Groundwater Monitoring and Independent Cleanup Report

KCHA Former Park Lake Homes
Maintenance Center Site
9800 8th Avenue SW
Seattle, Washington
VCP No. NW3033

for
King County Housing Authority

February 5, 2021

GeoEngineers
Earth Science + Technology

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VCP No. NW3033

File No. 1329-003-28

February 5, 2021

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1.0 INTRODUCTION AND BACKGROUND

This report presents 2020 cleanup actions and quarterly groundwater monitoring completed at King County Housing Authority's (KCHA) Former Park Lake Homes Maintenance Center Site located at 9800 8th Avenue SW in Seattle, Washington (Figure 1). The Site is entered into Washington State Department of Ecology's (Ecology) Voluntary Cleanup Program (VCP), VCP Site No. NW3033. KCHA intends to own and manage the areas within the Site for the foreseeable future. The location of the Site relative to surrounding physical features is shown in Figure 1. The general layout of the Site and surrounding areas is shown in Figure 2.

The Maintenance Center was removed in 2004/2005 and an independent Model Toxics Control Act (MTCA) cleanup of contaminated soil was completed by KCHA in 2005 (GeoEngineers 2005). After the 2005 cleanup action, the majority of soil underlying the former Maintenance Center was subsequently removed to depths up to 16 feet below original grade for the temporary CV4 construction stormwater pond (later backfilled, area shown in orange shading in Figure 2) and for the permanent CV3 water quality vault (area shown in yellow shading in Figure 2). The Site was substantially redeveloped in 2006 including housing, parking, new underground utilities and common areas associated with KCHA's Greenbridge project. No evidence of contaminated soil was reported by KCHA representatives or contractors, or by GeoEngineers during geotechnical construction observation, and during soil removal for the CV4 construction stormwater pond and the CV3 water quality vault.

The Site was entered into the VCP in late 2015, with a request for a No Further Action (NFA) determination on the former Maintenance Center cleanup completed by KCHA. Ecology provided a "Further Action" letter to KCHA dated June 6, 2016, requesting groundwater characterization at the Site. In 2017, Ecology approved KCHA's scope of work for Site groundwater characterization. KCHA installed two monitoring wells (MW-1 and MW-2) in July 2017 to monitor groundwater conditions downgradient of the completed soil cleanup at the Maintenance Center. The results of 2017 and 2018 groundwater monitoring were submitted to Ecology (GeoEngineers 2018). In 2019 Ecology concurred that chemical analytical sampling of MW-1 groundwater was no longer required. KCHA submitted the 2019 Annual Groundwater Monitoring Report to Ecology dated January 22, 2020 (GeoEngineers 2020). In June 2020, Ecology concurred with KCHA's request to discontinue testing organochlorine pesticides from MW-2 based on four consecutive quarterly samples meeting cleanup levels. As of mid-2020, the only contaminant at the Site exceeding the MTCA cleanup level was petroleum hydrocarbons in MW-2 groundwater.

This monitoring report summarizes quarterly groundwater elevation data at MW-1 and MW-2 and the most recent four quarterly groundwater sampling results for MW-2. This report also describes the in-situ treatment at the Site in the 2nd and 3rd quarters of 2020 to remove dissolved petroleum hydrocarbons in groundwater in the vicinity of MW-2.

2.0 SCOPE OF SERVICES

The scope of services included the following:

1. Measure groundwater parameters and water levels in MW-1 and MW-2 for four quarterly events.
2. Collect groundwater samples from MW-2 using low-flow sampling methods and submit the groundwater samples for chemical analysis of diesel- and heavy oil-range petroleum hydrocarbons by Northwest Method NWTPH-Dx.
3. Perform cleanup actions at and surrounding MW-2 including use of Oxygen Releasing Compound (ORC) and in-situ treatment by injecting PetroFix™.

3.0 FEBRUARY THROUGH AUGUST 2020 GROUNDWATER MONITORING

Quarterly groundwater monitoring events were conducted on February 14, May 1, and August 21 prior to the in-situ treatment discussed in Section 4.0. The fourth quarter 2020 monitoring event was conducted on January 8, 2021, after the injection treatment (Section 4.3). Depth to groundwater and groundwater elevations (NAVD88) are summarized in Table 1. The local groundwater flow direction beneath the site is likely to the south; however, groundwater gradient maps have not been prepared because only two groundwater elevation data points are available at this time.

Groundwater samples from MW-2 were obtained using low-flow/low-turbidity sampling techniques to minimize the suspension of sediment in groundwater samples. Groundwater field measurements were obtained during each sampling event. Groundwater parameters obtained during each monitoring event are reported in Table A-1. Field procedures are described in Appendix A. Analytical laboratory reports are included in Appendix B. Groundwater samples were analyzed by OnSite Environmental, Inc. in Redmond, Washington. Groundwater analytical results are summarized in Table 2, and a plot of the chemical analytical results over time is presented in Figure 2.

Diesel- and heavy oil-range hydrocarbons were detected in the February, May, and August 2020 groundwater samples from MW-2 at concentrations equivalent to or greater than the MTCA Method A cleanup level. Concentrations of diesel-range hydrocarbons in MW-2 groundwater samples slightly exceeded the cleanup level ranging from 0.50 to 0.56 milligrams per liter (mg/L) and concentrations of heavy oil-range hydrocarbons in MW-2 groundwater samples in 2020 ranged from 1.2 to 1.5 mg/L (the corresponding MTCA Method A cleanup level is 0.5 mg/L).

4.0 IN-SITU TREATMENTS AND JANUARY 2021 GROUNDWATER MONITORING

4.1. ORC Treatment Sock

An ORC treatment sock was placed in MW-2 in July 2020. After the ORC sock deployment, previously depressed dissolved oxygen (DO) concentrations in MW-2 had increased to concentrations similar to DO at MW-1, a well outside of the dissolved-phase petroleum plume (Table A-1).

4.2. PetroFix™ Overview and Permits

PetroFix™, known as a "trap and treat" technology, is a liquid activated carbon solution with sulfate as an electron donor. More information about PetroFix™ is included in Appendix C. The PetroFix™ carbon binds with the petroleum and allows for its biodegradation. PetroFix™ was evaluated to be a suitable injection media and the Site's shallow aquifer was evaluated to be a good candidate for successful injection treatment based on review of boring logs and the productivity rates of previous groundwater removal events. Injection activities are described in Section 4.3.

An underground injection control (UIC) permit (Site ID#35354) was obtained allowing injection of 800 pounds of PetroFix™ in the shallow groundwater. Injection activities occurred between October and December 2020. Photographs of the PetroFix™ injection field activities are documented in Appendix C.

The PetroFix™ media injection borings, IB-1 through IB-4, were spaced approximately 10 feet apart (see Figure 2) to treat an area approximately 300 square feet in plan dimensions surrounding monitoring well MW-2. The vertical treatment zone spanned from groundwater's highest seasonal level at approximately 8 feet below ground surface (bgs) down to the fill-native contact at approximately 16 to 18 feet bgs. The

injection activities occurred generally when the water table was near seasonal lows to maximize ability to distribute the injection media into the vadose zone. The injection program therefore was targeted to address the remaining contaminant of concern at the Site that exceeded cleanup levels (petroleum hydrocarbons in groundwater) at the only location where contamination is known to remain (MW-2).

The first injection event using a direct push GeoProbe rig began on October 13, 2020 and the second injection event using a sonic rig began on December 7, 2020, as described in Section 4.2.

4.3. PetroFix™ Injection

Direct push drilling on October 13, 2020 was nominally successful at injecting the treatment media to the target depths; the direct push hammer met refusal at a depth of 12 to 13 feet bgs due to dense soil. In addition, injection at shallow depths did not enter the formation. However, boring IB-1 was successfully completed to 12.5 feet bgs with approximately 100 gallons of PetroFix™ mixture injected. The initial injection mixture ratio was 1 pound of PetroFix™ per 5 gallons of water.

A sonic rig (Terra Sonic TSi 150 Compact Crawler) was used on December 7 through 9, 2020 to successfully complete the remaining injection borings IB-2, IB-3 and IB-4, each to total depths 17.5 to 18 feet bgs. Approximately 80 to 300 gallons of PetroFix™ mixture was injected per boring, with a total of 680 gallons across the treatment area (combined total for both injection events). The injection mixture ratio in December was adjusted to approximately 1 pound of PetroFix per 1.3 gallons of water to accommodate reservoir flow rates.

TABLE 1. INJECTION BORINGS

Injection Boring Location	Injection Depth (feet bgs)	Quantity of PetroFix™ (pounds)	Quantity of PetroFix™ Mixture (gallons)
IB-1	12-13	20	100
IB-2	15-18	50	80
IB-3	14.5-17.5	400	300
IB-4	15-18	330	200
	Totals	800 pounds	680 gallons

4.4. Post-Treatment Groundwater Monitoring

Quarterly monitoring resumed at MW-2 on January 8, 2021, four weeks after the injection activities, following the Groundwater Sampling Technical Bulletin provided by the reagent supplier (Appendix C). Refer to Section 3.0 and Appendix A for groundwater sampling procedures.

Before sampling monitoring well MW-2 in January 2021, the well was redeveloped by using a surging block to push water back and forth through the well screen and filter pack to remove any milled carbon that may have entered the well sand pack from the injection activities. Water and particulates from redevelopment activities were removed using a submersible pump until a minimum of 10 well volumes were purged and field parameters were stabilized. PetroFix™ was initially observed in purged groundwater during development activities, but turbidity decreased significantly (<20 nephelometric turbidity unit [NTU]) such that no dark gray color was visible in purge water as observed in a 40 milliliter (mL) glass vial (Groundwater

Sampling Technical Bulletin, Appendix C). No visible discoloration due to PetroFix™ was visible in the MW-2 groundwater sample obtained on January 8, 2021.

Diesel- and heavy oil-range hydrocarbons were not detected in the January 2021 groundwater sample from MW-2.

5.0 DISCUSSION AND CONCLUSIONS

Four quarters of groundwater monitoring were completed between February 2020 and January 2021 at the Former Park Lake Homes Maintenance Center. Independent cleanup activities in 2020 included deployment of an ORC sock in MW-2 and injection of 800 pounds of PetroFix™ to the shallow aquifer at approximately 12 to 18 feet bgs via four injection borings surrounding MW-2. The in-situ treatments were targeted as described to address the remaining contaminant of concern at the Site that exceeded cleanup levels (petroleum hydrocarbons in groundwater) at the only location where contamination is known to remain (MW-2).

Pre-injection concentrations of diesel- and oil-range hydrocarbons in MW-2 groundwater samples between February and August 2020 were generally similar to 2019 results at the same well. However, residual petroleum hydrocarbons in MW-2 groundwater were non-detect during the post-treatment groundwater sampling at MW-2 (January 2021), indicating the treatments have produced a favorable performance result. Petroleum hydrocarbons in MW-2 groundwater post-treatment demonstrated a rapid decline compared to pre-injection concentrations. Routine quarterly groundwater sampling at MW-2 is planned during 2021. MW-2 groundwater samples will be analyzed for diesel- and heavy oil-range petroleum hydrocarbons by Northwest Method NWTPH-Dx.

6.0 REFERENCES

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GeoEngineers, Inc. 2016. Letter to Michael Warfel, KCHA Response to Ecology's June 2016 Further Action Letter, Former Park Lake Homes Maintenance Shop Site, VCP #NW3033, dated November 21, 2016.

GeoEngineers, Inc. 2018. Supplemental Groundwater Characterization Report, KCHA Former Park Lake Homes Maintenance Facility, Seattle, Washington, dated December 21, 2018.

GeoEngineers, Inc. 2020. Annual Groundwater Characterization Report 2019, KCHA Former Park Lake Homes Maintenance Facility, Seattle, Washington, dated January 22, 2020.

Washington State Department of Ecology (Ecology). 2004. Implementation Memorandum #4, "Determining Compliance with Method A Cleanup Levels for Diesel and Heavy Oil," dated June 22, 2004.

Washington State Department of Ecology (Ecology). 2017. Email response from Warfel, Michael, Site Manager of Voluntary Cleanup Program, "VCP NW3033, Park Lake Homes Maintenance Facility - Follow up", dated May 30, 2017.

Washington State Department of Ecology (Ecology). 2019. Warfel, Michael, Site Manager of Voluntary Cleanup Program, "NW3033 Opinion Letter," dated March 19, 2019.

TABLES

GeoEngineers

Table 1

Monitoring Well Elevation Data

King County Housing Authority - Former Park Lake Homes Maintenance Center

9800 8th Avenue SW

Seattle, Washington

Monitoring Well Identification[1] (TOC elevation in feet NAVD88)[2]	Date measured	Depth to Water (feet bgs)	Groundwater Elevation (feet NAVD88)	Well Screen (feet bgs)	
				Top	Bottom
MW-1 (407.41)	08/28/17	9.64	397.77	5	20
	12/01/17	7.37	400.04		
	04/30/18	8.12	399.29		
	07/18/18	9.81	397.60		
	10/18/18	10.18	397.23		
	02/19/19	7.19	400.22		
	05/15/19	9.33	398.08		
	08/16/19	10.64	396.77		
	11/22/19	10.66	396.75		
	02/14/20	6.71	400.70		
	05/05/20	9.33	398.08		
	08/21/20	10.70	396.71		
	01/08/21	6.41	401.00		
MW-2 (408.58)	08/28/17	7.99	400.59	5	20
	12/01/17	6.57	402.01		
	04/30/18	7.27	401.31		
	07/18/18	8.96	399.62		
	10/18/18	9.15	399.43		
	02/19/19	7.00	401.58		
	05/15/19	8.20	400.38		
	08/16/19	9.47	399.11		
	11/22/19	10.09	398.49		
	02/14/20	6.20	402.38		
	04/10/20	7.72	400.86		
	05/05/20	8.27	400.31		
	08/21/20	9.56	399.02		
	01/08/21	6.69	401.89		

Notes:

[1] Monitoring well locations are shown on Figure 2.

[2] Elevations measured by Goldsmith Land Development Services on May 19, 2019.

bgs = below ground surface

Table 2

Summary of Groundwater Chemical Analytical Data

King County Housing Authority - Former Park Lake Homes Maintenance Center
9800 8th Avenue SW
Seattle, Washington

Sample ID[1]		MW-1-170828	MW-1-171201	MW-1-180430	MW-1-180718	MW-1-181018	MW-1-190219	MTCA Method A or B Cleanup Level
Sample Date	Units	08/28/17	12/01/17	04/30/18	07/18/18	10/18/18	02/19/19	
Petroleum Hydrocarbons by NWTPH-G or NWTPH-Dx								
Gasoline-Range	µg/L	<100	<100	<100	<100	<100	-	800[2]
Diesel-Range	mg/L	<0.26	<0.25	<0.26	<0.25	<0.25	<0.26	0.5
Oil-Range	mg/L	<0.42	<0.41	<0.41	<0.41	<0.40	<0.41	0.5
Totals Metals by EPA 6000/7000 Series or EPA 200.8								
Arsenic	µg/L	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	5
Chromium	µg/L	<11	<11	30	<11	<11	<11	50
Nickel	µg/L	<22	<22	<22	<22	<22	<22	320
Other (Cadium, Lead, Zinc)	µg/L	ND	ND	Lead- 2.1	ND	ND	ND	Lead - 15
Volatile Organic Compounds (VOCs) by EPA 8260[4]								
Benzene	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	5
Toluene	µg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1,000
Ethylbenzene	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	700
Total Xylenes[3]	µg/L	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	1,000
Acetone[4]	µg/L	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	720
Carbon Disulfide	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	800
1,2,4-Trimethylbenzene	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	NE
Naphthalene	µg/L	<1.0	<1.3	<1.3	<1.5	<1.5	<1.0	160[5]
p-Isopropyltoluene	µg/L	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	NE
Polychlorinated Biphenyls (PCBs) by EPA 8082A								
PCBs	µg/L	ND	--	--	--	--	--	varies
Organochlorine Pesticides by EPA 8081B[6]								
Endosulfan I	µg/L	**0.012**	<0.0047	<0.0048	<0.0047	<0.0047	<0.0047	NE
Heptachlor Epoxide	µg/L	<0.0047	<0.0047	<0.0048	<0.0047	<0.0047	<0.0047	0.00479
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270D/SIM[7]								
Naphthalene	µg/L	<0.0094	<0.0047	<0.095	<0.096	<0.095	<0.094	160[5]
1-Methylnaphthalene	µg/L	<0.094	<0.0047	<0.095	<0.096	<0.095	<0.094	
2-Methylnaphthalene	µg/L	<0.094	<0.0047	<0.095	<0.096	<0.095	<0.094	
Benzo[a]anthracene (cPAH)	µg/L	<0.0094	<0.0047	<0.0095	**0.0100**	<0.0095	<0.0094	see cPAHs (TEQ)
Benzo[a]pyrene (cPAH)	µg/L	<0.0094	<0.0047	<0.0095	**0.0110**	<0.0095	<0.0094	
Benzo[b]fluoranthene (cPAH)	µg/L	<0.0094	<0.0047	**0.0098**	**0.0130**	<0.0095	**0.0095**	
Benzo(k)fluoranthene (cPAH)	µg/L	<0.0094	<0.0047	<0.0095	<0.0096	<0.0095	<0.0094	
Chrysene (cPAH)	µg/L	<0.0094	<0.0047	**0.0110**	<0.0096	<0.0095	**0.012**	
Dibenz[a,h]anthracene (cPAH)	µg/L	<0.0094	<0.0047	<0.0095	<0.0096	<0.0095	<0.0094	
Indeno(1,2,3-c,d)pyrene (cPAH)	µg/L	<0.0094	<0.0047	<0.0095	<0.0096	<0.0095	<0.0094	
Total cPAHs (TEQ)[8]	µg/L	ND	ND	**0.007**	**0.015**	ND	**0.008**	0.1

Sample ID[1]		MW-2-170828	MW-2-171201	MW-2-180430	MW-2-180718	MW-2-181018	MW-2-190219	MW-2-190515	MW-2-190816	MW-2-191122	MW-2-200214	MW-2-200505	MW-2-200821	MW-2-210108	MTCA Method A or B Cleanup Level
Sample Date	**Units**	**08/28/17**	**12/01/17**	**04/30/18**	**07/18/18**	**10/18/18**	**02/19/19**	**05/15/19**	**08/16/19**	**11/22/19**	**02/14/20**	**05/05/20**	**08/21/20**	**01/08/21**	
Petroleum Hydrocarbons by NWTPH-G or NWTPH-Dx															
Gasoline-Range	µg/L	<100	<100	<100	<100	<100	<100	--	--	--	--	--	--	--	800[2]
Diesel-Range	mg/L	**0.89**	**0.83**	**0.52**	**0.49**	**0.70**	**0.55**	**0.37**	**0.53**	**0.83**	**0.50**	**0.56**	**0.50**	<0.21	0.5
Oil-Range	mg/L	**2.5**	**2.2**	**2.0**	**1.4**	**1.7**	**1.8**	**0.89**	**1.1**	**1.9**	**1.5**	**1.6**	**1.2**	<0.20	0.5
Totals Metals by EPA 6000/7000 Series or EPA 200.8															
Arsenic	µg/L	<3.3	<3.3	<3.3	<3.3	<3.3	<3.3	--	--	--	--	--	--	--	5
Chromium	µg/L	<11	<11	<11	<11	<11	<11	--	--	--	--	--	--	--	50
Nickel	µg/L	**23**	<22	<22	<22	<22	<22	--	--	--	--	--	--	--	320
Other (Cadium, Lead, Zinc)	µg/L	ND	ND	ND	ND	ND	ND	--	--	--	--	--	--	--	Lead - 15
Volatile Organic Compounds (VOCs) by EPA 8260[4]															
Benzene	µg/L	**0.77**	**0.68**	**0.40**	**0.47**	**0.47**	**0.37**	--	--	--	--	--	--	--	5
Toluene	µg/L	**1.1**	**1.0**	<1.0	<1.0	<1.0	<1.0	--	--	--	--	--	--	--	1,000
Ethylbenzene	µg/L	**0.24**	**0.24**	<0.20	**0.23**	**0.23**	**0.28**	--	--	--	--	--	--	--	700
Total Xylenes[3]	µg/L	**0.75**	**0.74**	**0.22**	**0.68**	**0.24**	**0.86**	--	--	--	--	--	--	--	1,000
Acetone[4]	µg/L	**11**	**6.6**	**10**	**9.6**	**7.0**	**5.2**	--	--	--	--	--	--	--	720
Carbon Disulfide	µg/L	**0.33**	<0.20	<0.20	<0.20	<0.20	<0.20	--	--	--	--	--	--	--	800
1,2,4-Trimethylbenzene	µg/L	**0.27**	**0.27**	**0.23**	**0.26**	<0.20	**0.33**	--	--	--	--	--	--	--	NE
Naphthalene	µg/L	**1.2**	<1.3	<2.3	<1.5	<1.0	<1.0	--	--	--	--	--	--	--	160[5]
p-Isopropyltoluene	µg/L	**4.7**	**5.7**	**6.8**	**7.8**	**7.7**	**11.0**	--	--	--	--	--	--	--	NE
Polychlorinated Biphenyls (PCBs) by EPA 8082A															
PCBs	µg/L	ND	--	--	--	--	--	--	--	--	--	--	--	--	varies
Organochlorine Pesticides by EPA 8081B[6]															
Endosulfan I	µg/L	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	<0.0047	--[6]	<0.0051	<0.0047	<0.0047	<0.0047	--	--	NE
Heptachlor Epoxide	µg/L	<0.0047	**0.011**	<0.0047	**0.0053**	**0.0050**	<0.0047	--[6]	<0.0031	<0.0028	<0.0028	<0.0028	--	--	0.00479
Polycyclic Aromatic Hydrocarbons (PAHs) by EPA 8270D/SIM[7]															
Naphthalene	µg/L	**0.46**	**0.60**	**0.44**	**0.51**	**0.60**	**0.48**	--	--	--	--	--	--	--	160[5]
1-Methylnaphthalene	µg/L	**0.30**	**0.37**	**0.30**	**0.35**	**0.39**	**0.35**	--	--	--	--	--	--	--	
2-Methylnaphthalene	µg/L	**0.30**	**0.42**	**0.27**	**0.37**	**0.40**	**0.32**	--	--	--	--	--	--	--	
Benzo[a]anthracene (cPAH)	µg/L	<0.094	<0.0094	**0.012**	<0.0096	<0.047	<0.0094	--	--	--	--	--	--	--	see cPAHs (TEQ)
Benzo[a]pyrene (cPAH)	µg/L	<0.0094	<0.0094	<0.0097	<0.0096	<0.0094	<0.0094	--	--	--	--	--	--	--	
Benzo[b]fluoranthene (cPAH)	µg/L	<0.0094	<0.0094	**0.0100**	<0.0096	<0.0094	**0.014**	--	--	--	--	--	--	--	
Benzo(k)fluoranthene (cPAH)	µg/L	<0.0094	<0.0094	<0.0097	<0.0096	<0.0094	**0.015**	--	--	--	--	--	--	--	
Chrysene (cPAH)	µg/L	<0.094	<0.0094	<0.0097	<0.0096	<0.047	<0.0094	--	--	--	--	--	--	--	
Dibenz[a,h]anthracene (cPAH)	µg/L	<0.0094	<0.0094	<0.0097	<0.0096	<0.0094	<0.0094	--	--	--	--	--	--	--	
Indeno(1,2,3-c,d)pyrene (cPAH)	µg/L	<0.0094	<0.0094	<0.0097	<0.0096	<0.0094	<0.0094	--	--	--	--	--	--	--	
Total cPAHs (TEQ)[8]	µg/L	ND	ND	**0.008**	ND	ND	**0.009**	--	--	--	--	--	--	--	0.1

Notes:

[1] Monitoring well locations are shown on Figure 2.

[2] When benzene is present the gasoline range cleanup level is 800 µg/L. When benzene is not present the range cleanup level is 1000 µg/L.

[3] Total xylenes is of the sum of m,p- and o- xylene. The higher detection limit is shown when xylenes were not detected.

[4] Acetone is a common laboratory solvent.

[5] Cleanup level for naphthalenes is the sum of naphthalene, 1-methylnaphthalene and 2-methylnaphthalene.

[6] Laboratory error on hold time for pesticide analyses; data not produced.

[7] Only analytes detected in one or more samples were listed. See Laboratory reports in Appendix B for complete list of method analytes and detection limits.

EPA = U.S. E ND = Not Detected

mg/L = mill "--" = Not tested

µg/L = micr NA = Not Applicable

Bold indicates analyte was detected.

Shading indicates analyte was detected at a concentration greater than the MTCA Cleanup Level.

FIGURES

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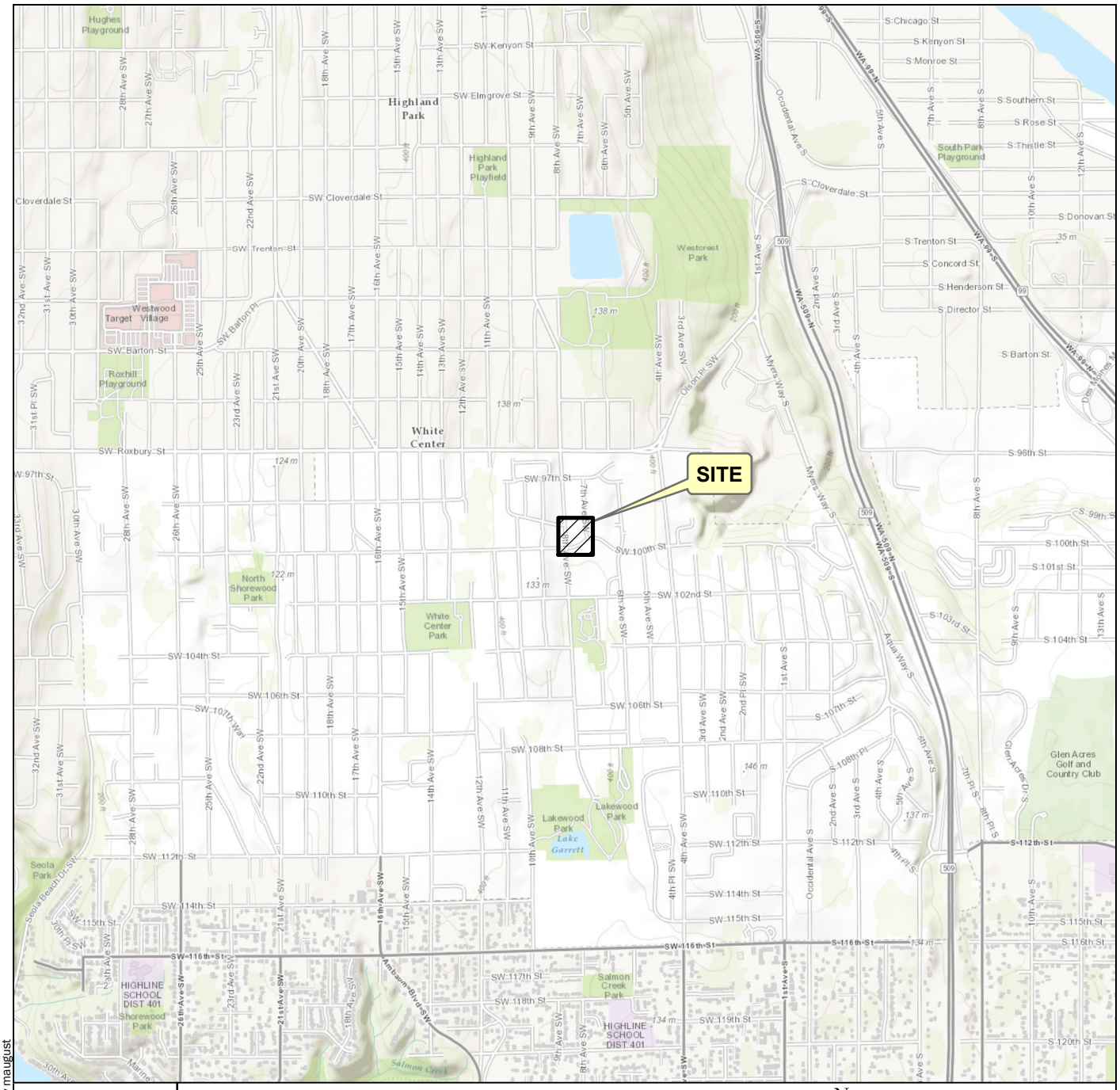

N
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2,000 0 2,000

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Mapbox Open Street Map, 2015

