Benzene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
m,p-Xylene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
o-Xylene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
Gasoline	**ND**	100	NWTPH-Gx	8-27-18	8-27-18	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*96*	*66-117*				
Client ID:	**082318-SW-26:GW**					
Laboratory ID:	08-281-02					
Benzene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
Toluene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
Ethyl Benzene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
m,p-Xylene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
o-Xylene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
Gasoline	**ND**	100	NWTPH-Gx	8-27-18	8-27-18	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*111*	*66-117*				
Client ID:	**082318-SVE-23:GW**					
Laboratory ID:	08-281-03					
Benzene	**ND**	4.0	EPA 8021B	8-27-18	8-27-18	
Toluene	**9.0**	4.0	EPA 8021B	8-27-18	8-27-18	
Ethyl Benzene	**68**	4.0	EPA 8021B	8-27-18	8-27-18	
m,p-Xylene	**160**	4.0	EPA 8021B	8-27-18	8-27-18	
o-Xylene	**4.1**	4.0	EPA 8021B	8-27-18	8-27-18	
Gasoline	**3100**	400	NWTPH-Gx	8-27-18	8-27-18	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*101*	*66-117*				

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: August 31, 2018
Samples Submitted: August 24, 2018
Laboratory Reference: 1808-281
Project: 21-1-12176-046

GASOLINE RANGE ORGANICS/BTEX
NWTPH-Gx/EPA 8021B
QUALITY CONTROL

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0827W1					
Benzene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
Toluene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
Ethyl Benzene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
m,p-Xylene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
o-Xylene	**ND**	1.0	EPA 8021B	8-27-18	8-27-18	
Gasoline	**ND**	100	NWTPH-Gx	8-27-18	8-27-18	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*98*	*66-117*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	08-276-03										
	ORIG	DUP									
Benzene	**ND**	**ND**	NA	NA		NA		NA	NA	30	
Toluene	**ND**	**ND**	NA	NA		NA		NA	NA	30	
Ethyl Benzene	**ND**	**ND**	NA	NA		NA		NA	NA	30	
m,p-Xylene	**ND**	**ND**	NA	NA		NA		NA	NA	30	
o-Xylene	**ND**	**ND**	NA	NA		NA		NA	NA	30	
Gasoline	**ND**	**ND**	NA	NA		NA		NA	NA	30	
Surrogate:											
Fluorobenzene						*101*	*93*	*66-117*			
MATRIX SPIKES											
Laboratory ID:	08-276-03										
	MS	MSD	MS	MSD		MS	MSD				
Benzene	**53.6**	**51.8**	50.0	50.0	ND	**107**	**104**	82-122	3	11	
Toluene	**52.2**	**50.4**	50.0	50.0	ND	**104**	**101**	83-123	4	12	
Ethyl Benzene	**52.3**	**50.6**	50.0	50.0	ND	**105**	**101**	83-123	3	12	
m,p-Xylene	**51.7**	**50.2**	50.0	50.0	ND	**103**	**100**	83-123	3	12	
o-Xylene	**52.3**	**51.0**	50.0	50.0	ND	**105**	**102**	83-123	3	11	
Surrogate:											
Fluorobenzene						*103*	*104*	*66-117*			

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in method 8260C, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Chain of Custody

Page 1 of 1

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Laboratory Number: 08-281

Company: Shannon & Wilson, Inc.
Project Number: 21-1-12176-046
Project Name: Seattle Center Lot #2
Project Manager: Christian Canfield
Sampled by: CTC

Turnaround Request (in working days)
(Check One)
☐ Same Day ☐ 1 Day
☐ 2 Days ☐ 3 Days
☒ Standard (7 Days) (TPH analysis 5 Days)
☐ _____ (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A					% Moisture
1	082318-SW-27:GW	8/23	1303	GW	3		X																				
2	082318-SW-26:GW	8/23	1406	GW	3		X																				
3	082318-SVE-23:GW	8/23	1202	GW	3		X																				
4	TRIP BLANK	8/23	—	W	1																						

