GeoEngineers

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May 8, 2024

Washington State Department of Ecology
Toxics Cleanup Program
3190 160th Avenue SE
Bellevue, Washington 98008

Attention: Michael R. Warfel

Subject: Request for No Further Action Determination
Former Park Lake Homes Maintenance Center
9800 8th Avenue SW
Seattle, Washington
VCP Project No. NW3033 / GEI File No. 01329-003-30

On behalf of the King County Housing Authority (KCHA), GeoEngineers, Inc. (GeoEngineers) has prepared the attached Groundwater Compliance Monitoring Report (May 2023 to February 2024) for the Former Park Lake Homes Maintenance Center (Site). The Site is currently enrolled in the Washington State Department of Ecology (Ecology) Voluntary Cleanup Program (VCP, ID No. NW3033), and has documented four clean quarters of compliance monitoring results. The Site is now prepared for a No Further Action status, and KCHA is formally requesting Ecology's review and determination. A detailed technical review session took place on April 12, 2024, involving Michael Warfel, the VCP Site manager, to discuss the technical analyses outlined in this report.

The attached report documents the compliance monitoring results for the groundwater samples collected at monitoring well, MW-2 as requested by Ecology. In addition, the report provides information to address the remaining data gaps identified in Ecology's 2019 Opinion Letter. The results for the four most recent quarterly monitoring events presented in the report demonstrate that the concentrations of the contaminants of concern in the groundwater samples from monitoring well MW-2 are all less than the MTCA Method A cleanup levels. Based on the recent groundwater monitoring data and the additional information provided to address the remaining Site characterization data gaps, we request that Ecology issue a No Further Action determination for the Site and provide its concurrence to cease groundwater monitoring activities and proceed with decommissioning of the remaining wells at the Site.

Sincerely,
GeoEngineers, Inc.

Katy Ataktürk
Environmental Scientist

Tim Syverson, LHG
Associate

KRA:DLC:TS:atk

Attachment:
Groundwater Compliance Monitoring Report (April 2023 to February 2024), Former Park Lake Homes Maintenance Center Site
VCP Request For Opinion Form

cc: John Eliason, Vice President of Development, King County Housing Authority

# Attachment

## Groundwater Compliance Monitoring Report, (May 2023 – February 2024)

# Groundwater Compliance Monitoring Report (May 2023 – February 2024)

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

*for*
**King County Housing Authority**

May 8, 2024

2101 4th Avenue, Suite 950
Seattle, Washington 98121

GeoEngineers

# Groundwater Compliance Monitoring Report
# (May 2023 – February 2024)

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

File No. 1329-003-30
May 8, 2024

Prepared for:

King County Housing Authority
600 Andover Park West
Seattle, Washington 98188

Attention: John Eliason

Prepared by:

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Environmental Scientist

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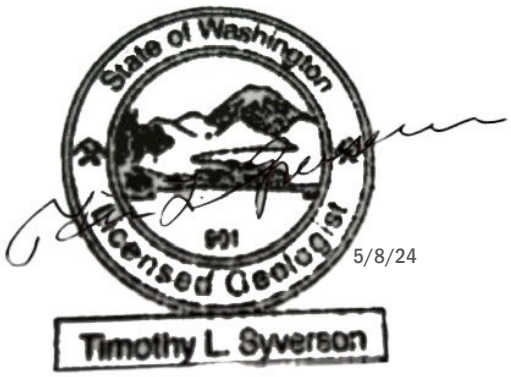


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## Appendices

# 1.0 Introduction and Background

This report presents the cleanup actions and quarterly groundwater monitoring completed between May 2023 and February 2024 at the King County Housing Authority (KCHA) former Park Lake Homes Maintenance Center (subject property), located at 9800 8th Avenue SW in the White Center area of Seattle, Washington. The subject property was entered into the Washington State Department of Ecology (Ecology) Voluntary Cleanup Program (VCP) in late 2015 and is identified as VCP Site No. NW3033 (Site). The location of the Site relative to surrounding physical features is shown in the Vicinity Map, Figure 1. The general layout of the Site and surrounding areas is shown in the Site Plan, Figure 2.

The Maintenance Center was removed in 2004/2005 and an independent cleanup was completed by KCHA in 2005 to address petroleum containing soil from previous underground storage tanks (USTs), consistent with the Model Toxics Control Act (MTCA) requirements (GeoEngineers 2005). After the 2005 cleanup action, the majority of the soil underlying the former Maintenance Center was subsequently removed to depths up to 16 feet below original grade during excavation for the temporary Central Valley area 4 (CV4) construction stormwater pond and for the permanent Central Valley area 3 (CV3) water quality vault. The remedial excavations and CV4 areas were later backfilled, as shown in Figure 2. The Site was redeveloped in 2006 with housing, parking, new underground utilities, and common areas associated with the KCHA Greenbridge project. No evidence of contaminant-containing soil was reported by KCHA representatives, contractors, or by GeoEngineers, Inc. (GeoEngineers) during geotechnical construction observation and soil removal for the CV4 construction stormwater pond and the CV3 water quality vault. KCHA intends to own and manage the Site and subject property for the foreseeable future.

The entry of the Site into the VCP in late 2015 included a request for a No Further Action (NFA) determination on the former Maintenance Center cleanup completed by KCHA. Ecology subsequently provided a "Further Action" opinion 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 to evaluate the occurrence of dissolved phase petroleum hydrocarbons and pesticide, which were the primary contaminants of concern (COCs) for the former Maintenance Center cleanup, in shallow groundwater (Ecology 2017). KCHA subsequently installed two monitoring wells (MW-1 and MW-2) in July 2017 to monitor groundwater downgradient of the area where the soil cleanup was conducted at the Maintenance Center. The results of the 2017, 2018 and 2019 groundwater monitoring were submitted to Ecology and indicated declining concentrations of site COCs and four clean quarters of groundwater sampling at MW-1 (GeoEngineers 2018 and GeoEngineers 2020). In 2019, Ecology concurred that sampling and chemical analysis of groundwater from MW-1 was no longer required. In June 2020, based on four consecutive clean quarterly groundwater samples at MW-2, Ecology concurred with KCHA's request to discontinue testing for organochlorine pesticides at MW-2. As of mid-2020, the only COCs at the Site that were present at concentrations greater than the MTCA cleanup level in the groundwater samples from MW 2 were diesel- and lube oil-range total petroleum hydrocarbons (DRPH and ORPH).

Local groundwater treatment by in-situ injection was conducted at the Site during the 2nd and 3rd quarters of 2020 to address the total petroleum hydrocarbons detected at MW-2. Quarterly groundwater monitoring continued at MW-2 from 2020 to 2024 with intermittent use of an Oxygen Releasing Compound (ORC) sock at MW-2 through May 2023 to further enhance petroleum hydrocarbon degradation (GeoEngineers 2021, GeoEngineers 2022, and GeoEngineers 2023). The quarterly groundwater monitoring to date has documented a decreasing trend in the concentrations of dissolved-phase petroleum hydrocarbons in the groundwater samples from MW-2.

This monitoring report presents the results of groundwater monitoring conducted between May 2023 and February 2024, which includes groundwater elevations at MW-1 and MW-2, and groundwater sampling at MW-2, and provides additional information requested by Ecology to further document groundwater conditions at the Site.

# 2.0 Scope of Services

The scope of services completed for annual groundwater monitoring included the following:

1. Measure depth to groundwater at both wells to evaluate the direction of groundwater flow. Present the groundwater elevations in reference to NAVD88 vertical datum.
2. Collect groundwater samples and measure groundwater parameters from MW-2 using low-flow sampling methods and submit the groundwater samples for chemical analysis of diesel-range petroleum hydrocarbons (DRPH) and oil-range petroleum hydrocarbons (ORPH) by Northwest Method NWTPH-Dx. Beginning in October 2022, the NWTPH-Dx analysis of MW-2 groundwater was done both with and without the silica gel cleanup (SGC) consistent with Ecology guidance.
3. Oversee the transport and disposal of purge water generated from monitoring well sampling activities.
4. Submit the annual TurboWaste report for any dangerous waste, in the form of elevated groundwater pH, generated on site.
5. Evaluate groundwater chemical results and document in an annual groundwater monitoring report.
6. Complete a Terrestrial Ecological Evaluation (TEE) based on the existing Site conditions.
7. Create a hydrogeologic cross section (NAVD88 vertical scale) showing boring and monitoring well locations, stratigraphy, groundwater levels, groundwater sample results, historical sources of contamination, and the limits of the previous soil excavation.
8. Create a groundwater elevation contour map and include a calculation of groundwater gradients.

# 3.0 Geologic and Hydrogeologic Setting

## 3.1 PHYSIOGRAPHY AND GEOLOGY

The Site location in White Center, south of West Seattle, shares many of the geological and topographical characteristics of the Puget Lowland region of Washington and was shaped by glacial processes. Characterized by rolling hills and steep slopes, the topography reflects the influence of the Vashon Glaciation. Remnants of glaciation include upland drift deposits in the form of parallel, north-south oriented ridgelines. Two of these ridgelines bound the central valley where the Site is located. The surface topography of the central valley includes a gradual downward slope to the south toward the White Center Highland wetlands and pond. An east-west topographic section (Figure 3) shows the prominent ridgelines containing the valley. Figure 3 also shows the unique physiography of the central valley visible with lidar imagery.

The geology at the Site primarily consists of historical fill up to 16 feet thick underlain by Vashon ice contact deposits, and by weathered and unweathered glacial till. The fill is the result of multiple episodes of development at the Site, including the original construction of the Maintenance Center complex, redevelopment-related stormwater pond construction and backfill, and regrading of the Site for the present-day multi-family housing buildings. The fill includes a mixture of sand, silt, clay, gravel and crushed concrete material densely compacted for building foundation support. The upper native unit (ice contact deposits) consists of loose to medium dense sand, sand with silt, and silty sand. The underlying weathered and unweathered glacial till is comprised of gray-brown dense silty sand with gravel that acts as a low permeability confining unit at approximately 15 feet below ground surface (bgs). An east-west trending conceptual site model cross section (A – A' on Figure 2) of the site portraying the local geology is presented in Figure 4.

## 3.2 HYDROGEOLOGY AND GROUNDWATER

White Center's central valley hydrogeology is influenced by the permeability of the fill and glacial soils, with groundwater flow patterns locally affected by topographic features. Groundwater flow direction is to the south and is bound by the central valley ridges. Following the axis of the valley, the surface topography slopes to the south at an average gradient of 0.1 vertical feet per lateral foot (ft/ft) (Figure 3). The hydraulic gradient within the shallow, unconfined aquifer is approximately 0.01 ft/ft based on comparison of the average groundwater elevation at MW-2 (400 feet NAVD88) and the northernmost edge of the Highland Park pond (382 feet NAVD88) located approximately 1,580 feet south of MW-2. Shallow groundwater occurrence varies depending on the extent of capped surfaces in the urban environment, permeability changes in the fill and native units, and the influence of stormwater drainage systems that divert surface and shallow water into designated storage ponds.

Pre-construction geotechnical borings from 2003 - 2004 were evaluated to identify the elevation of the underlying confining unit that constrains shallow groundwater within the central valley (GeoEngineers 2007). Two geotechnical borings drilled on the east and west bounding ridgelines did not encounter shallow groundwater and supports the hydrogeologic model for a valley-confined shallow aquifer (Figure 3). The prominent downward slope of the valley's axis combined with the surface water features identified south of the Site were used to document the direction of groundwater flow and calculate the hydraulic gradient. The groundwater contour map of the central valley (including the Site monitoring wells), surface water features located south of the Site, and general surface gradients defining the valley sidewalls and axis are presented in Figure 3.

## 3.3 TERRESTRIAL ECOLOGICAL EVALUATION

Based on the criteria in WAC 173-340-7491, the Site meets the undeveloped land exclusion requirement that there is less than 1.5 acres of contiguous undeveloped land on the Site or within 500 feet of any area of the Site affected by hazardous substances other than those listed in WAC 173-340-7491(1)(c)(ii), and there is less than 0.25 acres of contiguous undeveloped land on or within 500 feet of any area of the Site affected by hazardous substances listed in WAC 173-340-7491(1)(c)ii). Therefore, no terrestrial ecological evaluation is required.

# 4.0 Contaminants of Concern and Cleanup Levels

## 4.1 CONTAMINANTS AND MEDIA OF CONCERN

Contaminants of concern are defined as chemicals that have been detected at concentrations greater than the MTCA cleanup levels. The Site was characterized based on the evaluation of historical site uses and the groundwater monitoring conducted on the subject property to date. The Site COCs are diesel- and lube oil-range petroleum hydrocarbons (DRPH and ORPH). Site COCs are non-volatile compounds, and therefore, the presence of these COCs in groundwater is not considered to pose a risk to indoor air via vapor intrusion.

Groundwater samples were submitted for laboratory chemical analysis using the NWTPH-Dx method with and without silica gel cleanup (SGC) consistent with current Ecology guidance for Silica Gel Cleanup in Washington State (Ecology 2023). Split groundwater samples were analyzed with and without SGC, and the results were used to calculate the concentration of non-petroleum polar metabolites that were removed during the SGC step. Polar metabolite concentration screening levels are discussed in the following section but are not considered a Site COC.

## 4.2 CLEANUP LEVELS

As required by the Ecology Implementation Memorandum No. 4 and Guidance for Silica Gel Cleanup in Washington State, the sum of DRPH and ORPH concentration in groundwater samples was screened against the MTCA Method A cleanup level of 500 micrograms per liter (µg/L) (Ecology 2004 and 2023). The sum is calculated for both split samples (with and without SGC), and the difference between the values is considered the concentration of non-petroleum polar metabolites removed during the SGC step. The polar metabolite concentration was screened against the newly established cleanup level of 500 µg/L (Ecology, 2023).

# 5.0 Groundwater Monitoring

## 5.1 TERMINATION OF TREATMENT

The treatment of groundwater ended with the removal of the 10-ft long ORC sock from monitoring well MW-2 on March 16, 2023, two months prior to the first compliance groundwater monitoring event on May 25, 2023. The dissolved oxygen (DO) levels measured at MW-2 were less than 1 mg/L during subsequent groundwater monitoring events, which were consistent with the DO levels measured during ORC treatment. The chemical analytical results at MW-2 between 2017 and 2024 are plotted in relation to groundwater elevation (NADV88) and the timing of the various treatment events in Figure 5.

## 5.2 GROUNDWATER CONDITIONS

### *5.2.1 Groundwater Elevations*

Based on the quarterly monitoring events for the past 12 months, groundwater elevations at both wells MW-1 and MW-2 fluctuated approximately 2 to 3 feet seasonally, between Elevations 397 and 403 feet (NAVD88). Based on the past several years of groundwater monitoring, the highest groundwater elevations occurred during the wet season (October through April) and the lowest elevations occurred during the dry season (May through September). Depth to groundwater field measurements and calculated groundwater elevations (feet NAVD88) are summarized in Table 1.

### 5.2.2 Groundwater Parameters

Stabilized groundwater parameters including pH, DO, specific conductivity, oxygen reducing potential (ORP), and turbidity were recorded at each sampling event. In addition, one quarterly sample was tested for total organic carbon (TOC) at both monitoring wells in May 2023. The groundwater physiochemical conditions and select chemical analyses were used to evaluate the natural attenuation of the petroleum hydrocarbon plume in groundwater consistent with Ecology guidance (Ecology 2005). Groundwater parameters and chemical analytical results for TOC are reported in Table 2.

The pH of groundwater at MW-2, which has been greater than the anticipated area background, was elevated but consistently less than the dangerous waste threshold (<12.5 pH) for the past 18 quarterly monitoring events (May 2019 through February 2024). The pH at MW-2 was 9.31 in May 2024 and shows a decreasing trend toward background levels. The background level of pH measured at MW-1 ranged from 6.67 to 8.18 over the last 7 years of groundwater monitoring.

Concentrations of DO at MW-2 ranged from 0.65 to 1.02 milligrams per liter (mg/L) and has generally been increasing since December 2021. As noted above, there has been no significant change in DO since the ORC treatment was terminated at MW-2 in March 2023. Background DO at MW-1 ranged from 6 to 8 mg/L in the last two sampling events (February 2019 and May 2024).

The ORP was measured to evaluate the oxidation potential of the groundwater, where a relatively high ORP value indicates a greater potential for oxidation, and a low ORP value indicates a greater potential for reduction. The MW-1 ORP concentration was 154.1 millivolts (mV) in May 2023 and consistently over 100 mV in all previous sampling events. ORP at MW-2 was -137.9 mV in February 2024 and consistently less than -100 mV in the last 4 quarterly sampling events.

Total organic carbon was analyzed once at MW-1 and MW-2 in May 2023 by method SM 5310B at an Ecology accredited laboratory, Onsite Environmental Inc., located in Redmond, Washington. The TOC concentration at MW-1 was 1.4 mg/L and at MW-2 was 11 mg/L in May 2023 indicating increased organic matter is present where the plume was previously located. The elevated concentration at MW-2 further warrants the use of SGC during the chemical analysis of DRPH and ORPH, as discussed in the following section.

## 5.3 GROUNDWATER COMPLIANCE MONITORING CHEMICAL ANALYTICAL RESULTS

Following the end of treatment at the Site, four quarters of groundwater compliance monitoring were conducted on May 25, August 29, and November 28, 2023, and February 28, 2024. As noted above, the groundwater samples from MW-2 were tested quarterly for DRPH and ORPH (with and without SGC). The compliance groundwater monitoring chemical analytical results from the last four quarters are summarized in Table 3. The compliance groundwater monitoring chemical analytical results are plotted in Figure 6. Groundwater monitoring field procedures are described in Appendix A. Laboratory chemical analytical reports are provided in Appendix B.

Groundwater samples were analyzed by an Ecology approved laboratory, OnSite Environmental, Inc. Chemical analytical data from the samples collected at the Site between 2017 and 2024 was uploaded and entered into Ecology's Environmental Information Management (EIM) database as of May 2024. Confirmation of EIM data submittals are provided in Appendix C.

### 5.3.1 Total Petroleum Hydrocarbons (Sum of DRPH and ORPH)

Total petroleum hydrocarbons (as the sum of DRPH and ORPH) were analyzed using the NWTPH-Dx method with and without SGC beginning in October 2022 following the publication of the Ecology draft SGC Guidance (Ecology 2023). No acid was included in the SGC process in accordance with the Ecology guidance document. The sum of DRPH and ORPH without SGC ranged from 470 µg/L to 1,850 µg/L during the compliance monitoring period. Using SGC, the sum of DRPH and ORPH for all of the samples was less than the laboratory reporting limits, which were all less than the MTCA Method A cleanup level of 500 µg/L.

### 5.3.2 Non-Petroleum Polar Organics

In accordance with the November 2023 Ecology guidance, the sum of DRPH and ORPH with SGC was subtracted from the sum of DRPH and ORPH without SGC to evaluate the analytical results for the samples collected during the final two quarters of compliance monitoring. The difference between the two sums is reported as the concentration of non-petroleum polar organics removed from the groundwater sample through the SGC process and is compared to the cleanup level of 500 µg/L. Polar metabolites were detected at concentrations less than the Ecology established cleanup level (120 and 150 µg/L) for the samples collected in November 2023 and February 2024.

## 5.4 INVESTIGATION DERIVED WASTE AND ANNUAL REPORTING

Purge water generated from the four quarterly compliance monitoring events at MW-2 was taken to Marine Vacuum Services Inc. located in Seattle, Washington for permitted disposal. Disposal receipts are provided in Appendix D.

Turbowaste annual reporting for dangerous waste generation was completed in March 2024. The Site was reported as a non-generator of dangerous waste for 4 consecutive years. As noted above, the pH of purge water produced from sampling events at MW-2 consistently decreased and reached neutral levels by February 2024.

# 6.0 Discussion and Conclusions

Quarterly compliance groundwater monitoring at MW-2 was completed between May 2023 and February 2024 at the Former Park Lake Homes Maintenance Center Site. Total petroleum hydrocarbons in groundwater (as the sum of DRPH and ORPH) analyzed by method NWTPH-Dx with SGC were detected at concentrations less than the MTCA Method A cleanup level in all four compliance sampling events. Calculated concentrations of polar metabolites were detected at values less than the established cleanup level for the quarters of monitoring since the Ecology guidance was finalized in November 2023.

Groundwater pH levels remained below the dangerous waste threshold (<12.5 pH) for all quarterly sampling events and no dangerous waste, wastewater was generated during the reporting period.

Groundwater monitoring data from all quarterly events were uploaded to Ecology's EIM database as required under the VCP.

Based on the compliance monitoring and additional characterization data presented above, the cleanup action has addressed the Site COCs and mitigated potential risks to human health and the environment, consistent with the MTCA requirements. Therefore, we request that Ecology issue a 'No Further Action' determination for the Site in accordance with the VCP guidelines.

# 7.0 Limitations

We have prepared this letter report for use by KCHA. This report may be provided to regulatory agencies for review and information. Our services were completed in accordance with our contract with KCHA. No other party may rely on the product of our services unless we agree 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.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Please refer to Appendix E "Report Limitations And Guidelines For Use" for additional information pertaining to the use of this report.

# 8.0 References

GeoEngineers, Inc. 2005. Independent Cleanup of Petroleum-Contaminated Soil, KCHA Maintenance Center Former Park Lake Homes, King County, Washington, September 12, 2005.

GeoEngineers, Inc. 2007. Update Report: Geotechnical Engineering Services, Greenbridge Hope VI Redevelopment Project, January 12, 2007.

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

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

GeoEngineers, Inc. 2021. Groundwater Monitoring and Independent Cleanup Report, KCHA Former Park Lake Homes Maintenance Facility, Seattle, Washington, February 5, 2021.

GeoEngineers, Inc. 2022. Annual Groundwater Monitoring Report 2021, KCHA Former Park Lake Homes, Maintenance Center Site, Seattle, Washington, April 1, 2022.

GeoEngineers, Inc. 2023. Annual Groundwater Monitoring Report (April 2022 – January 2023), KCHA Former Park Lake Homes, Maintenance Center Site, Seattle, Washington, March 22, 2023.

Washington State Department of Ecology (Ecology) 2004. Implementation Memorandum #4, Determining Compliance with Method A Cleanup Levels for Diesel and Heavy Oil, Publication No. 04-09-086, Published June 2004.

Washington State Department of Ecology (Ecology) 2005. Guidance on Remediation of Petroleum-Contaminated Ground Water By Natural Attenuation. Publication No. 05-09-091 (Version 1.0), Published July 2005.

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," May 30, 2017.

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

# Tables

# Table 1

## Monitoring Well Groundwater Elevation Data

### Former Park Lake Homes Maintenance Center

### 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 | 400.7 | | |
| | 05/05/20 | 9.33 | 398.08 | | |
| | 08/21/20 | 10.70 | 396.71 | | |
| | 01/08/21 | 6.41 | 401.00 | | |
| | 05/04/21 | 7.66 | 399.75 | | |
| | 09/22/21 | 10.43 | 396.98 | | |
| | 12/15/21 | 7.49 | 399.92 | | |
| | 04/26/22 | 7.98 | 399.43 | | |
| | 07/21/22 | 9.10 | 398.31 | | |
| | 10/13/22 | 10.94 | 396.47 | | |
| | 01/23/23 | 7.93 | 399.48 | | |
| | 05/25/23 | 8.78 | 398.63 | | |
| | 08/29/23 | 9.71 | 397.70 | | |
| | 11/28/23 | 7.43 | 399.98 | | |
| | 2/28/24 | 7.47 | 399.94 | | |
| 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 | 6.2 | 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 | | |
| | 05/04/21 | 7.97 | 400.61 | | |
| | 09/22/21 | 9.33 | 399.25 | | |
| | 12/15/21 | 6.90 | 401.68 | | |
| | 04/26/22 | 7.23 | 401.35 | | |
| | 07/21/22 | 8.33 | 400.25 | | |
| | 10/13/22 | 9.73 | 398.85 | | |
| | 01/23/23 | 6.76 | 401.82 | | |
| | 05/25/23 | 6.77 | 401.81 | | |
| | 08/29/23 | 7.68 | 400.90 | | |
| | 11/28/23 | 5.37 | 403.21 | | |
| | 2/28/24 | 4.70 | 403.88 | | |

**Notes:**

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

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

NAVD88 = North American Vertical Datum of 1988

TOC = top of casing

bgs = below ground surface

# Table 2

## Groundwater Monitoring Parameter Data

### Former Park Lake Homes Maintenance Center

### Seattle, Washington

| Sample ID[1] | Date | pH | Specific Conductivity (µS/cm) | Dissolved Oxygen (mg/L) | Oxygen Reduction Potential (ORP) (mV) | Turbidity (NTU) | Total Organic Carbon[2] (mg/L) |
|---|---|---|---|---|---|---|---|
| **Monitoring Well MW-1** | | | | | | | |
| MW-1-170828 | 08/28/17 | 6.76 | 310.9 | 2.56 | 198.2 | 4.0 | -- |
| MW-1-171201 | 12/01/17 | 7.91 | 257.5 | 4.41 | 188.2 | 4.1 | -- |
| MW-1-180430 | 04/30/18 | 8.18 | 234.9 | 4.64 | 186.7 | 4.3 | -- |
| MW-1-180718 | 07/18/18 | 7.77 | 239.2 | 3.26 | 146.5 | 4.6 | -- |
| MW-1-181018 | 10/18/18 | 7.68 | 238.7 | 4.14 | 159.6 | 3.2 | -- |
| MW-1-190219 | 02/19/19 | 7.82 | 283.2 | 6.04 | 245.7 | 3.5 | -- |
| MW-1-230525 | 05/25/23 | 6.67 | 348.0 | 8.08 | 154.1 | 2.0 | 1.4 |
| **Monitoring Well MW-2** | | | | | | | |
| MW-2-170828 | 08/28/17 | 12.59 | 2,463 | 0.06 | -324.9 | 3.1 | -- |
| MW-2-171201 | 12/01/17 | 12.72 | 2,106 | 0.07 | -202.5 | 3.7 | -- |
| MW-2-180430 | 04/30/18 | 12.88[2] | 1,839 | 0.17 | -91.3 | 3.1 | -- |
| MW-2-180718 | 07/18/18 | 12.84[2] | 2,081 | 0.08 | -213.6 | 4.7 | -- |
| MW-2-181018 | 10/18/18 | 12.64[2] | 2,121 | 0.07 | -311.8 | 4.1 | -- |
| MW-2-190219 | 02/19/19 | 12.95[2] | 1,742 | 0.09 | -212.3 | 3.6 | -- |
| MW-2-190515 | 05/15/19 | 12.31 | 1,795 | 0.13 | -220.2 | 3.3 | -- |
| MW-2-190816 | 08/16/19 | 11.70 | 1,986 | 0.08 | -235.9 | 3.2 | -- |
| MW-2-191122 | 11/22/19 | 12.12 | 1,872 | 0.08 | -254.3 | 4.2 | -- |
| MW-2-200214 | 02/14/20 | 11.33 | 1,622 | 0.20 | -226.1 | 4.8 | -- |
| MW-2-200507 | 05/07/20 | 10.19 | 1,747 | 0.27 | 20.5 | 3.2 | -- |
| MW-2-200821 | 08/21/20 | 10.44 | 2,197 | 4.80 | 105.3 | 8.6 | -- |
| MW-2-210108 | 01/08/21 | 11.58 | 1,827 | 5.23 | 102.1 | 24 | -- |
| MW-2-210504 | 05/04/21 | 11.88 | 1,360 | 7.48 | -151.1 | 5.8 | -- |
| MW-2-210922 | 09/22/21 | 11.02 | 1,240 | 5.96 | -170.1 | 5.0 | -- |
| MW-2-211215 | 12/15/21 | 11.90 | 1,700 | 0.44 | -88.9 | 8.8 | -- |
| MW-2-220426 | 04/26/22 | 12.04 | 1,611 | 0.89 | -83.1 | 9.9 | -- |
| MW-2-220721 | 07/21/22 | 11.65 | 1,575 | 0.93 | -64.6 | 9.9 | -- |
| MW-2-221013 | 10/13/22 | 11.27 | 1,951 | 0.81 | -39.0 | 8.3 | -- |
| MW-2-230123 | 01/12/23 | 10.97 | 1,946 | 0.74 | -41.0 | 7.5 | -- |
| MW-2-230525 | 05/25/23 | 11.05 | 1,351 | 0.89 | -238.7 | 6.2 | 11 |
| MW-2-230829 | 08/29/23 | 11.28 | 1,349 | 0.65 | -221.4 | 8.2 | -- |
| MW-2-231128 | 11/28/23 | 9.63 | 1,258 | 0.65 | -128.6 | 7.9 | -- |
| MW-2-240228 | 02/28/24 | 9.31 | 459 | 1.02 | -137.9 | 6.2 | -- |

Notes:

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

[2] Total organic carbon was analyzed by method SM5310B at Onsite Environmental in Redmond, WA.

mg/L = milligrams per liter

µS/cm = microSiemens per centimeter

-- = not measured

# Table 3

## Summary of Groundwater Chemical Analytical Data

### Former Park Lake Homes Maintenance Center

### Seattle, Washington

| Sample ID[1] | Sample Year | Sample Date | Total Petroleum Hydrocarbons without SGC[3] (µg/L) | | | | Total Petroleum Hydrocarbons with SGC[3] (µg/L) | | | Non-Petroleum Polar Organics[5] (µg/L) |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Gasoline-Range[2] | Diesel-Range (DRPH) | Oil-Range (ORPH) | Sum of DRPH and ORPH[4] | Diesel-Range (DRPH) | Oil-Range (ORPH) | Sum of DRPH and ORPH[4] | |
| MW-2-170828 | 2017 | 08/28/17 | 100 U | **890** | **2,500** | **3,390** | -- | -- | -- | -- |
| MW-2-171201 | | 12/01/17 | 100 U | **830** | **2,200** | **3,030** | -- | -- | -- | -- |
| MW-2-180430 | 2018 | 04/30/18 | 100 U | **520** | **2,000** | **2,520** | -- | -- | -- | -- |
| MW-2-180718 | | 07/18/18 | 100 U | **490** | **1,400** | **1,890** | -- | -- | -- | -- |
| MW-2-181018 | | 10/18/18 | 100 U | **700** | **1,700** | **2,400** | -- | -- | -- | -- |
| MW-2-190219 | 2019 | 02/19/19 | 100 U | **550** | **1,800** | **2,350** | -- | -- | -- | -- |
| MW-2-190515 | | 05/15/19 | -- | **370** | **890** | **1,260** | -- | -- | -- | -- |
| MW-2-190816 | | 08/16/19 | -- | **530** | **1,100** | **1,630** | -- | -- | -- | -- |
| MW-2-191122 | | 11/22/19 | -- | **830** | **1,900** | **2,730** | -- | -- | -- | -- |
| MW-2-200214 | 2020 | 02/14/20 | -- | **500** | **1,500** | **2,000** | -- | -- | -- | -- |
| MW-2-200507 | | 05/07/20 | -- | **560** | **1,200** | **1,760** | -- | -- | -- | -- |
| MW-2-200821 | | 08/21/20 | -- | **500** | **1,200** | **1,700** | -- | -- | -- | -- |
| MW-2-210108 | 2021 | 01/08/21 | -- | 200 U | 210 U | 410 U | -- | -- | -- | -- |
| MW-2-210504 | | 05/04/21 | -- | 200 U | **590** | **790** | -- | -- | -- | -- |
| MW-2-210921 | | 09/22/21 | -- | 200 U | 200 U | 400 U | -- | -- | -- | -- |
| MW-2-211215 | | 12/15/21 | -- | **340** | **810** | **1,150** | -- | -- | -- | -- |
| MW-2-220426 | 2022 | 04/26/22 | -- | **420** | **1,500** | **1,920** | -- | -- | -- | -- |
| MW-2-220721 | | 07/21/22 | -- | **240** | **640** | **880** | -- | -- | -- | -- |
| MW-2-221013 | | 10/13/22 | -- | 200 U | **500** | **700** | 200 U | 200 U | 400 U | -- |
| MW-2-230112 | 2023 | 01/12/23 | -- | **160** | **380** | **540** | 210 U | 210 U | 420 U | -- |
| MW-2-230525 | | 05/25/23 | -- | **350** | **1,500** | **1,850** | 200 U | 200 U | 400 U | -- |
| MW-2-230829 | | 08/29/23 | -- | **310** | **640** | **950** | 210 U | 210 U | 420 U | -- |
| MW-2-231128 | | 11/28/23 | -- | **110** | **370** | **480** | 110 U | 220 U | 330 U | **150** |
| MW-2-240228 | 2024 | 02/28/24 | -- | 150 U | **320** | **470** | 150 U | 200 U | 350 U | **120** |
| **Groundwater MTCA Method A Cleanup Levels** | | | 800/1,000[6] | 500 | 500 | 500 | 500 | 500 | 500 | 500 |

**Notes:**

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

[2] Gasoline-range total petroleum hydrocarbons were analyzed by method NWTPH-Gx.

[3] Diesel- and oil-range total petroleum hydrocarbons were analyzed by method NWTPH-Dx with and without the silica gel cleanup method.

[4] The sum of diesel- and oil-range hydrocarbons is compared to the MTCA Method A cleanup level as required in Silica Gel Guidance (Ecology 2023).

[5] The concentrations of non-petroleum polar organics are calculated by subtracting the sum of DRPH and ORPH without SGC from the sum of DRPH and ORPH with SGC.

[6] When benzene is present the gasoline range cleanup level is 800 µg/L. When benzene is not present, the range cleanup level is 1,000 µg/L.

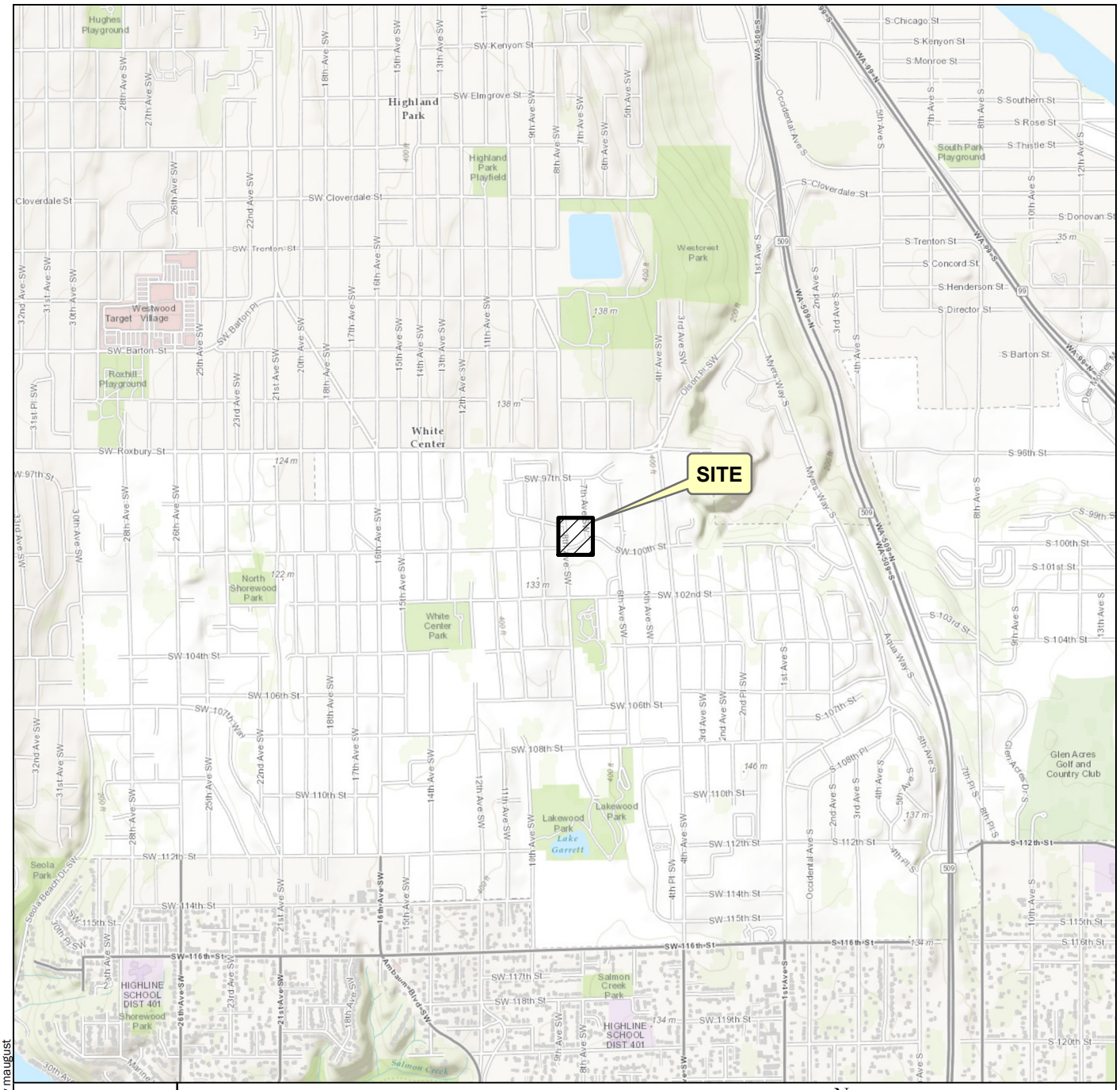
MTCA = Model Toxics Control Act

mg/L = milligrams per liter

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

**Bold** indicates analyte was detected

# Figures





N
W E
S

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**

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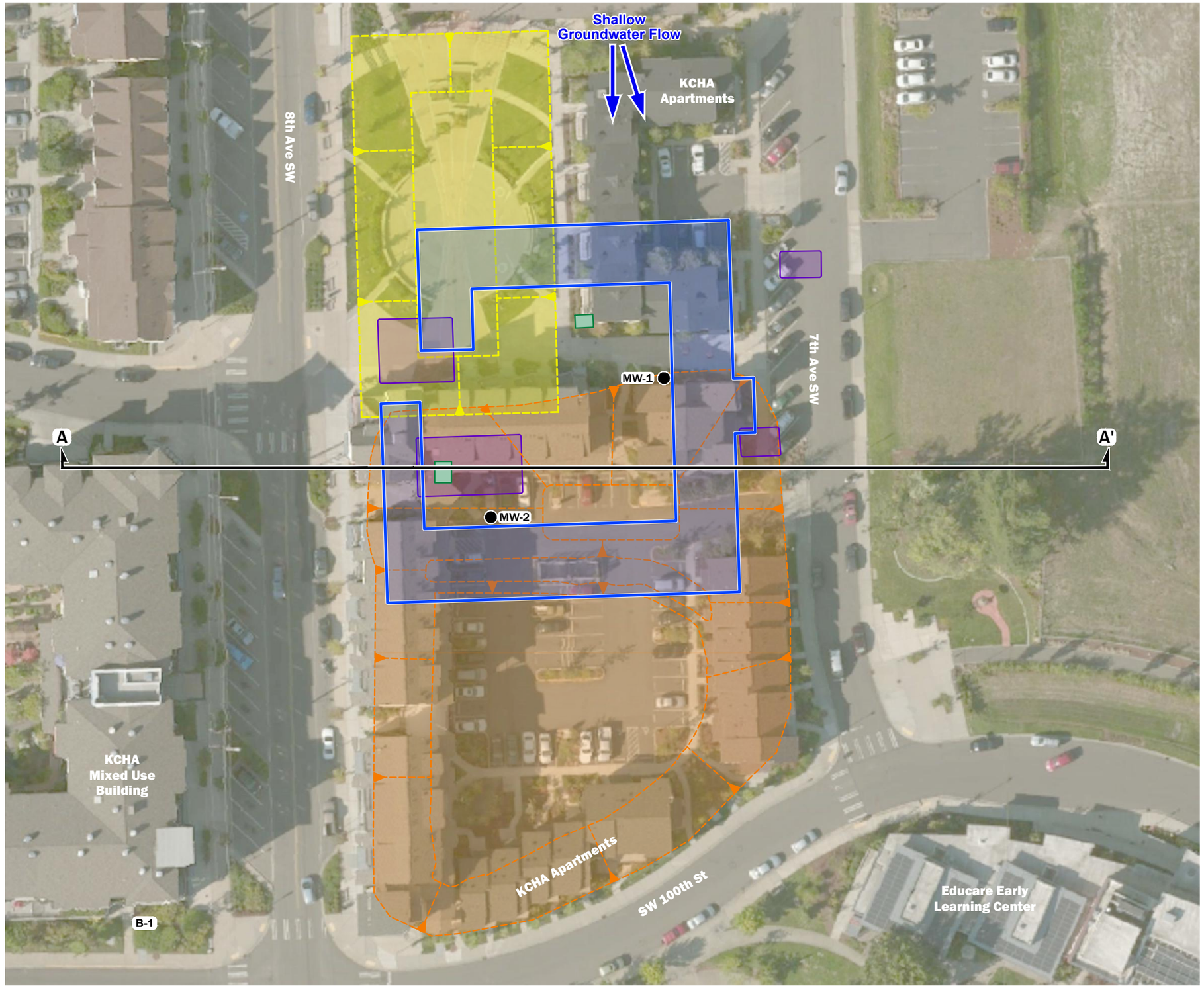



## Legend

- MW-1 ● Monitoring Well
- Approximate Footprint of Former Park Lake Homes Maintenance Center Building
- Approximate Location of Removed UST
- Approximate Location of 2005 Remedial Excavations - MTCA Cleanup at Maintenance Center
- Approximate Boundary of Backfilled CV4 Stormwater Pond Excavation
- Excavation for Water Quality Vault
- A — A' Cross Section Location

## 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.
3. Proposed Monitoring Well Locations may be modified slightly based on surface conditions observed in the field.

Data Source:

- Aerial from Microsoft Bing dated September 2013
- Stormwater Vault and Excavation from "Lake Garrett Sub-Basin Water Quality Vault Plan and Section", Sheet DF-3 by Goldsmith & Associates dated 10/25/2004
- Location of 2005 Remedial Excavations from "Final Cleanup Report, KCHA Maintenance Facility, Former Park Lake Homes, 9900 8th Avenue SW, Seattle, Washington," dated September 7, 2005 for King County Housing Authority, GEI File 1329-003-04
- CV4 Stormwater Pond Excavation Boundary and 2003/2004 Borings from "Geotechnical Engineering Services Greenbridge Hope VI Redevelopment Update Report" by GeoEngineers dated 1/12/2007
- Waterline Connection Location from "BDR Greenbridge Park Water Plan and Profile", Sheet WA-02 by ESM Consulting Engineers dated 4/26/2016

N

0 50

Feet

**Site Plan**

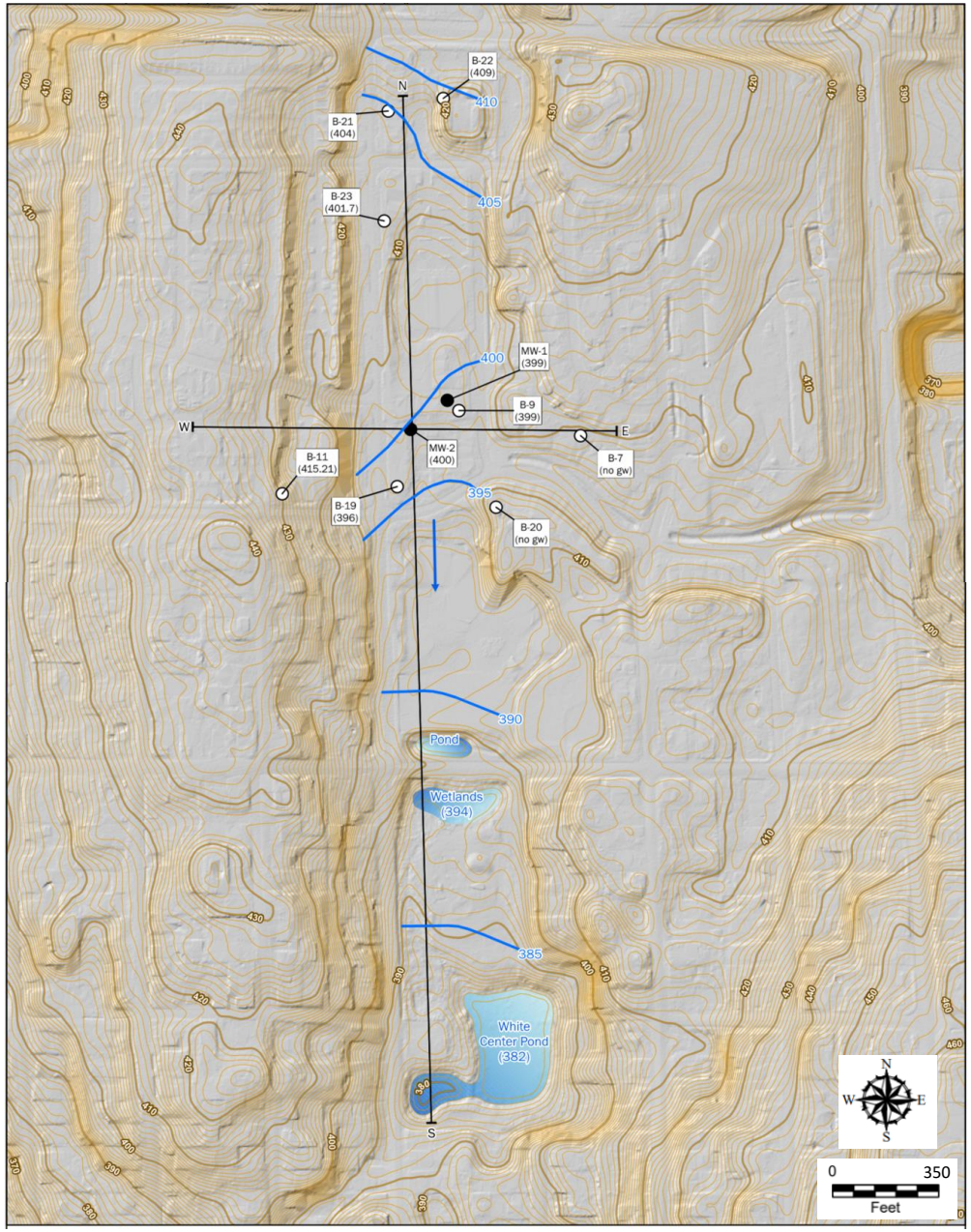
Former Park Lake Homes Maintenance Center
9800 8th Ave SW. Seattle, Washington

GeoEngineers

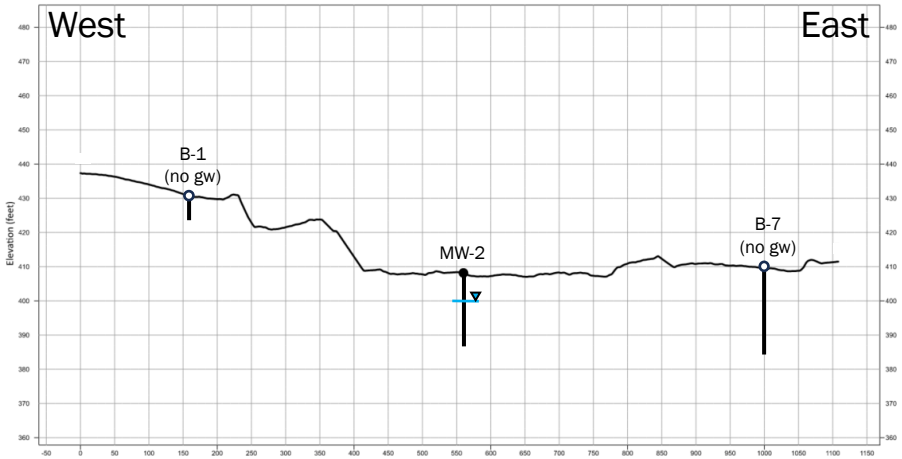
**Figure 2**

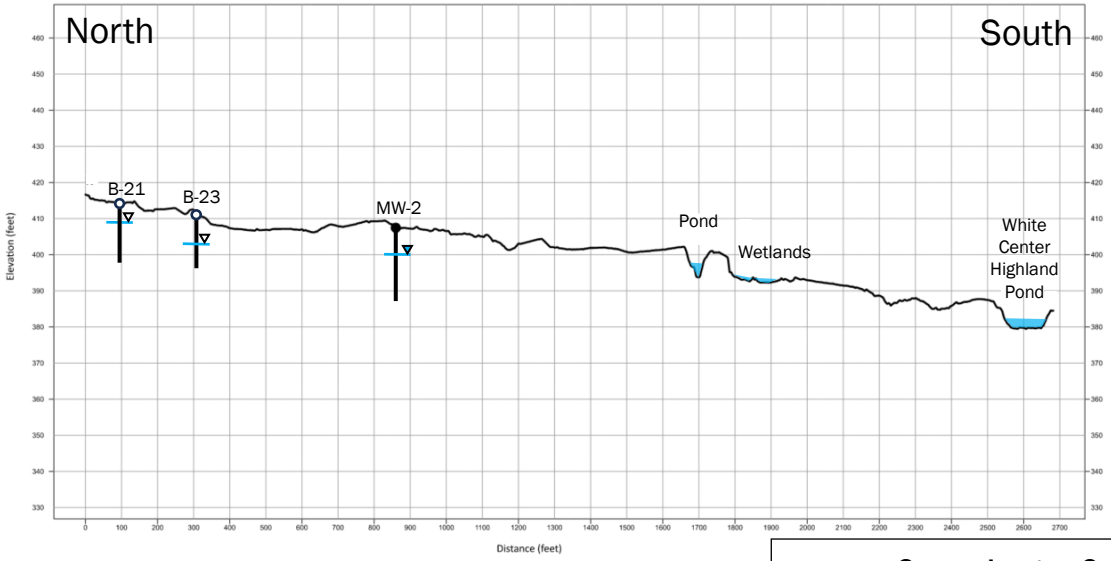
P:\1\1329003\CAD\30\Enviromental Report\1329003330_F02_Site Plan.dwg TAB:F02 Site Plan Date Exported: 05/01/24 - 9:54 by JFellows

# Groundwater Contour Map




# Topographic Profiles




**Legend:**

- 400 — Approximate Groundwater Contour Elevation (Ft NAVD88)
- Site Monitoring Well (GeoEngineers, 2017)
- Geotechnical Boring (GeoEngineers, 2007)
- B-11 (410.1) — Boring ID and Groundwater Elevation (GEI 2007 and GEI 2024)
- Groundwater Elevation Measured from Monitoring Well (February 2024)
- Groundwater Elevation Measured During Drilling (GeoEngineers 2007)
- Surface Water Feature
- Topographic Section Line

Notes:

1. Data Source: LiDAR - North Puget 2017, Groundwater elevations are in NAVD88 vertical datum, and Boring data is from GeoEngineers 2007 and GeoEngineers 2019 reports.
2. Topographic profiles are approximately 10x vertically exaggerated.
3. This plot 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.

**Groundwater Contour Map and Topographic Sections**

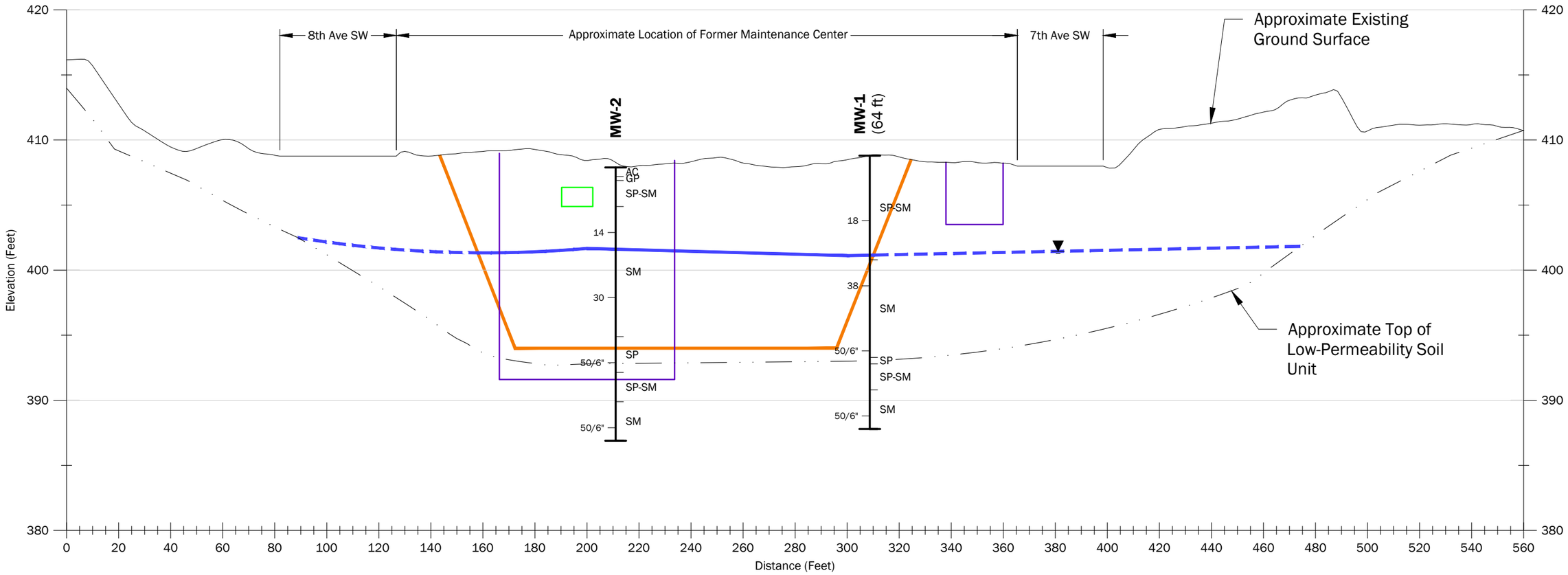
Former Park Place Homes Maintenance Center
Seattle, Washington

GeoEngineers

**Figure 3**

1329-003-30 Date Exported: 05/1/2024

| MW-2 Groundwater Analytical Results (NWTPH-Dx with SGC, µg/L) | | | |
|---|---|---|---|
| **Date** | **Diesel-Range (DRPH)** | **Oil-Range (ORPH)** | **TPH Sum (DRPH + ORPH)** |
| 05/25/23 | <200 U | <200 U | <400 U |
| 08/29/23 | <210 U | <210 U | <420 U |
| 11/28/23 | <110 U | <220 U | <330 U |
| 02/28/24 | <150 U | <200 U | <350 U |




## Note(s):

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

## Source(s):

1. Topographic survey from Washington LiDAR Portal's 2021 DTM Hillshade map.

Datum: NAVD88

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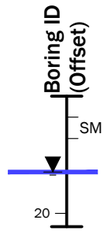



**Legend**

- Boring
- Soil Classification
- Groundwater Measured in Monitoring Well (February 2024) (Dashed Where Inferred) Blow Count
- Approximate Location of Removed UST
- Approximate Location of 2005 Remedial Excavations - MTCA Cleanup at Maintenance Center
- Approximate Boundary of Backfilled CV4 Stormwater Pond Excavation
- Approximate Top of Low-Permeability Soil Unit

0 40
Horizontal Feet

0 8
Vertical Feet
Vertical Exaggeration = 5X

**CSM Cross Section A to A'**

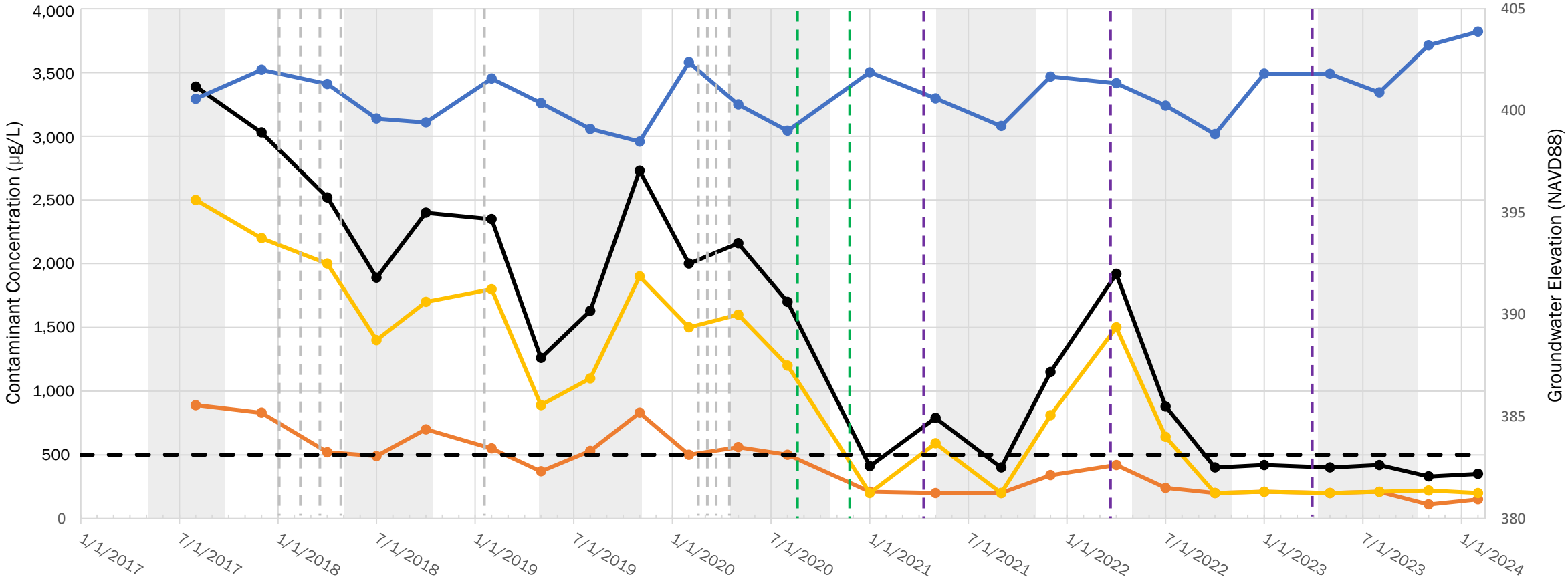
Former Park Lake Homes Maintenance Center
Seattle, Washington

GeoEngineers

**Figure 4**

P:\1\1329003\CAD\30\Enviromental Report\1329003300_F04_Section A-A'.dwg 4 Date Exported:5/1/2024 10:04 AM - by Jackson N. Fellows

# MW-2 Groundwater Analytical Data and Treatment Plot




**Legend:**

Remedial Events

- Groundwater Removal Event
- Injection Event
- ORC Sock Install or Removal
- Dry Season (May through September)

Groundwater Data Results

- Sum of Diesel & Lube Oil *With SGC 10/2022 to 2/2024
- Diesel-Range Hydrocarbons *With SGC 10/2022 to 2/2024
- Lube Oil-Range Hydrocarbons *With SGC 10/2022 to 2/2024
- MTCA Method A Cleanup Level
- Groundwater Elevation (feet NAVD88)

Notes:

1. Data Source: Groundwater samples were collected by low-flow Sampling Methods and analyzed at Onsite Environmental Laboratory, in Redmond, WA.
2. Abbreviations: µg/L = milligrams per liter, MTCA = Model Toxics Control Act, MW = monitoring well, ORC = oxygen reducing compound, and SGC = silica gel cleanup.
3. SGC was used on groundwater samples collected between October 2022 and February 2024. The MTCA Method A cleanup level for the sum of diesel and lube oil range hydrocarbons is 500 µg/L.
4. This plot 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.

**MW-2 Groundwater Data and Treatment Plot**

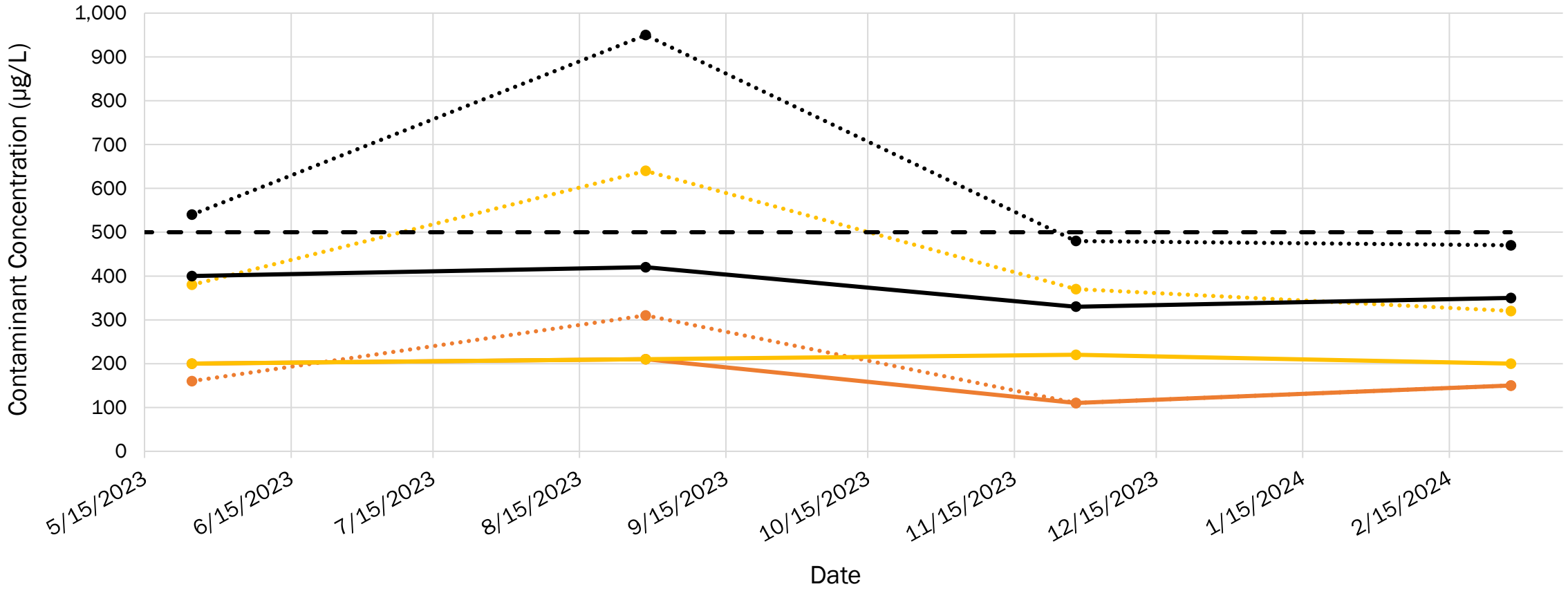
Former Park Place Homes Maintenance Center
Seattle, Washington

GeoEngineers

**Figure 5**

1329-003-30 Date Exported: 05/1/2024

# Compliance Monitoring: MW-2 Groundwater Plot




**Legend:**

Groundwater Chemical Analytical Results

- Sum of Diesel & Lube Oil with SGC
- Sum of Diesel & Lube Oil (no SGC)
- Diesel-Range Hydrocarbons with SGC
- Diesel-Range Hydrocarbons (no SGC)
- Lube Oil-Range Hydrocarbons with SGC
- Lube Oil-Range Hydrocarbons (no SGC)
- MTCA Method A Cleanup Level

Notes:

1. Data Source: Groundwater samples were collected by low-flow Sampling Methods and analyzed at Onsite Environmental Laboratory, in Redmond, WA. 2. Abbreviations: µg/L = milligrams per liter, MTCA = Model Toxics Control Act, MW = monitoring well, and SGC = silica gel cleanup.
3. The MTCA Method A cleanup level for the sum of diesel and lube oil range hydrocarbons is 500 µg/L.
4. This plot 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.

**MW-2 Compliance Monitoring Groundwater Plot**

Former Park Place Homes Maintenance Center
Seattle, Washington

GeoEngineers

**Figure 6**

1329-003-30 Date Exported: 05/1/2024