Projection: NAD 1983 UTM Zone 10N

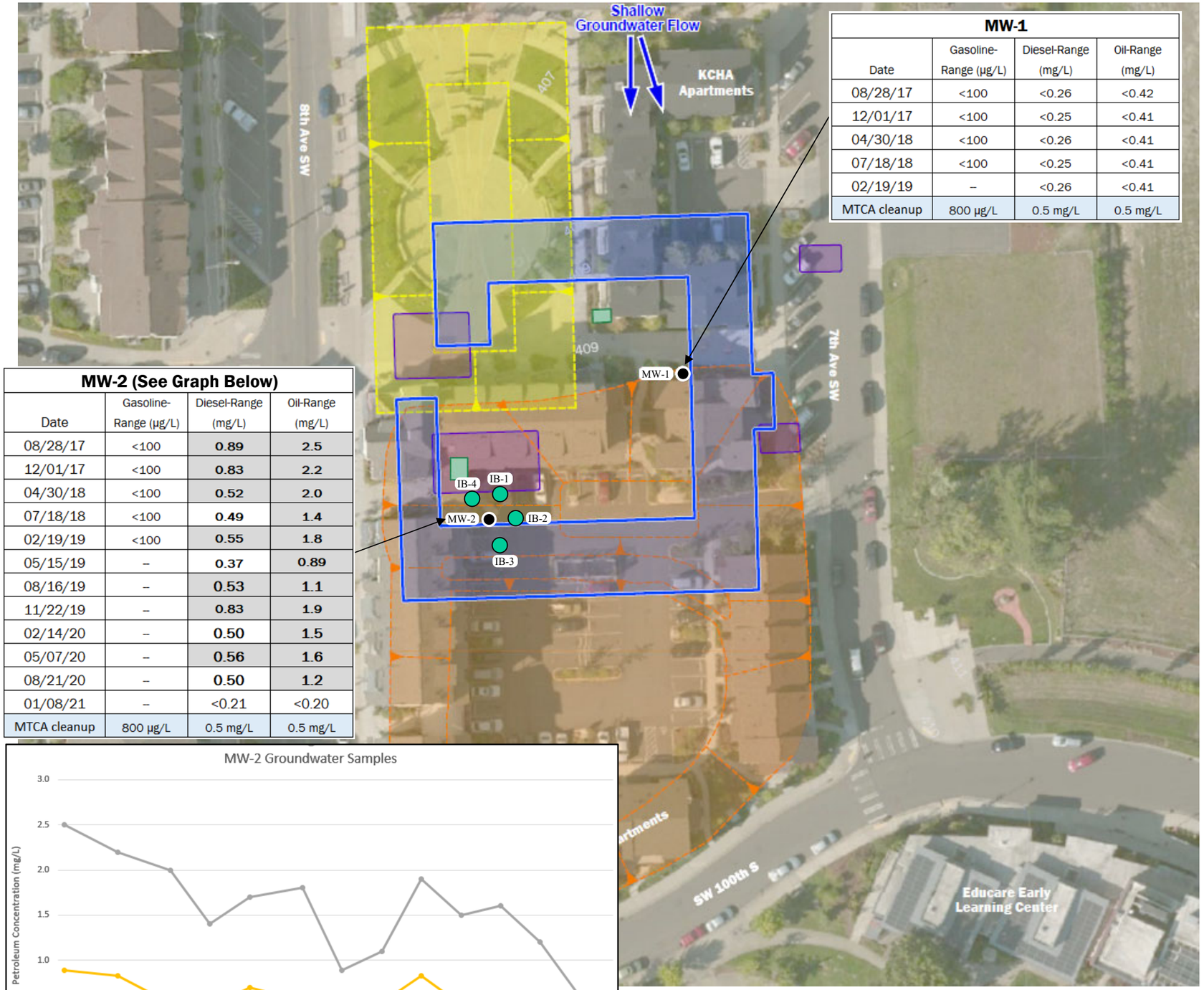
Vicinity Map

Former Park Lake Homes Maintenance Center
Seattle, Washington

GeoEngineers

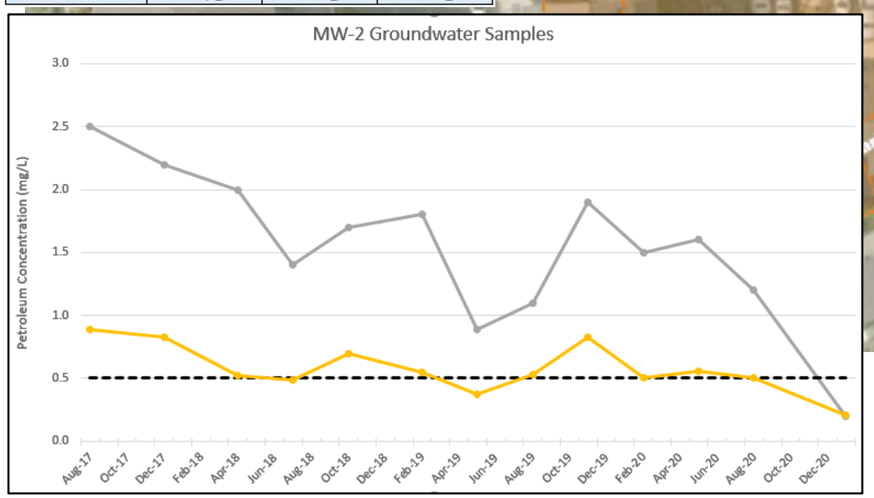
Figure 1

P:\1\132900\3\GIS\132900320_VicinityMap.mxd Date Exported: 10/21/15 by mauguste



MW-1			
Date	Gasoline-Range (µg/L)	Diesel-Range (mg/L)	Oil-Range (mg/L)
08/28/17	<100	<0.26	<0.42
12/01/17	<100	<0.25	<0.41
04/30/18	<100	<0.26	<0.41
07/18/18	<100	<0.25	<0.41
02/19/19	–	<0.26	<0.41
MTCA cleanup	800 µg/L	0.5 mg/L	0.5 mg/L

MW-2 (See Graph Below)			
Date	Gasoline-Range (µg/L)	Diesel-Range (mg/L)	Oil-Range (mg/L)
08/28/17	<100	**0.89**	**2.5**
12/01/17	<100	**0.83**	**2.2**
04/30/18	<100	**0.52**	**2.0**
07/18/18	<100	**0.49**	**1.4**
02/19/19	<100	**0.55**	**1.8**
05/15/19	–	**0.37**	**0.89**
08/16/19	–	**0.53**	**1.1**
11/22/19	–	**0.83**	**1.9**
02/14/20	–	**0.50**	**1.5**
05/07/20	–	**0.56**	**1.6**
08/21/20	–	**0.50**	**1.2**
01/08/21	–	<0.21	<0.20
MTCA cleanup	800 µg/L	0.5 mg/L	0.5 mg/L



Graph Legend:

- Heavy Oil
- Diesel
- MTCA Method A Cleanup Level

Legend:

- Monitoring Well Location
- Injection Boring Location
- Approximate Footprint of Former Park Lake Homes Maintenance Center Building
- Approximate Location o f2005 Remedial Excavations – MTCA Cleanup at Maintenance Center
- Approximate Location of Removed UST
- Approximate Boundary of Backfilled CV4 Stormwater Pond Excavation
- Excavation for Existing Water Quality Vault

Groundwater Chemical Analytical Results:

<0.21	Analyte not detected.
0.49	Bold font indicates analyte was detected.
0.52	Shading indicates analyte was detected at a concentration greater than the MTCA Method A Cleanup Level.

N
W E
S

60 0 60
Feet

NOTES:

1. The locations of all features shown are approximate.
2. This drawing is only for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: King County iMAP, 2017

Site Plan

Former Park Lake Homes Maintenance Center
Seattle, Washington

GeoEngineers | **Figure 2**

APPENDICES

GeoEngineers

APPENDIX A
Field Procedures

APPENDIX A
FIELD PROCEDURES

Groundwater Sample Collection and Handling

Groundwater samples were collected using a peristaltic pump with dedicated Teflon tubing at low-flow sampling rates. The groundwater was pumped at approximately 0.5 liter per minute until the water purged clear, after which the samples were collected at a flow rate of approximately 0.5 liter per minute (low-flow). A YSI water quality meter with flow-through-cell was used to monitor the following parameters during purging:

- Acidity (pH)
- Electrical conductivity (EC)
- Turbidity
- Dissolved oxygen (DO)
- Temperature
- Total dissolved solids (TDS)
- Oxygen reduction potential (ORP)
- Salinity

Collection of water samples began once these parameters were observed to vary by less than 10 percent on three consecutive measurements. Purge water generated during these activities was transferred to the onsite dedicated purge water drum labeled with the date and origin of contents. Incidental waste generated during sampling activities such as gloves, plastic sheeting, paper towels and similar expended and discarded field supplies were disposed of in the local trash receptacle.

The groundwater samples were transferred directly from the tubing outlet to laboratory-prepared sample containers. New nitrile gloves were worn when collecting the groundwater samples. The sample containers were filled completely and placed in a cooler with ice pending transport to the analytical laboratory. Sample labels were completed for each sample. Chain-of-custody procedures were followed in transporting the samples to the laboratory.

Soil Borings and Surface Restoration

Soil cuttings generated during drilling activities were stored in 55-gallon steel drums labeled with the contents and securely stored on KCHA property. Once injection was completed, each boring was backfilled with bentonite chips and ground surfaces were restored to the original conditions. The Site area was swept and wiped clean after the completion of the injection event.

Investigative Waste Disposal for Groundwater and Soil

Groundwater purged during quarterly monitoring events was stored in 55-gallon steel drums. The drums were temporarily stored on KCHA property nearby. pH measurements of investigation wastewater are tabulated in Table A-1; wastewater pH was below 12.5.

Drummed soil cuttings from the 2020 sonic injection drilling were stored nearby on KCHA property. The drums will be characterized for transport and disposal in 2021.

Table A-1

Groundwater Field Parameter Data

King County Housing Authority - Former Park Lake Homes Maintenance Center

9800 8th Avenue SW

Seattle, Washington

Monitoring Well ID		MW-1						MW-2												
Sample ID[1]		MW-1-170828	MW-1-171201	MW-1-180430	MW-1-180718	MW-1-181018	MW-1-190219	MW-2-170828	MW-2-171201	MW-2-180430	MW-2-180718	MW-2-181018	MW-2-190219	MW-2-190515	MW-2-190816	MW-2-191122	MW-2-200214	MW-2-200507	MW-2-200214	MW-2-200507
Monitoring Quarter		Q1	Q2	Q3	Q4	Q5	Q6	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Sample Date	Units	08/28/17	12/01/17	04/30/18	07/18/18	10/18/18	02/19/19	08/28/17	12/01/17	04/30/18	07/18/18	10/18/18	02/19/19	05/15/19	08/16/19	11/22/19	02/14/20	05/07/20	08/21/20	01/08/21
Groundwater Field Parameters																				
pH	pH	6.76	7.91	8.18	7.77	7.68	7.82	12.59	12.72	12.88	12.84	12.64	12.95	12.31	11.70	12.12	11.33	10.19	10.44	11.58
Specific Conductivity	µS/cm	310.9	257.5	234.9	239.2	238.7	283.2	2,463	2,106	1,839	2,081	2,121	1,742	1,795	1,986	1,872	1,622	1,747	2,197	1,827
Dissolved Oxygen	mg/L	2.56	4.41	4.64	3.26	4.14	6.04	0.06	0.07	0.17	0.08	0.07	0.09	0.13	0.08	0.08	0.20	0.27	4.80	5.23
Redox Potential	mV	198.2	188.2	186.7	146.5	159.6	245.7	-324.9	-202.5	-91.3	-213.6	-311.8	-212.3	-220.2	-235.9	-254.3	-226.1	20.5	105.3	102.1
Turbidity	NTU	4.0	4.1	4.30	4.60	3.20	3.50	3.1	3.7	3.1	4.7	4.1	3.6	3.3	3.2	4.2	4.8	3.2	8.6	18
Purge Water Field Parameters																				
Drummed Wastewater[2]	pH	--	--	--	--	--	--	--	--	--	--	--	--	--	11.76	11.79	11.63	11.00	10.87	10.97

Notes:

[1] Monitoring well locations are shown on Figure 2.

[2] Bulk pH measured from drum water grab sample.

µg/L = micrograms per liter

µS/cm = microSiemens per centimeter

mV = millivolts

NTU = nephelometric turbidity units;

NA = Not Applicable

APPENDIX B
Chemical Analytical Data

APPENDIX B
CHEMICAL ANALYTICAL DATA

Analytical Methods

Chain-of-custody procedures were followed during the transport of the soil and groundwater samples to the analytical laboratory. The samples were held in cold storage pending extraction and/or analysis. The analytical results, analytical methods reference and laboratory quality control (QC) records are included in this appendix. The analytical results are also summarized in the text and tables of this report.

Analytical Data Review

The laboratory maintains an internal quality assurance program as documented in its laboratory quality assurance manual. The laboratory uses a combination of blanks, surrogate recoveries, duplicates, matrix spike recoveries, matrix spike duplicate recoveries, blank spike recoveries and blank spike duplicate recoveries to evaluate the validity of the analytical results. The laboratory also uses data quality goals for individual chemicals or groups of chemicals based on the long-term performance of the test methods. The data quality goals were included in the laboratory reports. The laboratory compared each group of samples with the existing data quality goals and noted any exceptions in the laboratory report. Data quality exceptions documented by the accredited laboratory were reviewed by GeoEngineers. Based on our data quality review, it is our opinion that the laboratory data qualifiers listed are not significant with regard to the use of the data for characterization purposes. The samples/results were considered of acceptable quality for their intended use in this report.

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

February 25, 2020

Katy Atakturk
GeoEngineers, Inc.
2101 4th Avenue, Suite 950
Seattle, WA 98121

Re: Analytical Data for Project 1329-003-26
Laboratory Reference No. 2002-157

Dear Katy:

Enclosed are the analytical results and associated quality control data for samples submitted on February 14, 2020.

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

Date of Report: February 25, 2020
Samples Submitted: February 14, 2020
Laboratory Reference: 2002-157
Project: 1329-003-26

Case Narrative

Samples were collected on February 14, 2020 and received by the laboratory on February 14, 2020. 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.

Organochlorine Pesticides by EPA 8081B Analysis

The percent recovery for Methoxychlor (58%) in the Spike Blank duplicate was below it's control limit of 60-128%. Due to the fact that all other quality control values were within control limits, no further action was performed.

Any other QA/QC issues associated with this extraction and analysis will be indicated with a footnote reference and discussed in detail on the Data Qualifier page.

Date of Report: February 25, 2020
Samples Submitted: February 14, 2020
Laboratory Reference: 2002-157
Project: 1329-003-26

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
MW-2-200214	02-157-01	Water	2-14-20	2-14-20	

Date of Report: February 25, 2020
Samples Submitted: February 14, 2020
Laboratory Reference: 2002-157
Project: 1329-003-26

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MW-2-200214**					
Laboratory ID:	02-157-01					
Diesel Range Organics	**0.50**	0.20	NWTPH-Dx	2-20-20	2-21-20	
Lube Oil Range Organics	**1.5**	0.20	NWTPH-Dx	2-20-20	2-21-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*89*	*50-150*				

Date of Report: February 25, 2020
Samples Submitted: February 14, 2020
Laboratory Reference: 2002-157
Project: 1329-003-26

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MW-2-200214**					
Laboratory ID:	02-157-01					
alpha-BHC	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
gamma-BHC	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
beta-BHC	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
delta-BHC	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
Heptachlor	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
Aldrin	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
Heptachlor Epoxide	**ND**	0.0028	EPA 8081B	2-18-20	2-19-20	
gamma-Chlordane	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
alpha-Chlordane	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
4,4'-DDE	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
Endosulfan I	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
Dieldrin	**0.016**	0.0047	EPA 8081B	2-18-20	2-19-20	
Endrin	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
4,4'-DDD	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
Endosulfan II	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
4,4'-DDT	**0.041**	0.0047	EPA 8081B	2-18-20	2-19-20	
Endrin Aldehyde	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
Methoxychlor	**ND**	0.0094	EPA 8081B	2-18-20	2-19-20	
Endosulfan Sulfate	**ND**	0.0047	EPA 8081B	2-18-20	2-19-20	
Endrin Ketone	**ND**	0.019	EPA 8081B	2-18-20	2-19-20	
Toxaphene	**ND**	0.047	EPA 8081B	2-18-20	2-19-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*58*	*32-103*				
DCB	*65*	*42-132*				

Date of Report: February 25, 2020
Samples Submitted: February 14, 2020
Laboratory Reference: 2002-157
Project: 1329-003-26

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx
QUALITY CONTROL

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0220W1					
Diesel Range Organics	**ND**	0.20	NWTPH-Dx	2-20-20	2-21-20	
Lube Oil Range Organics	**ND**	0.20	NWTPH-Dx	2-20-20	2-21-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*93*	*50-150*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	SB0220W1										
	ORIG	DUP									
Diesel Fuel #2	**0.452**	**0.431**	NA	NA		NA		NA	5	NA	
Lube Oil Range	**ND**	**ND**	NA	NA		NA		NA	NA	NA	
Surrogate:											
o-Terphenyl						*90*	*92*	*50-150*			

Date of Report: February 25, 2020
Samples Submitted: February 14, 2020
Laboratory Reference: 2002-157
Project: 1329-003-26

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0218W1					
alpha-BHC	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
gamma-BHC	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
beta-BHC	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
delta-BHC	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
Heptachlor	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
Aldrin	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
Heptachlor Epoxide	**ND**	0.0030	EPA 8081B	2-18-20	2-19-20	
gamma-Chlordane	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
alpha-Chlordane	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
4,4'-DDE	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
Endosulfan I	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
Dieldrin	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
Endrin	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
4,4'-DDD	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
Endosulfan II	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
4,4'-DDT	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
Endrin Aldehyde	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
Methoxychlor	**ND**	0.010	EPA 8081B	2-18-20	2-19-20	
Endosulfan Sulfate	**ND**	0.0050	EPA 8081B	2-18-20	2-19-20	
Endrin Ketone	**ND**	0.020	EPA 8081B	2-18-20	2-19-20	
Toxaphene	**ND**	0.050	EPA 8081B	2-18-20	2-19-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*65*	*32-103*				
DCB	*79*	*42-132*				

Date of Report: February 25, 2020
Samples Submitted: February 14, 2020
Laboratory Reference: 2002-157
Project: 1329-003-26

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Water
Units: ug/L (ppb)

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
SPIKE BLANKS											
Laboratory ID:	SB0218W1										
	SB	SBD	SB	SBD		SB	SBD				
alpha-BHC	**0.0805**	**0.0717**	0.100	0.100	N/A	**80**	**72**	47-89	12	15	
gamma-BHC	**0.0802**	**0.0715**	0.100	0.100	N/A	**80**	**71**	49-91	11	15	
beta-BHC	**0.0823**	**0.0715**	0.100	0.100	N/A	**82**	**71**	55-99	14	15	
delta-BHC	**0.0796**	**0.0689**	0.100	0.100	N/A	**80**	**69**	20-84	14	15	
Heptachlor	**0.0587**	**0.0592**	0.100	0.100	N/A	**59**	**59**	49-106	1	15	
Aldrin	**0.0530**	**0.0574**	0.100	0.100	N/A	**53**	**57**	41-100	8	15	
Heptachlor Epoxide	**0.0677**	**0.0595**	0.100	0.100	N/A	**68**	**59**	48-112	13	15	
gamma-Chlordane	**0.0618**	**0.0572**	0.100	0.100	N/A	**62**	**57**	55-95	8	15	
alpha-Chlordane	**0.0618**	**0.0563**	0.100	0.100	N/A	**62**	**56**	53-101	9	15	
4,4'-DDE	**0.0775**	**0.0706**	0.100	0.100	N/A	**77**	**71**	49-103	9	15	
Endosulfan I	**0.0690**	**0.0610**	0.100	0.100	N/A	**69**	**61**	57-107	12	15	
Dieldrin	**0.0721**	**0.0624**	0.100	0.100	N/A	**72**	**62**	54-110	14	15	
Endrin	**0.0766**	**0.0676**	0.100	0.100	N/A	**77**	**68**	63-117	12	15	
4,4'-DDD	**0.0689**	**0.0608**	0.100	0.100	N/A	**69**	**61**	52-111	12	15	
Endosulfan II	**0.0721**	**0.0648**	0.100	0.100	N/A	**72**	**65**	60-104	11	15	
4,4'-DDT	**0.0818**	**0.0717**	0.100	0.100	N/A	**82**	**72**	52-112	13	15	
Endrin Aldehyde	**0.0610**	**0.0536**	0.100	0.100	N/A	**61**	**54**	52-117	13	15	
Methoxychlor	**0.0664**	**0.0581**	0.100	0.100	N/A	**66**	**58**	60-128	13	15	I
Endosulfan Sulfate	**0.0635**	**0.0561**	0.100	0.100	N/A	**63**	**56**	53-105	12	15	
Endrin Ketone	**0.0727**	**0.0647**	0.100	0.100	N/A	**73**	**65**	52-120	12	15	
Surrogate:											
TCMX						*43*	*55*	*32-103*			
DCB						*70*	*62*	*42-132*			

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 methods 8260 & 8270, 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

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

Company: GEOENGINEERS
Project Number: 1329-003-26
Project Name: KCHA GREENBRIDGE
Project Manager: KATY ATAKTURK
Sampled by: BRIAN ANDERSON

Turnaround Request (in working days)

(Check One)

☐ Same Day ☐ 1 Day
☐ 2 Days ☐ 3 Days
☒ Standard (7 Days)
☐ _____ (other)

Laboratory Number: 02-157

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	MW-2-200214	2-14-20	1050	W	4				X							X											

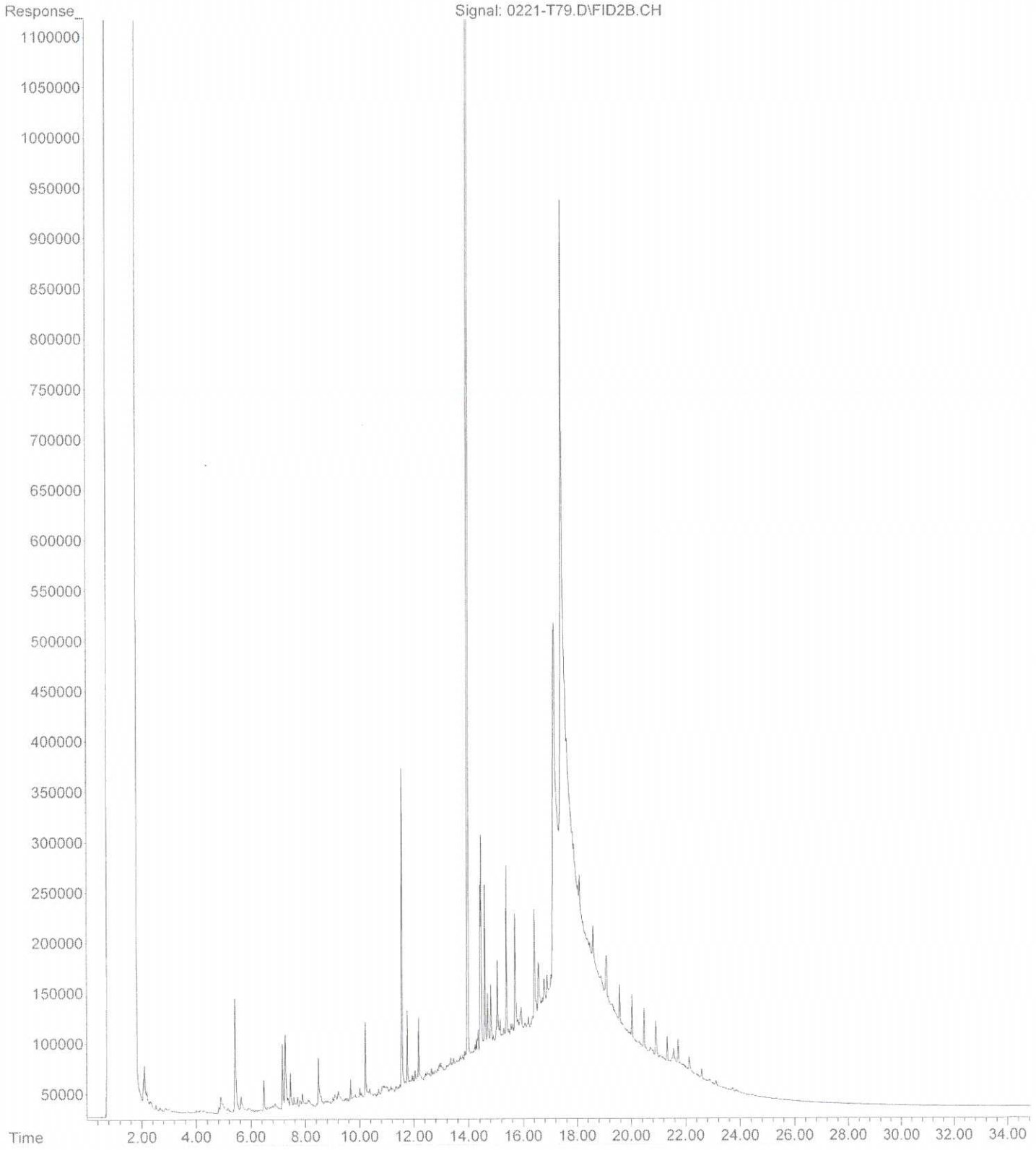
	Signature	Company	Date	Time
Relinquished	B Anderson	GEOENGINEERS	2-14-20	1249
Received		OSE	2/14/20	1249
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions

Data Package: Standard ☐ Level III ☐ Level IV ☐

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

File :X:\DIESELS\TERI\DATA\T200221.SEC\0221-T79.D
Operator : JT
Acquired : 22 Feb 2020 2:00 using AcqMethod T200106F.M
Instrument : Teri
Sample Name: 02-157-01
Misc Info :
Vial Number: 79



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

May 13, 2020

Katy Atakturk
GeoEngineers, Inc.
2101 4th Avenue, Suite 950
Seattle, WA 98121

Re: Analytical Data for Project 1329-003-26
Laboratory Reference No. 2005-026

Dear Katy:

Enclosed are the analytical results and associated quality control data for samples submitted on May 5, 2020.

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

Date of Report: May 13, 2020
Samples Submitted: May 5, 2020
Laboratory Reference: 2005-026
Project: 1329-003-26

Case Narrative

Samples were collected on May 5, 2020 and received by the laboratory on May 5, 2020. 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.

Date of Report: May 13, 2020
Samples Submitted: May 5, 2020
Laboratory Reference: 2005-026
Project: 1329-003-26

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
MW-2-200505	05-026-01	Water	5-5-20	5-5-20	

Date of Report: May 13, 2020
Samples Submitted: May 5, 2020
Laboratory Reference: 2005-026
Project: 1329-003-26

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MW-2-200505**					
Laboratory ID:	05-026-01					
Diesel Range Organics	**0.56**	0.21	NWTPH-Dx	5-11-20	5-11-20	
Lube Oil Range Organics	**1.6**	0.21	NWTPH-Dx	5-11-20	5-11-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*100*	*50-150*				

Date of Report: May 13, 2020
Samples Submitted: May 5, 2020
Laboratory Reference: 2005-026
Project: 1329-003-26

ORGANOCHLORINE PESTICIDES EPA 8081B

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MW-2-200505**					
Laboratory ID:	05-026-01					
alpha-BHC	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
gamma-BHC	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
beta-BHC	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
delta-BHC	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
Heptachlor	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
Aldrin	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
Heptachlor Epoxide	**ND**	0.0028	EPA 8081B	5-8-20	5-8-20	
gamma-Chlordane	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
alpha-Chlordane	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
4,4'-DDE	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
Endosulfan I	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
Dieldrin	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
Endrin	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
4,4'-DDD	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
Endosulfan II	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
4,4'-DDT	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
Endrin Aldehyde	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
Methoxychlor	**ND**	0.0095	EPA 8081B	5-8-20	5-8-20	
Endosulfan Sulfate	**ND**	0.0047	EPA 8081B	5-8-20	5-8-20	
Endrin Ketone	**ND**	0.019	EPA 8081B	5-8-20	5-8-20	
Toxaphene	**ND**	0.047	EPA 8081B	5-8-20	5-8-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*80*	*25-114*				
DCB	*89*	*30-137*				

Date of Report: May 13, 2020
Samples Submitted: May 5, 2020
Laboratory Reference: 2005-026
Project: 1329-003-26

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx
QUALITY CONTROL

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0511W1					
Diesel Range Organics	**ND**	0.20	NWTPH-Dx	5-11-20	5-11-20	
Lube Oil Range Organics	**ND**	0.20	NWTPH-Dx	5-11-20	5-11-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*89*	*50-150*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	05-026-01										
	ORIG	DUP									
Diesel Range Organics	**0.564**	**0.482**	NA	NA		NA		NA	16	NA	
Lube Oil Range Organics	**1.61**	**1.35**	NA	NA		NA		NA	18	NA	
Surrogate:											
o-Terphenyl						*100*	*93*	*50-150*			

Date of Report: May 13, 2020
Samples Submitted: May 5, 2020
Laboratory Reference: 2005-026
Project: 1329-003-26

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Water
Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0508W1					
alpha-BHC	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
gamma-BHC	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
beta-BHC	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
delta-BHC	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
Heptachlor	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
Aldrin	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
Heptachlor Epoxide	**ND**	0.0030	EPA 8081B	5-8-20	5-8-20	
gamma-Chlordane	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
alpha-Chlordane	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
4,4'-DDE	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
Endosulfan I	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
Dieldrin	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
Endrin	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
4,4'-DDD	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
Endosulfan II	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
4,4'-DDT	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
Endrin Aldehyde	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
Methoxychlor	**ND**	0.010	EPA 8081B	5-8-20	5-8-20	
Endosulfan Sulfate	**ND**	0.0050	EPA 8081B	5-8-20	5-8-20	
Endrin Ketone	**ND**	0.020	EPA 8081B	5-8-20	5-8-20	
Toxaphene	**ND**	0.050	EPA 8081B	5-8-20	5-8-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
TCMX	*88*	*25-114*				
DCB	*110*	*30-137*				

Date of Report: May 13, 2020
Samples Submitted: May 5, 2020
Laboratory Reference: 2005-026
Project: 1329-003-26

ORGANOCHLORINE PESTICIDES EPA 8081B QUALITY CONTROL

Matrix: Water
Units: ug/L (ppb)

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
SPIKE BLANKS											
Laboratory ID:	SB0508W1										
	SB	SBD	SB	SBD		SB	SBD				
alpha-BHC	**0.0836**	**0.0822**	0.100	0.100	N/A	**84**	**82**	42-113	2	19	
gamma-BHC	**0.0890**	**0.0880**	0.100	0.100	N/A	**89**	**88**	45-110	1	15	
beta-BHC	**0.0827**	**0.0814**	0.100	0.100	N/A	**83**	**81**	40-118	2	15	
delta-BHC	**0.0742**	**0.0722**	0.100	0.100	N/A	**74**	**72**	20-113	3	15	
Heptachlor	**0.0971**	**0.0974**	0.100	0.100	N/A	**97**	**97**	41-113	0	15	
Aldrin	**0.0812**	**0.0799**	0.100	0.100	N/A	**81**	**80**	35-115	2	15	
Heptachlor Epoxide	**0.0968**	**0.0976**	0.100	0.100	N/A	**97**	**98**	54-107	1	15	
gamma-Chlordane	**0.0899**	**0.0885**	0.100	0.100	N/A	**90**	**89**	43-110	2	15	
alpha-Chlordane	**0.0899**	**0.0872**	0.100	0.100	N/A	**90**	**87**	38-112	3	15	
4,4'-DDE	**0.0868**	**0.0831**	0.100	0.100	N/A	**87**	**83**	41-127	4	15	
Endosulfan I	**0.0831**	**0.0823**	0.100	0.100	N/A	**83**	**82**	42-115	1	15	
Dieldrin	**0.0879**	**0.0866**	0.100	0.100	N/A	**88**	**87**	46-115	1	15	
Endrin	**0.0872**	**0.0841**	0.100	0.100	N/A	**87**	**84**	52-117	4	16	
4,4'-DDD	**0.0828**	**0.0830**	0.100	0.100	N/A	**83**	**83**	48-122	0	15	
Endosulfan II	**0.0813**	**0.0803**	0.100	0.100	N/A	**81**	**80**	44-114	1	15	
4,4'-DDT	**0.0936**	**0.0911**	0.100	0.100	N/A	**94**	**91**	38-141	3	15	
Endrin Aldehyde	**0.0903**	**0.0860**	0.100	0.100	N/A	**90**	**86**	24-117	5	15	
Methoxychlor	**0.105**	**0.107**	0.100	0.100	N/A	**105**	**107**	51-135	2	15	
Endosulfan Sulfate	**0.0869**	**0.0844**	0.100	0.100	N/A	**87**	**84**	37-112	3	15	
Endrin Ketone	**0.0923**	**0.0932**	0.100	0.100	N/A	**92**	**93**	48-112	1	15	
Surrogate:											
TCMX						*87*	*86*	*25-114*			
DCB						*102*	*95*	*30-137*			

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 methods 8260 & 8270, 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

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

Company: GEOENGINEERS
Project Number: 1329-003-26
Project Name: KCHA-GREENBRIDGE
Project Manager: KATY ATAKTURK
Sampled by: BRIAN ANDERSON

Turnaround Request (in working days)

(Check One)

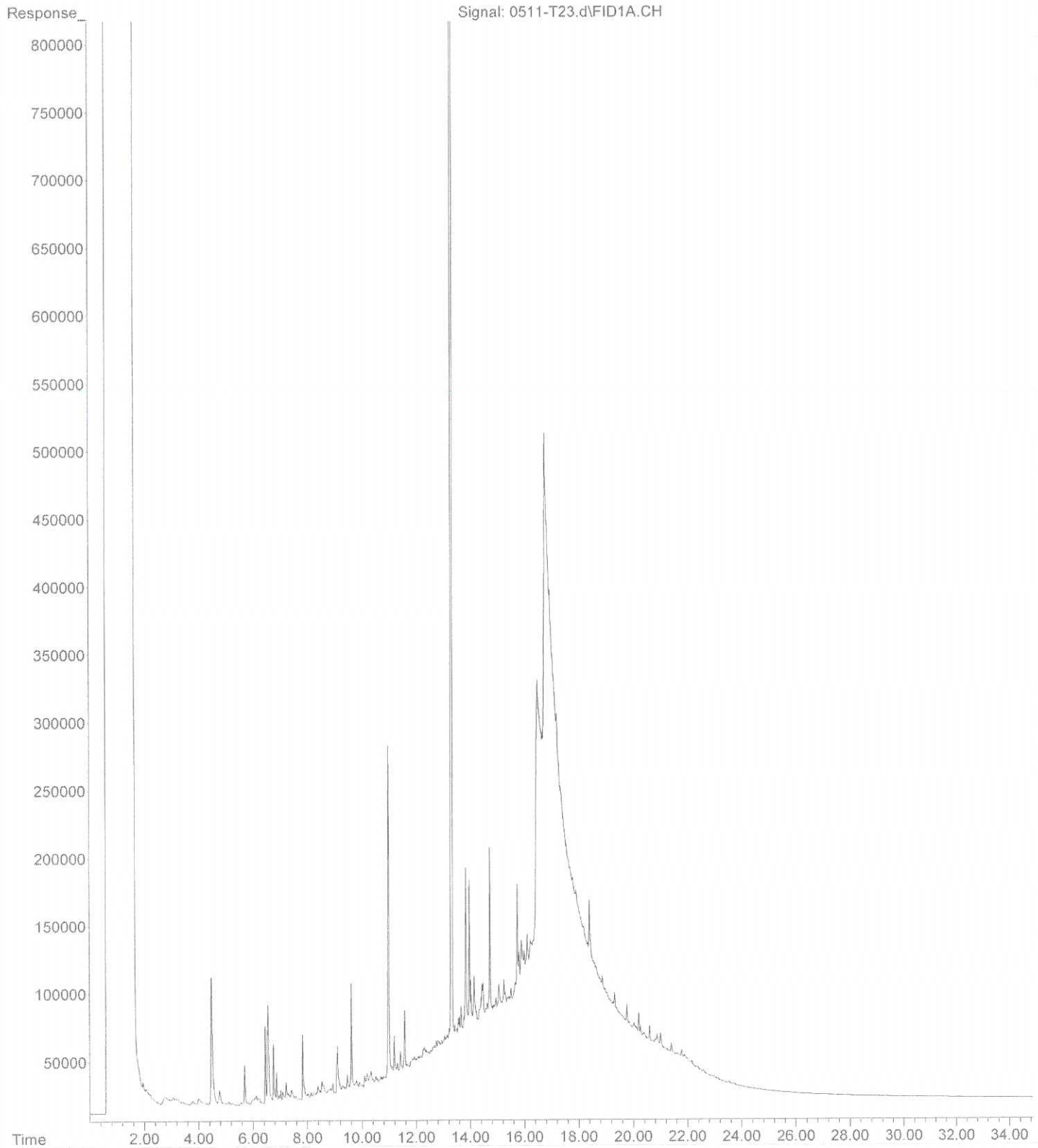
☐ Same Day ☐ 1 Day
☐ 2 Days ☐ 3 Days
☑ Standard (7 Days)
☐ _____ (other)

Laboratory Number: 05-026

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	MW-2-200505	5.5.20	1200	W	4				X							X											

	Signature	Company	Date	Time	Comments/Special Instructions
Relinquished	Brian Anderson	GEOENGINEERS	5.5.20		
Received		CORE	5/5/20	1327	
Relinquished					
Received					
Relinquished					
Received					Data Package: Standard ☐ Level III ☐ Level IV ☐
Reviewed/Date		Reviewed/Date			Chromatograms with final report ☐ Electronic Data Deliverables (EDDs) ☐

File :X:\DIESELS\TERI\DATA\T200511\0511-T23.d
Operator : JT
Acquired : 12 May 2020 0:07 using AcqMethod T200106F.M
Instrument : Teri
Sample Name: 05-026-01 ~~DUP~~
Misc Info :
Vial Number: 23



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

August 26, 2020

Katy Atakturk
GeoEngineers, Inc.
2101 4th Avenue, Suite 950
Seattle, WA 98121

Re: Analytical Data for Project 1329-003-26
Laboratory Reference No. 2008-206

Dear Katy:

Enclosed are the analytical results and associated quality control data for samples submitted on August 21, 2020.

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

Date of Report: August 26, 2020
Samples Submitted: August 21, 2020
Laboratory Reference: 2008-206
Project: 1329-003-26

Case Narrative

Samples were collected on August 21, 2020 and received by the laboratory on August 21, 2020. 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.

Date of Report: August 26, 2020
Samples Submitted: August 21, 2020
Laboratory Reference: 2008-206
Project: 1329-003-26

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MW-2-200821**					
Laboratory ID:	08-206-01					
Diesel Range Organics	**0.50**	0.21	NWTPH-Dx	8-21-20	8-24-20	
Lube Oil Range Organics	**1.2**	0.21	NWTPH-Dx	8-21-20	8-24-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*80*	*50-150*				

Date of Report: August 26, 2020
Samples Submitted: August 21, 2020
Laboratory Reference: 2008-206
Project: 1329-003-26

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx
QUALITY CONTROL

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0821W1					
Diesel Range Organics	**ND**	0.20	NWTPH-Dx	8-21-20	8-24-20	
Lube Oil Range Organics	**ND**	0.20	NWTPH-Dx	8-21-20	8-24-20	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*86*	*50-150*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	SB0821W1										
	ORIG	DUP									
Diesel Fuel #2	**0.501**	**0.479**	NA	NA		NA		NA	4	NA	
Lube Oil Range	**ND**	**ND**	NA	NA		NA		NA	NA	NA	
Surrogate:											
o-Terphenyl						*96*	*93*	*50-150*			

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 methods 8260 & 8270, 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

Chain of Custody

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

Company: GEOENGINEERS
Project Number: 1329-003-26
Project Name: KCHA – GREENBRIDGE
Project Manager: KATY ATAKTURK
Sampled by: BRIAN ANDERSON

Turnaround Request (in working days)

(Check One)

- ☐ Same Day
- ☐ 1 Day
- ☐ 2 Days
- ☐ 3 Days
- ☑ Standard (7 Days)
- ☐ _____ (other)

Laboratory Number: 08-206

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	MW-2-200821	8-21-20	1030	W	2				Y																		

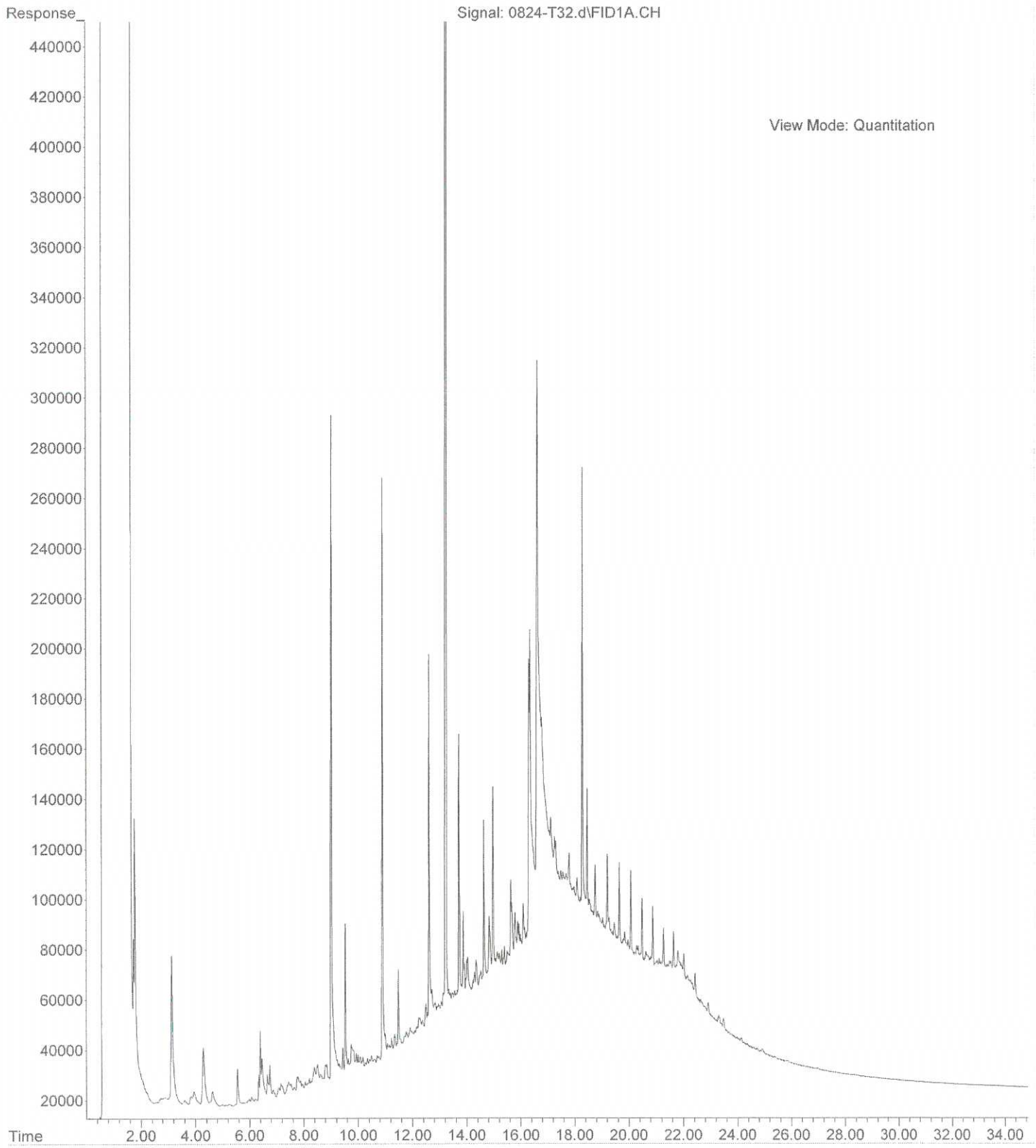
	Signature	Company	Date	Time
Relinquished	Brian Anderson	GEOENGINEERS	8-21-20	1250
Received		OSE	8/21/20	1250
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions

Data Package: Standard ☐ Level III ☐ Level IV ☐

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

File :X:\DIESELS\TERI\DATA\T200824\0824-T32.d
Operator : JT
Acquired : 25 Aug 2020 5:12 using AcqMethod T200106F.M
Instrument : Teri
Sample Name: 08-206-01
Misc Info :
Vial Number: 32



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

January 18, 2021

Katy Atakturk
GeoEngineers, Inc.
2101 4th Avenue, Suite 950
Seattle, WA 98121

Re: Analytical Data for Project 1329-003-28
Laboratory Reference No. 2101-070

Dear Katy:

Enclosed are the analytical results and associated quality control data for samples submitted on January 8, 2021.

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

Date of Report: January 18, 2021
Samples Submitted: January 8, 2021
Laboratory Reference: 2101-070
Project: 1329-003-28

Case Narrative

Samples were collected on January 8, 2021 and received by the laboratory on January 8, 2021. 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.

Date of Report: January 18, 2021
Samples Submitted: January 8, 2021
Laboratory Reference: 2101-070
Project: 1329-003-28

ANALYTICAL REPORT FOR SAMPLES

Client ID	Laboratory ID	Matrix	Date Sampled	Date Received	Notes
MW-2	01-070-01	Water	1-8-21	1-8-21	

Date of Report: January 18, 2021
Samples Submitted: January 8, 2021
Laboratory Reference: 2101-070
Project: 1329-003-28

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	**MW-2**					
Laboratory ID:	01-070-01					
Diesel Range Organics	**ND**	0.21	NWTPH-Dx	1-14-21	1-15-21	
Lube Oil Range Organics	**ND**	0.21	NWTPH-Dx	1-14-21	1-15-21	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*96*	*50-150*				

Date of Report: January 18, 2021
Samples Submitted: January 8, 2021
Laboratory Reference: 2101-070
Project: 1329-003-28

DIESEL AND HEAVY OIL RANGE ORGANICS
NWTPH-Dx
QUALITY CONTROL

Matrix: Water
Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0114W1					
Diesel Range Organics	**ND**	0.20	NWTPH-Dx	1-14-21	1-14-21	
Lube Oil Range Organics	**ND**	0.20	NWTPH-Dx	1-14-21	1-14-21	
Surrogate:	*Percent Recovery*	*Control Limits*				
o-Terphenyl	*98*	*50-150*				

Analyte	Result		Spike Level		Source Result	Percent Recovery		Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE											
Laboratory ID:	SB0114W1										
	ORIG	DUP									
Diesel Fuel #2	**0.445**	**0.407**	NA	NA		NA		NA	9	NA	
Lube Oil Range	**ND**	**ND**	NA	NA		NA		NA	NA	NA	
Surrogate:											
o-Terphenyl						*96*	*93*	*50-150*			

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 methods 8260 & 8270, 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

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

Company: GEOENGINEERS
Project Number: 1329-003-28
Project Name: KCHA
Project Manager: KATY ATAKTURK
Sampled by: BRIAN ANDERSON

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

Laboratory Number: 01-070

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	MW-2	1-8-20	1550	W	2				X																		

	Signature	Company	Date	Time
Relinquished	BRIAN ANDERSON	GEI	1-8-20	1719
Received		OSE	1/8/21	1719
Relinquished				
Received				
Relinquished				
Received				
Reviewed/Date		Reviewed/Date		

Comments/Special Instructions

* PETRO FIX IN SAMPLE TALK TO DAVID.
* CENTRAFUGE?

Data Package: Standard ☐ Level III ☐ Level IV ☐

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

APPENDIX C
PetroFix™ Reference Materials

PetroFIX™
Remediation Fluid

PetroFix Groundwater Sampling Technical Bulletin

www.regenesis.com

PetroFIX™
Remediation Fluid

PetroFix In Monitoring Wells Post Injection

During injection, PetroFix® may flow into nearby monitoring wells, as evidenced by sampling the well and finding the water color to be black. This occurrence is not uncommon and is simply the result of the PetroFix material transporting through the natural flux zones of the aquifer. To ensure that PetroFix in monitoring wells doesn't interfere with commercial analytical methods, several things can be done. This document describes the best practices for analysis of PetroFix-impacted water in monitoring wells.

What should be done?

If a well is impacted, the best solution is to delay sampling and analysis until PetroFix has had more time to deposit onto the soil which will result in clarified groundwater samples. *At many sites, two to four weeks is enough, although it can take up to three months.* The time to equilibrate in the subsurface is correlated with soil clay and silt content. Generally, increased clay and silt content will decrease the time for PetroFix to sorb and equilibrate. Divalent cations (ex. calcium or magnesium) in groundwater also speed up the clarification process.

If PetroFix is observed in a groundwater well during application, the well can be flushed with clear water (i.e., no reagent). More information on a clear water well flush can be found in the "PetroFix Well Flushing" Technical Bulletin.

As a rule of thumb, if a sample is transparent it is safe to analyze. Samples that have minimal PetroFix impact may be light to dark gray in color. It is recommended to use a small glass sampling container such as a 40-mL VOA vial to determine this. If sampling at least four weeks post-PetroFix application, extended low-flow purging of the monitoring well may improve the water clarity.

Passive diffusion bag (PDB) samplers can be used to sample groundwater where PetroFix is present. The PetroFix cannot diffuse through these bags so the groundwater collected will be free of PetroFix. For more information on PDB samplers, see the **FAQs** put out by the Interstate Technology Regulatory Council (ITRC).

Unfortunately, there are no commercial laboratory prep procedures that can easily remove PetroFix from samples prior to analysis without deviating from standard methods. Filtering the colloidal particles is extremely difficult and is not advisable for volatile organic compounds. While centrifuging is a possible option, commercial labs typically do not have one with the necessary centrifugal force to effectively separate PetroFix. If you need further technical assistance addressing interference of PetroFix when sampling, please contact Regenesis at info@petrofix.com.

REGENESIS
Technology-Based Solutions for the Environment

1011 Calle Sombra • San Clemente, CA 92673 • Tel: 949.366.8000 | www.regenesis.com

REGENESIS

Technology-Based Solutions for the Environment

(949)366-8000
www.regenesis.com

1011 Calle Sombra
San Clemente, CA 92673

Photo 1: Sonic rig setup during injection activities. Photograph illustrates secondary containment and designated work zone in the parking lot area.

Photo 2: Injection setup at IB-4 located in the landscaping northwest of MW-2. PetroFix injection line (yellow) feeding multiport tool downhole. Nitrogen line (white) feeding inflatable packer downhole.

Field Photos, Injection Activities
December 2020

KCHA Former Park Lake Homes
Maintenance Center
Seattle, Washington

GeoEngineers

Figure C-1

APPENDIX D
Report Limitations and Guidelines for Use

APPENDIX D
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

Read These Provisions Closely

Some clients, design professionals and contractors may not recognize that the geosciences practices (geotechnical engineering, geology and environmental science) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or site.

Environmental Services Are Performed for Specific Purposes, Persons and Projects

This report has been prepared for the exclusive use of King County Housing Authority (KCHA) and their authorized agents. This report may be reviewed by regulatory agencies. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, an environmental site assessment or remedial action study conducted for a property owner may not fulfill the needs of a prospective purchaser of the same property. Because each environmental study is unique, each environmental report is unique, prepared solely for the specific client and project site. No one except KCHA should rely on this report without first conferring with GeoEngineers. This report should not be applied for any purpose or project except the one originally contemplated.

This Environmental Report Is Based on a Unique Set of Project-Specific Factors

This report applies to the Former Park Lake Homes Maintenance Center Site located at 9800 8th Avenue SW located in Seattle, Washington. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- Not prepared for you,
- Not prepared for your project,
- Not prepared for the specific site explored, or
- Completed before important project changes were made.

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

[1] Developed based on material provided by GBA, The GeoProfessional Business Association; www.gba.org.

Reliance Conditions for Third Parties

No third party may rely on the product of our services unless GeoEngineers agrees in advance, and in writing to such reliance. This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions.

Environmental Regulations Are Always Evolving

Some substances may be present in the site vicinity in quantities or under conditions that may have led, or may lead, to contamination of the subject site, but are not included in current local, state or federal regulatory definitions of hazardous substances or do not otherwise present current potential liability. GeoEngineers cannot be responsible if the standards for appropriate inquiry, or regulatory definitions of hazardous substance, change or if more stringent environmental standards are developed in the future.

Subsurface Conditions Can Change

This report is based on conditions that existed at the time our site studies were performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, by new releases of hazardous substances, or by natural events such as floods, earthquakes and slope instability or groundwater fluctuations. Always contact GeoEngineers before applying this report to determine if it is still applicable.

Biological Pollutants

GeoEngineers' Scope of Work specifically excludes the investigation, detection, prevention or assessment of the presence of Biological Pollutants. Accordingly, this report does not include any interpretations, recommendations, findings, or conclusions regarding the detecting, assessing, preventing or abating of Biological Pollutants and no conclusions or inferences should be drawn regarding Biological Pollutants, as they may relate to this project. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and/or any of their byproducts.

If Client desires these specialized services, they should be obtained from a consultant who offers services in this specialized field.

Geotechnical, Geologic and Environmental Reports Should Not Be Interchanged

The equipment, techniques and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study and vice versa. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Similarly, environmental reports are not used to address geotechnical or geologic concerns regarding a specific project.

Soil and Groundwater End Use

The cleanup levels referenced in this report are site- and situation-specific. The cleanup levels may not be applicable for other sites or for other on-site uses of the affected media (soil and/or groundwater). Note that hazardous substances may be present in some of the site soil and/or groundwater at detectable concentrations that are less than the referenced cleanup levels. GeoEngineers should be contacted prior to the export of soil or groundwater from the subject site or reuse of the affected media on site to evaluate

the potential for associated environmental liabilities. We cannot be responsible for potential environmental liability arising out of the transfer of soil and/or groundwater from the subject site to another location or its reuse on site in instances that we were not aware of or could not control.

Most Environmental Findings Are Professional Opinions

Our interpretations of subsurface conditions are based on field observations and chemical analytical data from widely spaced sampling locations at the site. Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ – sometimes significantly – from those indicated in this report. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions.

GeoEngineers