	Signature	Company	Date	Time	Comments/Special Instructions
Relinquished		SWI	8/24	11:25	
Received		ALPHA	8/24	1125	
Relinquished		ALPHA	8/24	1204	
Received		QSE	8/24/18	1204	
Relinquished					
Received					
Reviewed/Date		Reviewed/Date			

Data Package: Standard ☒ Level III ☐ Level IV ☐
Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☒

OnSite Environmental Inc.
14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

September 6, 2018

Christian Canfield
Shannon & Wilson, Inc.
400 N 34th Street, Suite 100
Seattle, WA 98103

Re: Analytical Data for Project 21-1-12176-046
Laboratory Reference No. 1808-320

Dear Christian:

Enclosed are the analytical results and associated quality control data for samples submitted on August 28, 2018.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: September 6, 2018
Samples Submitted: August 28, 2018
Laboratory Reference: 1808-320
Project: 21-1-12176-046

Case Narrative

Samples were collected on August 28, 2018 and received by the laboratory on August 28, 2018. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: September 6, 2018
Samples Submitted: August 28, 2018
Laboratory Reference: 1808-320
Project: 21-1-12176-046

GASOLINE RANGE ORGANICS/BTEX
NWTPH-Gx/EPA 8021B

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**08282018-SVE-24:GW**					
Laboratory ID:	08-320-01					
Benzene	**ND**	1.0	EPA 8021B	8-30-18	8-30-18	
Toluene	**ND**	1.0	EPA 8021B	8-30-18	8-30-18	
Ethyl Benzene	**ND**	1.0	EPA 8021B	8-30-18	8-30-18	
m,p-Xylene	**ND**	1.0	EPA 8021B	8-30-18	8-30-18	
o-Xylene	**ND**	1.0	EPA 8021B	8-30-18	8-30-18	
Gasoline	**ND**	100	NWTPH-Gx	8-30-18	8-30-18	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*114*	*66-117*				
Client ID:	**08282018-SVE-25:GW**					
Laboratory ID:	08-320-02					
Benzene	**20**	4.0	EPA 8021B	8-30-18	8-30-18	
Toluene	**14**	4.0	EPA 8021B	8-30-18	8-30-18	
Ethyl Benzene	**45**	4.0	EPA 8021B	8-30-18	8-30-18	
m,p-Xylene	**97**	4.0	EPA 8021B	8-30-18	8-30-18	
o-Xylene	**ND**	4.0	EPA 8021B	8-30-18	8-30-18	
Gasoline	**1200**	400	NWTPH-Gx	8-30-18	8-30-18	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*94*	*66-117*				

This report pertains to the samples analyzed in accordance with the chain of custody,
and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: September 6, 2018
Samples Submitted: August 28, 2018
Laboratory Reference: 1808-320
Project: 21-1-12176-046

GASOLINE RANGE ORGANICS/BTEX
NWTPH-Gx/EPA 8021B
QUALITY CONTROL

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0830W1					
Benzene	**ND**	1.0	EPA 8021B	8-30-18	8-30-18	
Toluene	**ND**	1.0	EPA 8021B	8-30-18	8-30-18	
Ethyl Benzene	**ND**	1.0	EPA 8021B	8-30-18	8-30-18	
m,p-Xylene	**ND**	1.0	EPA 8021B	8-30-18	8-30-18	
o-Xylene	**ND**	1.0	EPA 8021B	8-30-18	8-30-18	
Gasoline	**ND**	100	NWTPH-Gx	8-30-18	8-30-18	
Surrogate:	*Percent Recovery*	*Control Limits*				
Fluorobenzene	*113*	*66-117*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	08-334-01										
	ORIG	DUP									
Benzene	**ND**	**ND**	NA	NA		NA		NA	NA	30	
Toluene	**ND**	**ND**	NA	NA		NA		NA	NA	30	
Ethyl Benzene	**ND**	**ND**	NA	NA		NA		NA	NA	30	
m,p-Xylene	**ND**	**ND**	NA	NA		NA		NA	NA	30	
o-Xylene	**ND**	**ND**	NA	NA		NA		NA	NA	30	
Gasoline	**ND**	**ND**	NA	NA		NA		NA	NA	30	
Surrogate:											
Fluorobenzene						*113*	*114*	*66-117*			

MATRIX SPIKES

Laboratory ID:	08-334-01									
	MS	MSD	MS	MSD		MS	MSD			
Benzene	**46.8**	**46.6**	50.0	50.0	ND	**94**	**93**	82-122	0	11
Toluene	**46.9**	**46.3**	50.0	50.0	ND	**94**	**93**	83-123	1	12
Ethyl Benzene	**47.4**	**46.8**	50.0	50.0	ND	**95**	**94**	83-123	1	12
m,p-Xylene	**47.5**	**46.7**	50.0	50.0	ND	**95**	**93**	83-123	2	12
o-Xylene	**48.6**	**47.9**	50.0	50.0	ND	**97**	**96**	83-123	1	11
Surrogate:										
Fluorobenzene						*92*	*96*	*66-117*		

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OnSite Environmental Inc.

Data Qualifiers and Abbreviations

A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.

B - The analyte indicated was also found in the blank sample.

C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.

E - The value reported exceeds the quantitation range and is an estimate.

F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.

H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.

I - Compound recovery is outside of the control limits.

J - The value reported was below the practical quantitation limit. The value is an estimate.

K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.

L - The RPD is outside of the control limits.

M - Hydrocarbons in the gasoline range are impacting the diesel range result.

M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.

N - Hydrocarbons in the lube oil range are impacting the diesel range result.

N1 - Hydrocarbons in diesel range are impacting lube oil range results.

O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.

P - The RPD of the detected concentrations between the two columns is greater than 40.

Q - Surrogate recovery is outside of the control limits.

S - Surrogate recovery data is not available due to the necessary dilution of the sample.

T - The sample chromatogram is not similar to a typical _____.

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

U1 - The practical quantitation limit is elevated due to interferences present in the sample.

V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.

W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.

X - Sample extract treated with a mercury cleanup procedure.

X1- Sample extract treated with a sulfuric acid/silica gel cleanup procedure.

Y - The calibration verification for this analyte exceeded the 20% drift specified in method 8260C, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.

Z -

ND - Not Detected at PQL
PQL - Practical Quantitation Limit
RPD - Relative Percent Difference

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Chain of Custody

Page 1 of 1

OnSite Environmental Inc.
Analytical Laboratory Testing Services
14648 NE 95th Street • Redmond, WA 98052
Phone: (425) 883-3881 • www.onsite-env.com

Laboratory Number: 08-320

Company: Shannon & Wilson, Inc
Project Number: 21-1-12176-046
Project Name: Seattle Center lot #2
Project Manager: CTC Christian Canfield.
Sampled by: CTC

Turnaround Request (in working days)
(Check One)
☐ Same Day ☐ 1 Day
☐ 2 Days ☐ 3 Days
☒ Standard (7 Days)
☐ _____ (other)

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers
1	08282018-~~SW~~ SVE DE-24:GW	8/28	1051	GW	3
2	08282018-~~SW~~ SVE DE-25:GW	8/28	1139	GW	3
3	Trip Blank	8/28	—	W	2

Lab ID	NWTPH-HCID	NWTPH-Gx/BTEX	NWTPH-Gx	NWTPH-Dx (☐ Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A		HOLD			% Moisture
1		X																				
2		X																				
3																			X			

	Signature	Company	Date	Time
Relinquished		SWI	8/28	1200
Received	Eileen Clark	Alpha	8/28	1:30
Relinquished	Eileen Clark	Alpha	8/28	3:45
Received		Alpha QRE	8/28/18	1545
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions

Data Package: Standard ☒ Level III ☐ Level IV ☐

Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☒

APPENDIX B

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to and part of Report 21-1-12176-046

Date: January 4, 2019
To: Seattle Center Redevelopment
Attn: Mr. Ned Dunn

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland