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**T E C H N I C A L M E M O R A N D U M**

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**TO:** Tena Seeds, P.E. – Washington State Department of Ecology

**cc:** Jim Broadlick and Sean Biehl – City Investors IX L.L.C.

**FROM:** Suzy Stumpf, P.E., Senior Engineer  
Clifford T. Schmitt L.G., L.H.G., Principal Hydrogeologist

**DATE:** May 22, 2020

**RE:** **MONITORING WELL INSTALLATION  
BLOCK 38 WEST PROPERTY  
500 THROUGH 536 WESTLAKE AVENUE NORTH  
SEATTLE, WASHINGTON  
FARALLON PN: 397-019  
AGREED ORDER NO. DE 17963**

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Farallon Consulting, L.L.C. (Farallon) has prepared this Technical Memorandum on behalf of City Investors IX L.L.C. (City Investors IX) to present a scope of work and rationale to install compliance groundwater monitoring wells at the Block 38 West Site. The proposed monitoring wells are associated with the current independent remedial action being performed under the auspices of Agreed Order No. DE 17963 (AO) between the Washington State Department of Ecology (Ecology) and City Investors IX. The Block 38 West Site as defined under the AO is where a hazardous substance, other than a consumer product in consumer use, has been deposited, stored, disposed of, or placed, or otherwise come to be located. The Site is generally located at 500 through 536 Westlake Avenue North in Seattle, Washington (Block 38 West Property) (Figure 1).

This Technical Memorandum summarizes the scope of work and rationale for adding two monitoring wells to evaluate groundwater conditions at the Block 38 West Property after independent remedial action activities, which include sampling and off-Site disposal of contaminated soil and construction dewatering and treatment of contaminated groundwater. The scope of work presented in this Technical Memorandum only pertains to a portion of the remedial investigation (RI) monitoring well network and is focused to address the groundwater impacts that were present in the Intermediate Water-Bearing Zone prior to the implementation of the independent remedial action. The proposed monitoring wells are within the building foundation and will allow for performance groundwater monitoring after independent remedial action activities and construction of the building on the Block 38 West Property. The proposed



monitoring wells will be part of the compliance monitoring well network and additional monitoring wells screened in both the Shallow and Intermediate Water-Bearing zones will be presented in the draft RI Work Plan for the Block 38 West Site.

This Technical Memorandum and the request for approval of the proposed locations and other monitoring well details are submitted at this time in order to allow for installation of these monitoring wells during building construction. The proposed monitoring well locations could not be confirmed until performance sampling at the Block 38 West Property was substantially complete, and City Investors IX has kept the Washington State Department of Ecology (Ecology) apprised of the independent interim action progress and general results.

City Investors IX is committed to the investigation and cleanup of the Block 38 West Property and associated Site and will continue to collect the necessary information to support the RI for the Block 38 West Site in compliance with the AO. The installation of the proposed monitoring wells will be scheduled within 30 days following Ecology approval of these additional work elements.

## **BLOCK 38 WEST PROPERTY DESCRIPTION**

The Block 38 West Property is in a commercial and light industrial area zoned as mixed residential and commercial in the South Lake Union area approximately 1 mile north of downtown Seattle. The Block 38 West Property totals approximately 1.06 acres of land and comprises King County Parcel No. 1983200196 on the northern portion of the Block 38 West Property (534 and 536 Westlake Avenue North), King County Parcel No. 1983200180 on the central portion of the Block 38 West Property (520 Westlake Avenue North), and King County Parcel No. 1983200170 on the southern portion of the Block 38 West Property (500 and 510 Westlake Avenue North). The Block 38 West Property most recently was developed with structures formerly used for retail, temporary office space, storage, and parking.

The vertical structures have been demolished as part of the ongoing redevelopment of the Block 38 West Property. The planned finished floor elevation of the lowest level of parking is -3.25 feet North American Vertical Datum of 1988 (NAVD88), with the bottom of footing elevation for the majority of the foundation at approximately -6.5 feet NAVD88 and the excavation extending deeper in areas for footings or elevator pits. The anticipated completion of the mass excavation is the week of June 8, 2020, with additional structural foundation features being installed through June 2020.

## **BACKGROUND**

Subsurface investigations have been conducted on the Block 38 West Property since 1999. This section summarizes the activities and results from previous subsurface investigations conducted by Farallon and others at the Block 38 West Property. Figure 2 shows boring locations associated with previous investigations. The data summarized below were provided in the *Interim Action Work Plan, Block 38 West Property, 500 through 536 Westlake Avenue North, Seattle, Washington*



dated November 8, 2019 prepared by Farallon (IAWP) and the letter regarding Subsurface Investigation Results, Block 38 West Property, 500 through 536 Westlake Avenue North, Seattle, Washington dated January 22, 2020 from Ms. Suzy Stumpf and Mr. Clifford Schmidt of Farallon to Ms. Tena Seeds of Ecology (SI Summary Letter). Based on the previous investigations conducted at the Block 38 West Property, constituents of concern (COCs) detected at concentrations exceeding the Washington State Model Toxics Control Act Cleanup Regulation (MTCA) screening levels in one or more samples include total petroleum hydrocarbons as gasoline-range organics (GRO), diesel-range organics (DRO), oil-range organics (ORO), benzene, total naphthalenes, and carcinogenic polycyclic aromatic hydrocarbons (cPAHs) in soil, and DRO, ORO, benzene, and total naphthalenes in groundwater.

The soil and groundwater laboratory analytical results for borings and monitoring wells within the Block 38 West Property boundary are discussed below and presented in the attached tables and figures. Figures 3 through 8 depict soil sampling results for COCs, Figures 9 through 14 depict groundwater sampling results for COCs, and Figures 15 through 18 depict soil and groundwater sampling results in cross-sectional views. Soil sampling analytical results are provided in Tables 1 and 2. Groundwater measurements and sampling analytical results are provided in Tables 3 through 5, and monitoring well construction details are provided in Table 6. The soil and groundwater analytical results are compared to screening levels that correspond to the MTCA Method A cleanup levels for most constituents. If no MTCA Method A cleanup level is reported for a constituent, then the MTCA Method B cleanup level is used for the screening level. The complete laboratory analytical reports for soil and groundwater samples will be provided in the RI Work Plan but will be made available to Ecology upon request once compiled by Farallon.

## SOIL

Based on subsurface investigation activities and independent interim action soil performance data, all COCs were reported at concentrations less than the MTCA screening levels or reported non-detect at the laboratory practical quantitation limits (PQLs) in all soil samples collected at an approximate elevation of 10 feet NAVD88 across the Block 38 West Property. Thus, the vertical extent of soil with COC concentrations exceeding the screening levels has been defined, and COCs meet MTCA screening levels 15 feet prior to reaching the excavation depth for the planned building. The supplemental subsurface investigation conducted in December 2019 (December 2019 SSI) focused on soil sample collection from the soil interval that will remain in place below the future building foundation. The December 2019 SSI results were reported in the SI Summary Letter, and demonstrate that all analytes were reported non-detect at the laboratory PQLs in all soil samples collected at an approximate elevation of -7 to -10 feet NAVD88, below the planned building foundation.

The mass excavation soil performance samples demonstrate a similar trend with concentrations of DRO, ORO, and remaining COCs reported at concentrations less than the MTCA screening levels or non-detect at the laboratory PQLs at an approximate elevation of 10 feet NAVD88 across the Block 38 West Property. The mass excavation soil performance data associated with the independent remedial action is being compiled and will be provided in the draft RI Work Plan to



support discussion of the conceptual site model for the Block 38 West Site. No further soil characterization within the Block 38 West Property boundaries is planned for the proposed scope of work based on the results of previous subsurface investigations, the presence of 15 feet of clean soil with no COCs detected at concentrations exceeding MTCA screening levels prior to reaching final mass excavation depth, and analytical results demonstrating that COCs in soil beneath the future building foundation were reported non-detect at the laboratory PQLs. Additional details regarding the extent and characterization of COCs in soil, cleanup of contaminated soil, and further soil characterization outside of the Block 38 West Property boundary will be provided in the draft RI Work Plan.

## **GROUNDWATER**

The nomenclature for groundwater occurrence was described in the IAWP and is not reiterated here.

Monitoring wells FMW130, FMW-136, FMW-144 through FMW-147, and FMW-149 were installed in the Intermediate Water-Bearing Zone, which is present in the glacially consolidated soil at the Block 38 West Property and encountered at approximate elevations of 5 to 10 feet NAVD88 (approximately 15 to 20 feet below ground surface) and extends to an elevation of -30 feet NAVD88. Observations during drilling of borings for the subsurface investigations did not provide any evidence of an aquitard (e.g., laterally continuous non-water-bearing silt or clay) between the Shallow Water-Bearing Zone and Intermediate Water-Bearing Zone. The monitoring wells installed during the subsurface investigation were screened across water-bearing sand and silty sand intervals. The soil types and occurrence of groundwater in the screened interval indicate the Intermediate Water-Bearing Zone is continuous across the Block 38 West Property. Prior groundwater-level measurement events at monitoring wells screened in the Shallow Water-Bearing Zone and Intermediate Water-Bearing Zone suggest there is little to no vertical gradient between these units.

Groundwater elevations in the Intermediate Water-Bearing Zone were measured from monitoring wells FMW-144 through FMW-147 and FMW-149 and ranged from 17.25 to 17.07 feet NAVD88 on December 26, 2019 when groundwater samples were collected for the December 2019 SSI. Depth to groundwater in monitoring wells FMW-144 through FMW-147 and FMW-149 ranged from 5.42 to 19.18 feet below ground surface (Table 6). Based on the depth-to-water measurements, calculated groundwater elevations ranged from 16.81 to 17.48 feet NAVD88 at the Block 38 West Property during the December 2019 SSI (Table 6).

The groundwater levels measured in wells screened in the Intermediate Water-Bearing Zone during the December 2019 SSI groundwater measurement events indicate the inferred groundwater flow direction for the Intermediate Water-Bearing Zone was highly variable and ranged to the east, southeast, northeast, west, and southwest. The average horizontal hydraulic gradient was low, ranging from approximately 0.001 to 0.013 foot per foot. Thus, even slight variations in groundwater levels at each monitoring well, on the order of a 0.1- to 0.2-foot change over a period of a few days, could result in a substantial difference in the groundwater-level contours and



inferred groundwater flow direction. The high variability of the inferred groundwater flow direction during the subsurface investigation was attributed to the recent demolition of the cap (buildings) on the Block 38 West Property and the significant amount of groundwater recharge during a rainfall event in which over 2.5 inches of precipitation was observed in the Seattle area<sup>1</sup>. Based on no aquitard present between and little to no vertical gradient between the Shallow and Intermediate Water-Bearing Zones, and documented groundwater flow direction to the south to southwest for the Shallow Water-Bearing Zone, the groundwater flow direction for the Shallow Water-Bearing Zone is presented on Figures 9 through 14.

DRO and ORO were detected at concentrations exceeding their screening levels in the groundwater samples collected from monitoring wells FMW-146 and FMW-147 on the east-central portion of the Block 38 West Property during the December 2019 SSI (Figures 11 and 12; Table 4). Analytical data for groundwater samples collected from nearby monitoring well FMW-130 (screened from -22.8 to -32.8 NAVD88) in 2018 and 2019 were less than the screening levels for DRO and ORO and bound the vertical extent of these COCs in groundwater (Table 4). The southern extent of DRO and ORO in the Intermediate Water-Bearing Zone is bounded by groundwater analytical data collected at monitoring well FMW-136 (Figures 11 and 16) and the western extent in the Intermediate Water-Bearing Zone is bounded by groundwater analytical data collected at monitoring wells FMW-144 and FMW-149 (Figure 11). The analytical results for DRO at monitoring wells FMW-144 and FMW-149 define the vertical extent of DRO present in the Shallow Water-Bearing Zone detected at boring FB-03 and monitoring well FMW-134 (Figures 11 and 15).

GRO, benzene, total naphthalenes, and cPAHs were either detected at concentrations less than the screening levels or reported non-detect at the laboratory PQLs in groundwater samples collected from monitoring wells during the December 2019 SSI (Figures 9, 10, 13, and 14; Tables 4 and 5). Additional analytes such as polychlorinated biphenyls and chlorinated volatile organic compounds were reported non-detect at the laboratory PQLs in groundwater samples collected from the monitoring wells during the December 2019 SSI, with the exception of cis-1,2-dichloroethene, which was detected at a concentration less than the screening level in the groundwater sample collected from monitoring well FMW-149 on the southwestern corner of the Block 38 West Property.

## CONCEPTUAL SITE MODEL SUMMARY

No COCs were detected at concentrations exceeding the MTCA screening levels in soil within 15 vertical feet of the base of the planned excavation or below the planned building foundation elevation. Groundwater impacts were encountered below the planned building foundation elevation but were limited to the east-central portion of the Block 38 West Property. Contaminated soil formerly present on the Block 38 West Property has been removed, thus eliminating the potential for contribution to future groundwater contamination. Contaminated soil outside of the

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<sup>1</sup> Total rainfall is based on National Weather Service information accessed on January 17, 2020 at <https://w2.weather.gov/climate/index.php?wfo=sew>.



Block 38 West Property boundary will be characterized during the RI and potential cleanup alternatives will be identified and evaluated in the feasibility study for the Block 38 West Site.

City Investors IX will continue to collect additional data to update the existing conceptual site model to support remedial actions at the Block 38 West Site and will continue to advise and consult with Ecology regarding that data.

Based on the results of previous investigations conducted for the Block 38 West Site, the COCs for groundwater include DRO, ORO, benzene, and total naphthalenes in groundwater. The conceptual site model and COCs will be discussed in detail in the draft RI Work Plan.

### **DATA GAP SPECIFIC TO PROPOSED MONITORING WELLS**

DRO and ORO were detected at concentrations exceeding the MTCA screening levels in groundwater samples collected from former monitoring wells FMW-146 and FMW-147 screened in the Intermediate Water-Bearing Zone and beneath the future building footprint. The extent of DRO and ORO impacts to groundwater in the Intermediate Water-Bearing Zone are defined by monitoring wells FMW-136 to the south, FMW-144 and FMW-149 to the west, and FMW-145 to the north. The installation of additional monitoring wells outside the building foundation will be evaluated for the Intermediate Water-Bearing Zone to the north, east, south, and west of the Block 38 West Property and the results of that evaluation will be presented in the draft RI Work Plan.

Only the two monitoring wells within the building foundation and described in this Technical Memorandum are planned to be installed in June 2020 (Figure 19). Additional potential monitoring well locations shown around the perimeter of the planned building foundation are included for discussion purposes only. They are also intended to demonstrate that the likely proposed replacement monitoring well for FMW-147 is outside the building foundation approximately 15 feet to the east, and that another monitoring well may be proposed for the east-adjacent alley to evaluate the northern extent of DRO and ORO in the Intermediate Water-Bearing Zone, in the area up-gradient of the former locations of monitoring wells FMW-146 and FMW-147. The installation of monitoring wells screened in the Intermediate Water-Bearing Zone in the alley will allow for the installation of a paired monitoring well in the Shallow Water-Bearing Zone if warranted in this area of the Block 38 West Site.

The proposed monitoring wells will be part of the compliance monitoring well network and additional monitoring wells screened in both the Shallow and Intermediate Water-Bearing zones will be presented in the draft RI Work Plan for the Block 38 West Site.

### **MONITORING WELL CONSTRUCTION, DEVELOPMENT, AND SURVEY**

The proposed monitoring well locations are based on the former location of monitoring wells FMW-146 and FMW-147, which had DRO and ORO detections in groundwater samples at concentrations exceeding MTCA screening levels and that were located within the estimated



extent of petroleum-contaminated groundwater in the Intermediate Water-Bearing Zone (Figure 19). The possible locations are also constrained by building features. Attachment A provides the building design plans for parking garage levels P1 through P4 and shows the approximate location of the proposed monitoring wells. An electrical service room on parking garage level P1 precludes the installation and completion of monitoring wells in this area of the building due to construction building codes. The electrical service room and other building features and/or building codes that may constrain the location of proposed monitoring wells are presented in Attachment A.

Farallon field staff will observe and log subsurface conditions during monitoring well installation. Standard operating procedures are provided in the attached sampling and analysis plan (Attachment B). The information recorded for each boring log includes soil types encountered, visual and olfactory observations (e.g., staining, odor, etc.), and volatile organic vapor concentrations as measured using a photoionization detector.

Groundwater monitoring wells will be constructed in accordance with Section 400 of Chapter 173-160 of the Washington Administrative Code (WAC 173-160-400) and will meet Washington State requirements for resource protection well construction. Monitoring wells will be installed using 2-inch-diameter Schedule-40 stainless steel well casings with a 0.010-inch slotted well screen. Monitoring well screen intervals will be set from approximate elevation -8 to -13 feet NAVD88, below the future building foundation and similar to the screened intervals at former monitoring wells FMW-146 and FMW-147 (Figure 20). Each monitoring well will extend a minimum of 5 feet into the water-bearing unit.

Each monitoring well filter pack will consist of 10/20 Colorado Silica Sand emplaced in the borehole annulus up to 1 foot above the top of the screen. The borehole will be sealed to within 2 feet of the surface with hydrated bentonite chips. The monitoring wells will be completed with flush-mounted steel monuments set in concrete.

New monitoring wells will be developed using a submersible pump. Each monitoring well will be developed until the majority of fine-grained sediment has been removed from the well screen and adjacent sand pack. Well development activities are not anticipated to occur until after groundwater returns to steady state condition after the construction dewatering system is turned off in October or November of 2020.

A monitoring well survey using the Washington State Plane North coordinates system and measuring the top of casing elevations in NAVD88 by a Washington State Professionally Licensed Land Surveyor will be included in the draft RI Work Plan scope and will incorporate any additional monitoring wells that may be installed.

## **GROUNDWATER MONITORING**

A schedule for groundwater monitoring will be provided in the draft RI Work Plan. Performance and compliance groundwater activities cannot commence until the construction dewatering system is turned off and the Intermediate Water-Bearing Zone has been allowed to equilibrate to steady state conditions.



Attachments: Figure 1, *Vicinity Map*  
Figure 2, *Site Plan*  
Figure 3, *Soil Analytical Results for GRO*  
Figure 4, *Soil Analytical Results for Benzene*  
Figure 5, *Soil Analytical Results for DRO*  
Figure 6, *Soil Analytical Results for ORO*  
Figure 7, *Soil Analytical Results for Naphthalenes*  
Figure 8, *Soil Analytical Results for cPAH TEC*  
Figure 9, *Groundwater Analytical Results for GRO*  
Figure 10, *Groundwater Analytical Results for Benzene*  
Figure 11, *Groundwater Analytical Results for DRO*  
Figure 12, *Groundwater Analytical Results for ORO*  
Figure 13, *Groundwater Analytical Results for Naphthalenes*  
Figure 14, *Groundwater Analytical Results for cPAH TEC*  
Figure 15, *Cross Section A-A'*  
Figure 16, *Cross Section B-B'*  
Figure 17, *Cross Section C-C'*  
Figure 18, *Cross Section D-D'*  
Figure 19, *Proposed Monitoring Well Locations*  
Figure 20, *Monitoring Well Details*  
Table 1, *Soil Analytical Results for TPH and BTEX*  
Table 2, *Soil Analytical Results for PAHs*  
Table 3, *Groundwater Elevations*  
Table 4, *Groundwater Analytical Results for TPH and BTEX*  
Table 5, *Groundwater Analytical Results for PAHs*  
Table 6, *Monitoring Well Summary*  
  
Attachment A, *Construction Plan Excerpt - Sheets A1-001 and A1-002*  
  
Attachment B, *Sampling and Analysis Plan*

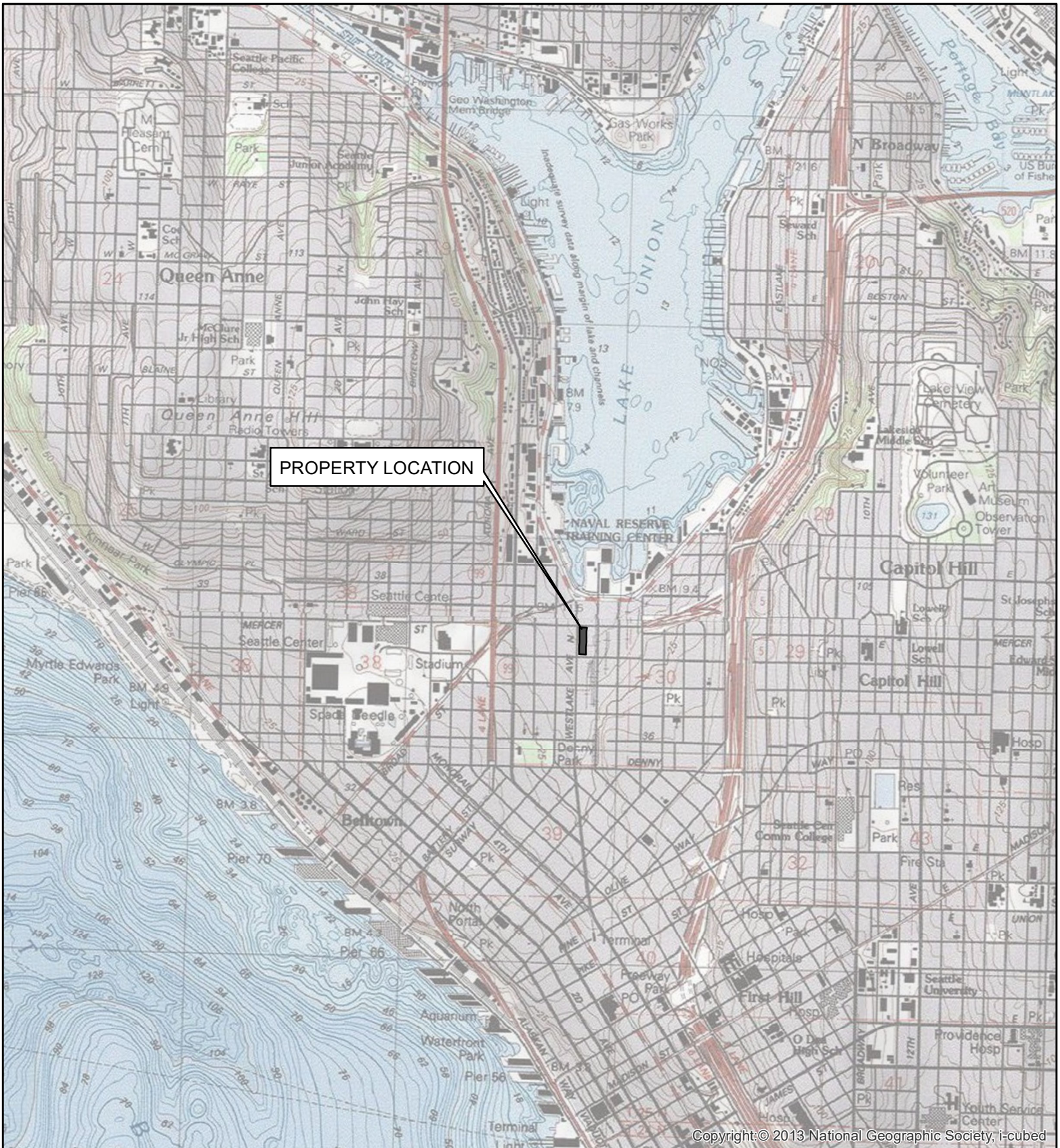
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## **FIGURES**

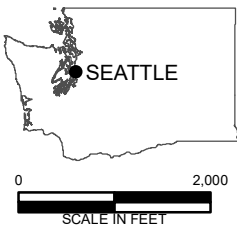
**MONITORING WELL INSTALLATION**  
**Block 38 West Property**  
**500 through 536 Westlake Avenue North**  
**Seattle Washington**

**Farallon PN: 397-019**



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REFERENCE: 7.5 MINUTE USGS QUADRANGLE SEATTLE NORTH, WASHINGTON, DATED 1983



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Oregon  
Portland | Bend | Baker City

California  
Oakland | Folsom | Irvine

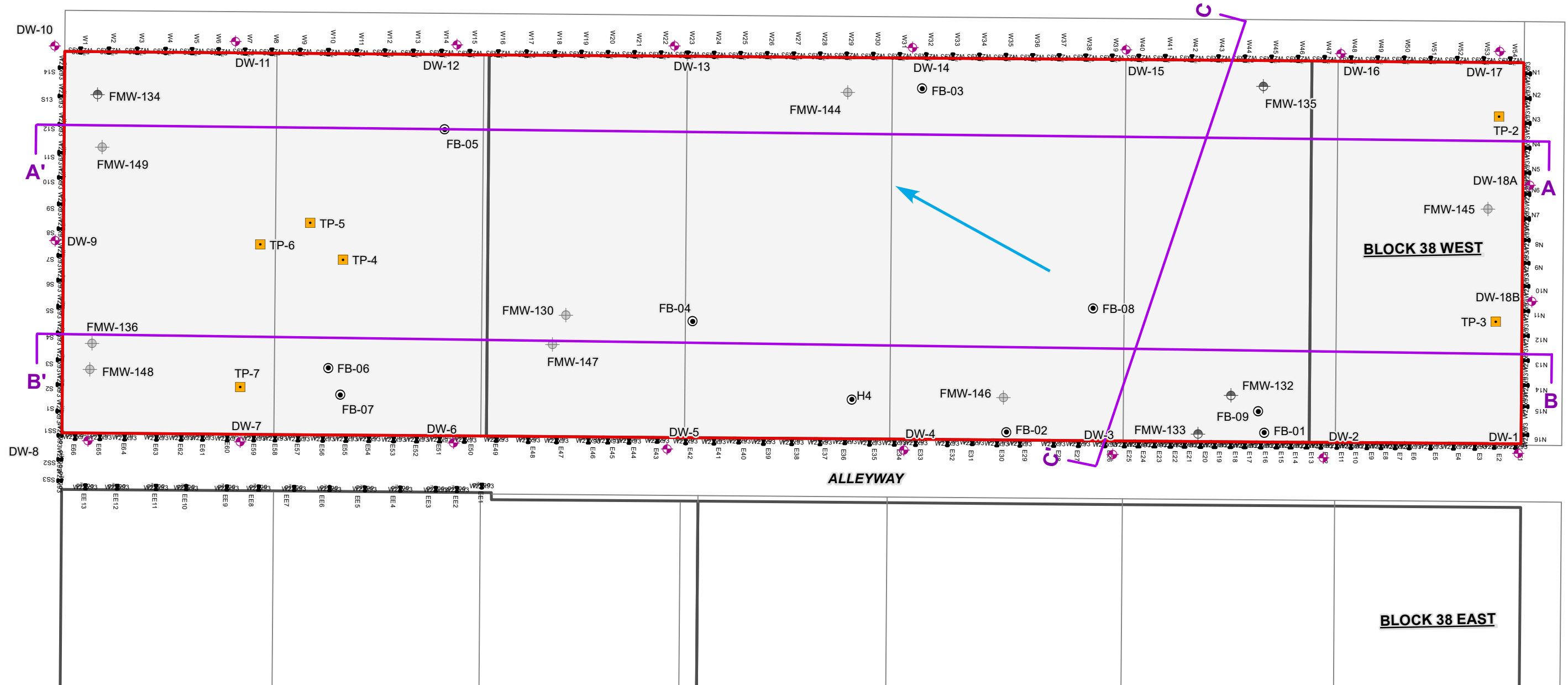
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**FIGURE 1**  
**VICINITY MAP**  
**BLOCK 38 WEST PROPERTY**  
**SEATTLE, WASHINGTON**

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WESTLAKE AVENUE NORTH

MERCER STREET



**LEGEND**

- BORING
- TEST PIT
- ⊕ DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- ⊕ DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- ◆ DEWATERING WELL
- I PILE

- A A' CROSS SECTION LINE
- ➔ INFERRED GROUNDWATER FLOW DIRECTION MARCH 2019 (SHALLOW WATER-BEARING ZONE)
- LOT LINE
- ▭ PROPERTY BOUNDARY
- ▭ KING COUNTY PARCEL BOUNDARY



NOTES:  
ALL LOCATIONS ARE APPROXIMATE.  
FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.

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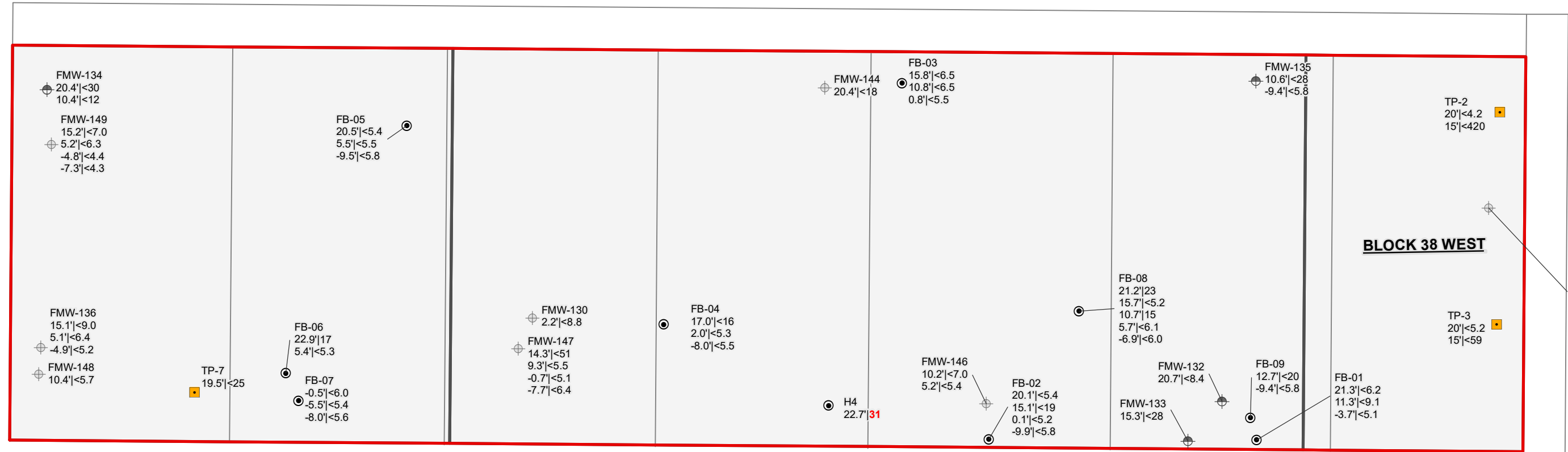
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**FIGURE 2**  
SITE PLAN  
BLOCK 38 WEST PROPERTY  
SEATTLE, WASHINGTON

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WESTLAKE AVENUE NORTH

MERCER STREET



ALLEYWAY

**BLOCK 38 EAST**

**LEGEND**

- BORING
- TEST PIT
- DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- LOT LINE
- PROPERTY BOUNDARY
- KING COUNTY PARCEL BOUNDARY

NOTES:  
 SAMPLE ELEVATIONS AND CONCENTRATIONS REPORTED AS:  
 ELEVATION IN FEET RELATIVE TO NAVD88 | GRO  
 ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)

**BOLD** = DENOTES CONCENTRATIONS THAT EXCEEDED THE SCREENING LEVEL (MTCA METHOD A CLEANUP LEVEL)  
 < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED  
 GRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS GASOLINE-RANGE ORGANICS  
 MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION  
 NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988



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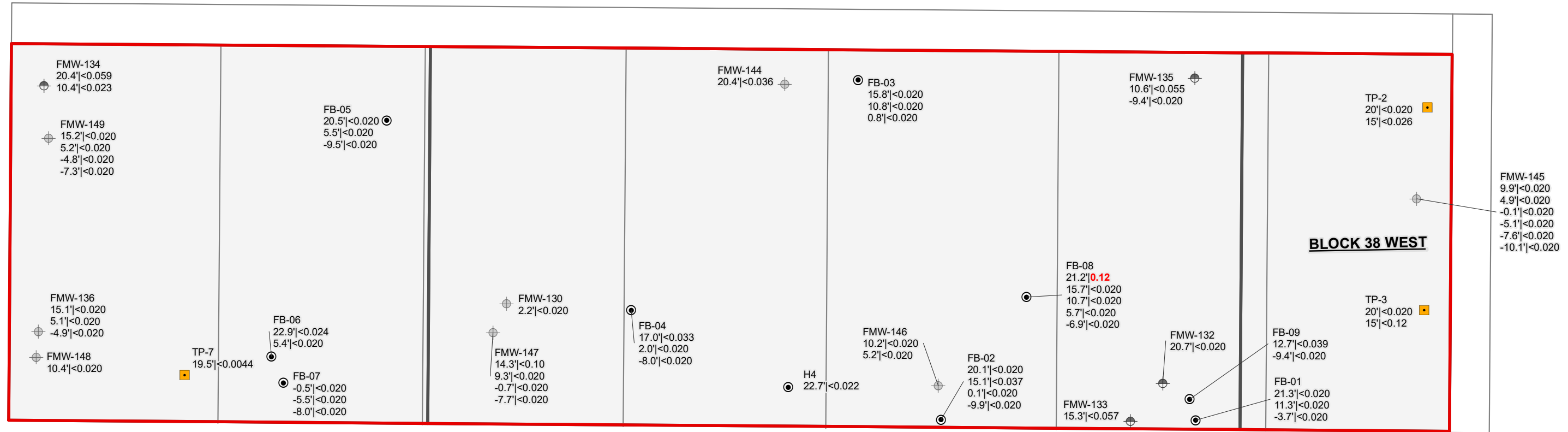


**FIGURE 3**  
 SOIL ANALYTICAL RESULTS FOR GRO  
 BLOCK 38 WEST PROPERTY  
 SEATTLE, WASHINGTON

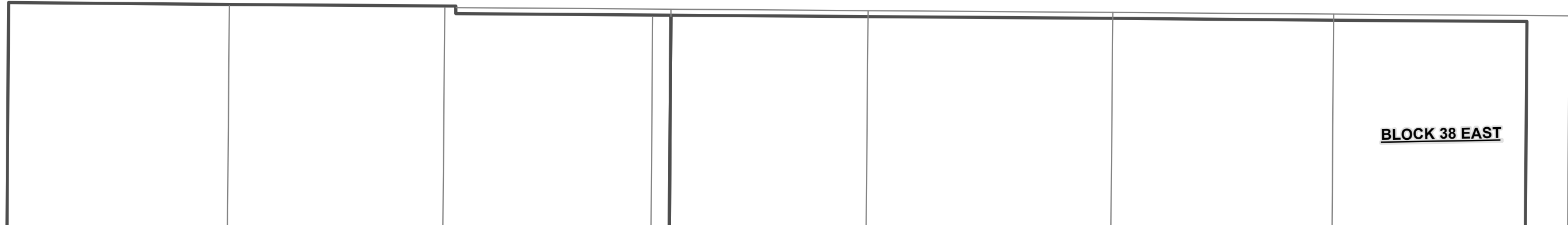
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WESTLAKE AVENUE NORTH

MERCER STREET



ALLEYWAY



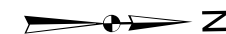
LEGEND

- BORING
- TEST PIT
- DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL

- LOT LINE
- PROPERTY BOUNDARY
- KING COUNTY PARCEL BOUNDARY

NOTES:  
 SAMPLE ELEVATIONS AND CONCENTRATIONS REPORTED AS:  
 ELEVATION IN FEET RELATIVE TO NAVD88 | BENZENE  
 ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)

**BOLD** = DENOTES CONCENTRATIONS THAT EXCEEDED THE SCREENING LEVEL (MTC A METHOD A CLEANUP LEVEL)  
 < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED  
 MTC A = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION  
 NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988



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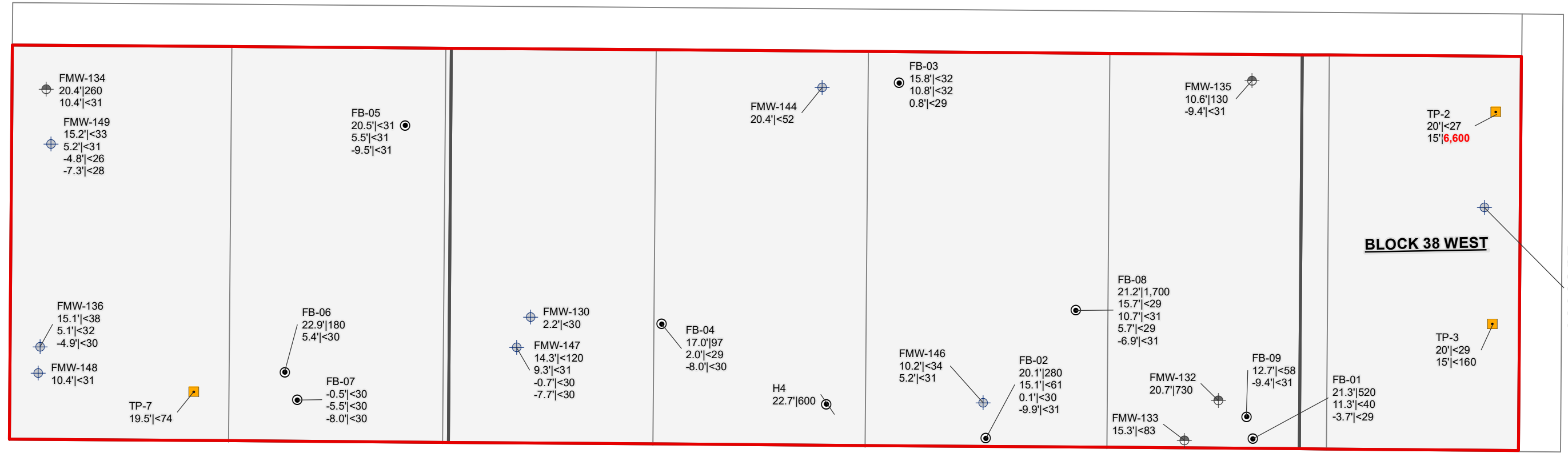
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**FIGURE 4**  
 SOIL ANALYTICAL RESULTS FOR BENZENE  
 BLOCK 38 WEST PROPERTY  
 SEATTLE, WASHINGTON

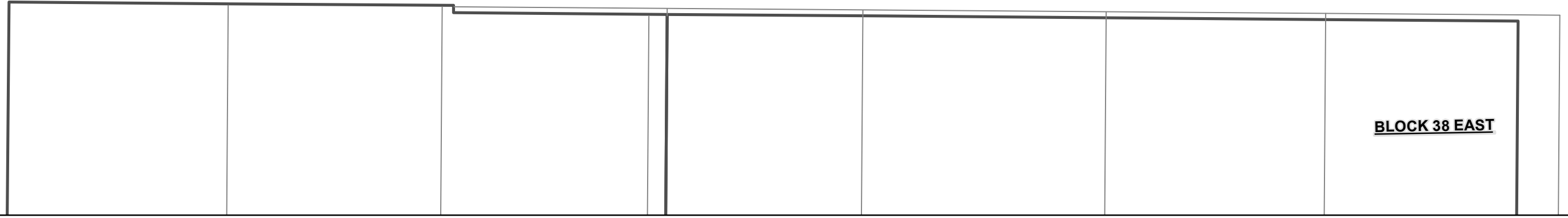
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WESTLAKE AVENUE NORTH

MERCER STREET



ALLEYWAY



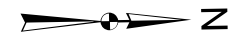
LEGEND

- BORING
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- DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- LOT LINE
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- KING COUNTY PARCEL BOUNDARY

NOTES:  
 SAMPLE ELEVATIONS AND CONCENTRATIONS REPORTED AS:  
 ELEVATION IN FEET RELATIVE TO NAVD88 | DRO  
 ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)

**BOLD** = DENOTES CONCENTRATIONS THAT EXCEEDED THE SCREENING LEVEL (MTCA METHOD A CLEANUP LEVEL)  
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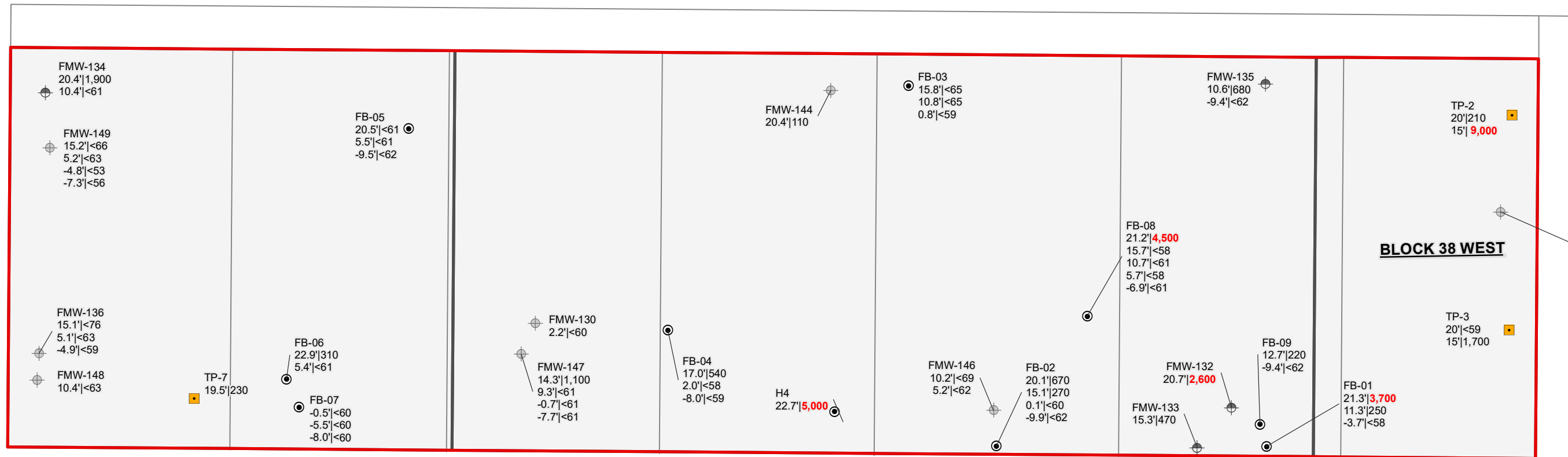
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**FIGURE 5**  
 SOIL ANALYTICAL RESULTS FOR DRO  
 BLOCK 38 WEST PROPERTY  
 SEATTLE, WASHINGTON

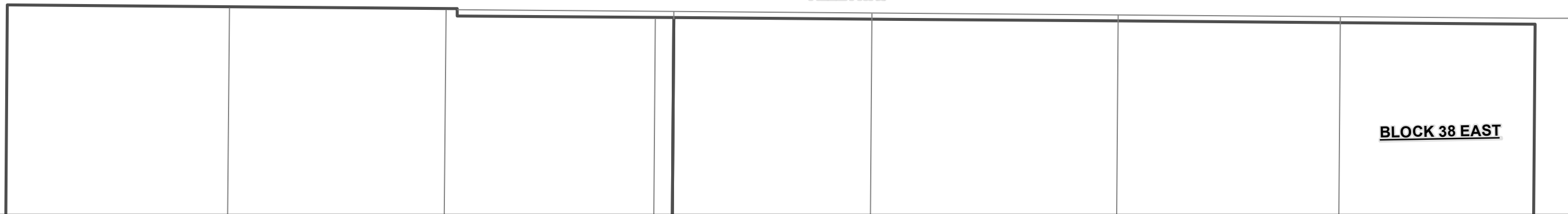
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WESTLAKE AVENUE NORTH

MERCER STREET



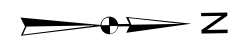
ALLEYWAY



LEGEND

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 SAMPLE ELEVATIONS AND CONCENTRATIONS REPORTED AS:  
 ELEVATION IN FEET RELATIVE TO NAVD88 | ORO  
 ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)  
**BOLD** = DENOTES CONCENTRATIONS THAT EXCEED THE SCREENING LEVEL (MTCA METHOD A CLEANUP LEVEL)  
 < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED  
 ORO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS OIL-RANGE ORGANICS  
 MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION  
 NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988



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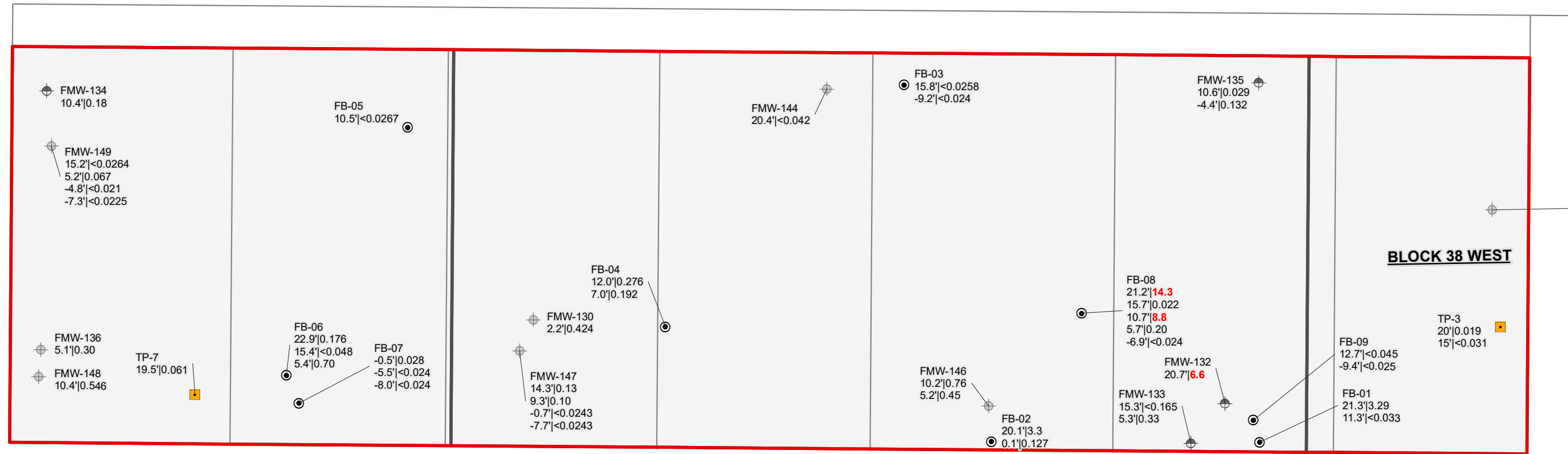


**FIGURE 6**  
 SOIL ANALYTICAL RESULTS FOR ORO  
 BLOCK 38 WEST PROPERTY  
 SEATTLE, WASHINGTON

FARALLON PN: 397-019

WESTLAKE AVENUE NORTH

MERCER STREET



ALLEYWAY

**LEGEND**

- BORING
- TEST PIT
- DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- LOT LINE
- PROPERTY BOUNDARY
- KING COUNTY PARCEL BOUNDARY

NOTES:  
 SAMPLE ELEVATIONS AND CONCENTRATIONS REPORTED AS:  
 ELEVATION IN FEET RELATIVE TO NAVD88 | NAPHTHALENES  
 ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)  
**BOLD** = DENOTES CONCENTRATIONS THAT EXCEEDED THE SCREENING LEVEL (MTCA METHOD A CLEANUP LEVEL)  
 < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED  
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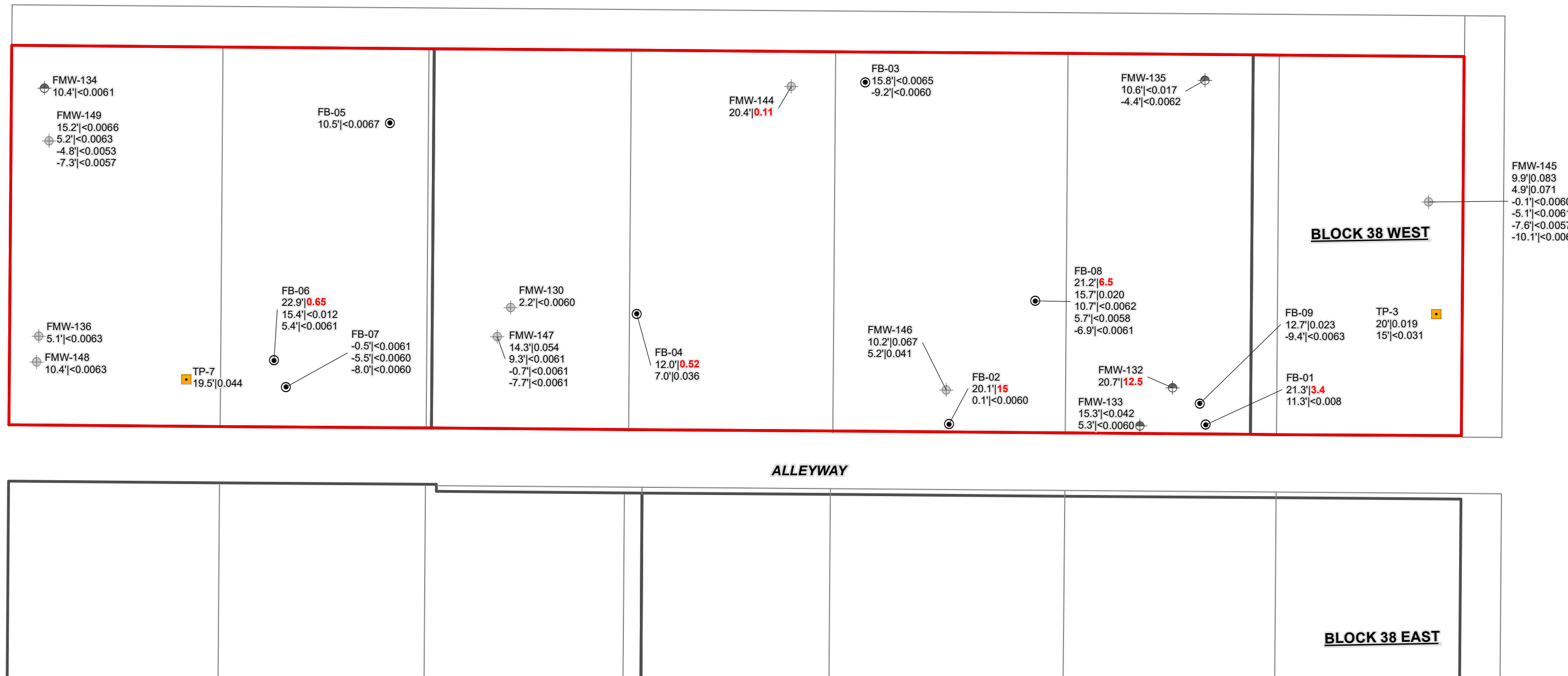
**FIGURE 7**  
 SOIL ANALYTICAL RESULTS FOR  
 NAPHTHALENES  
 BLOCK 38 WEST PROPERTY  
 SEATTLE, WASHINGTON

FARALLON PN: 397-019



WESTLAKE AVENUE NORTH

MERCER STREET



LEGEND

- BORING
- TEST PIT
- DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- LOT LINE
- PROPERTY BOUNDARY
- KING COUNTY PARCEL BOUNDARY

NOTES:  
 SAMPLE ELEVATIONS AND CONCENTRATIONS REPORTED AS:  
 ELEVATION IN FEET RELATIVE TO NAVD88 | cPAH TEC  
 ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)

**BOLD** = DENOTES CONCENTRATIONS THAT EXCEEDED THE SCREENING LEVEL (MTCA METHOD A CLEANUP LEVEL)

< = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED FOR TOTAL TOXIC EQUIVALENT CONCENTRATION OF BENZO(A)PYRENE (mg/kg)

cPAHs = CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS  
 TEC = TOXIC EQUIVALENT CONCENTRATION OF BENZO(A)PYRENE FOR cPAH MIXTURE

MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION

NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988



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**FIGURE 8**

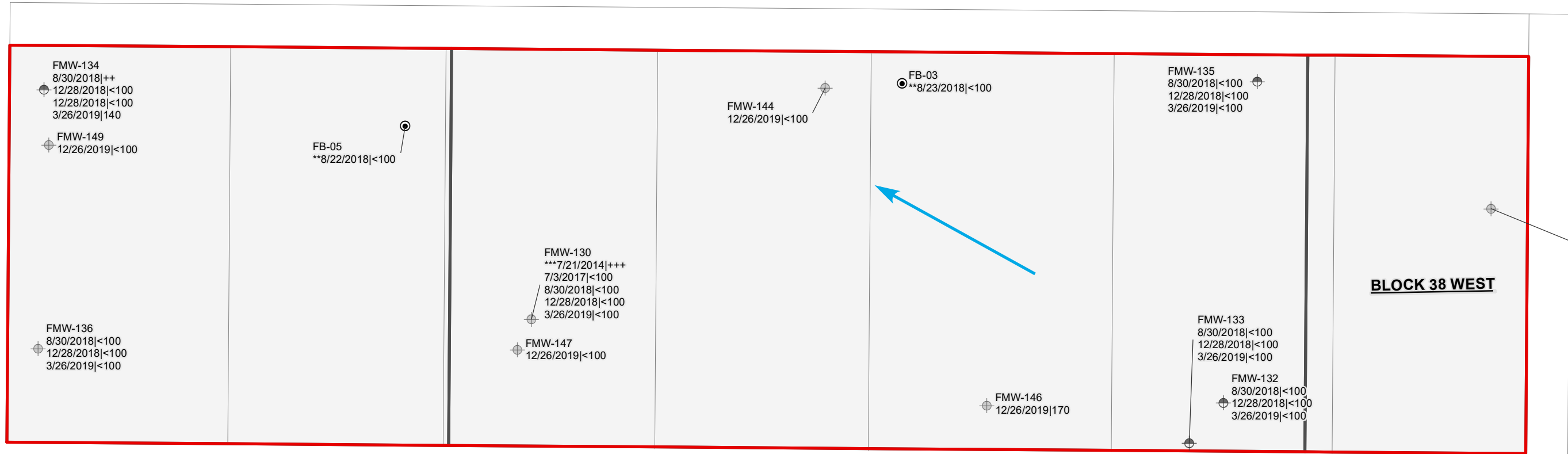
SOIL ANALYTICAL RESULTS FOR cPAH TEC  
 BLOCK 38 WEST PROPERTY  
 SEATTLE, WASHINGTON

FARALLON PN: 397-019

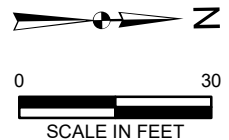
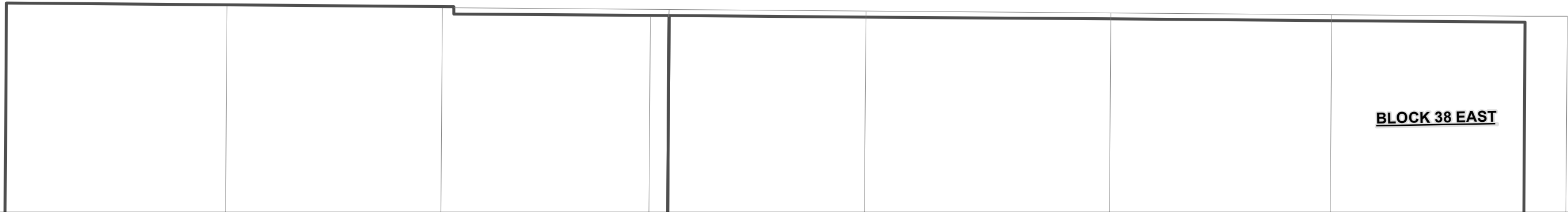
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WESTLAKE AVENUE NORTH

MERCER STREET



ALLEYWAY



**LEGEND**

- BORING
- ⊕ DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- ⊕ DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL

- INFERRED GROUNDWATER FLOW DIRECTION MARCH 2019 (SHALLOW WATER-BEARING ZONE)
- LOT LINE
- PROPERTY BOUNDARY
- KING COUNTY PARCEL BOUNDARY

ALL LOCATIONS ARE APPROXIMATE. FIGURES WERE PRODUCED IN COLOR. GRAYSSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.

NOTES:  
DATE SAMPLED AND CONCENTRATIONS REPORTED AS:  
SAMPLE DATE | GRO  
ANALYTICAL RESULTS IN MICROGRAMS PER LITER (µg/l)

- \*\* = INDICATES RESULTS ARE FROM A RECONNAISSANCE GROUNDWATER SAMPLE
- BOLD** = CONCENTRATIONS THAT EXCEED THE SCREENING LEVEL (MTCA METHOD A CLEANUP LEVEL)
- < = ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED
- GRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS GASOLINE-RANGE ORGANICS
- MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION
- NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988

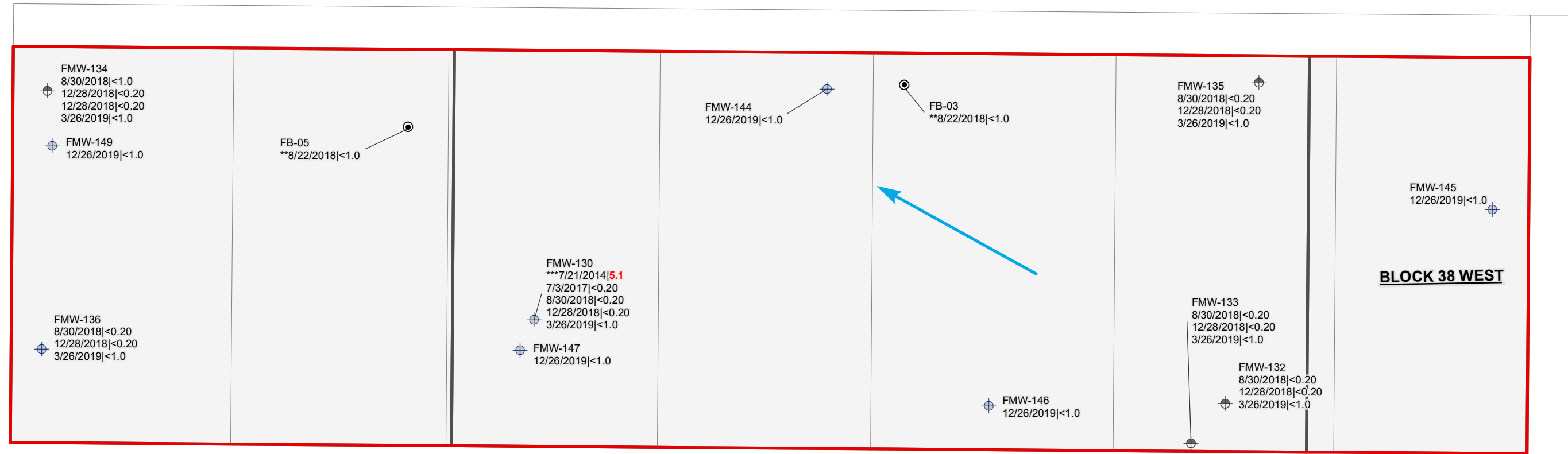
\*\*\* = INDICATES RESULTS ARE FROM A RECONNAISSANCE GROUNDWATER SAMPLE THAT WAS SCREENED AT AN ELEVATION OF 7.2 TO 2.2 FEET RELATIVE TO THE NAVD88 DATUM.  
+++ = GRO REPORTED AT A CONCENTRATION OF 2,100 µg/l; HOWEVER, RE-EVALUATION BY THE ANALYTICAL LABORATORY INDICATED THAT THE REPORTED CONCENTRATION WAS NOT SIMILAR TO A TYPICAL GAS.  
++ = GRO REPORTED AT A CONCENTRATION OF 1,100 µg/l; HOWEVER, RE-EVALUATION BY THE ANALYTICAL LABORATORY INDICATED THAT THE REPORTED CONCENTRATION GRO WAS ATTRIBUTED TO A SINGLE PEAK ON THE CHROMATOGRAM, WHICH WAS IN THE RANGE OF NAPHTHALENE. NAPHTHALENE WAS QUANTIFIED AT A CONCENTRATION OF 290 µg/l AND TOTAL NAPHTHALENES AT 312 µg/l IN THIS GROUNDWATER SAMPLE.

**FIGURE 9**  
**GROUNDWATER ANALYTICAL RESULTS FOR GRO**  
**BLOCK 38 WEST PROPERTY**  
**SEATTLE, WASHINGTON**

FARALLON PN: 397-019

WESTLAKE AVENUE NORTH

MERCER STREET



ALLEYWAY

**BLOCK 38 EAST**

**LEGEND**

- BORING
- DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- LOT LINE
- PROPERTY BOUNDARY
- KING COUNTY PARCEL BOUNDARY

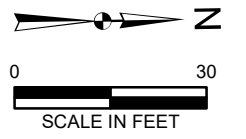
**NOTES:**  
 DATE SAMPLED AND CONCENTRATIONS REPORTED AS:  
 SAMPLE DATE | BENZENE  
 ANALYTICAL RESULTS IN MICROGRAMS PER LITER (µg/l)

\*\* = INDICATES RESULTS ARE FROM A RECONNAISSANCE GROUNDWATER SAMPLE  
**BOLD** = CONCENTRATIONS THAT EXCEED THE SCREENING LEVEL (MTCA METHOD A CLEANUP LEVEL)  
 < = ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED  
 MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION

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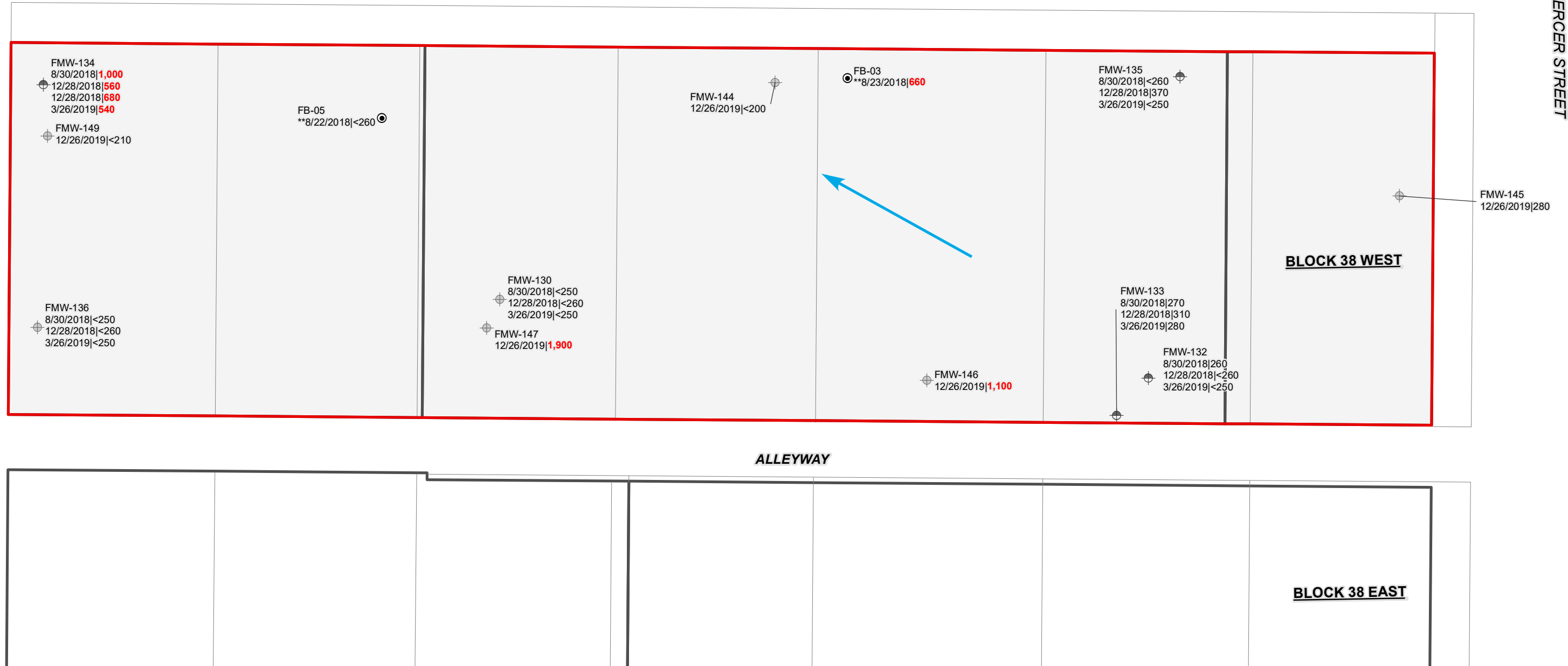


**FIGURE 10**  
 GROUNDWATER ANALYTICAL RESULTS FOR BENZENE  
 BLOCK 38 WEST PROPERTY  
 SEATTLE, WASHINGTON  
 FARALLON PN: 397-019



WESTLAKE AVENUE NORTH

MERCER STREET



ALLEYWAY

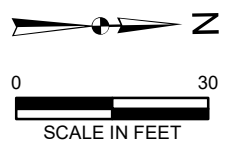
**LEGEND**

- BORING
- ⊕ DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- ⊕ DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL

- ➔ INFERRED GROUNDWATER FLOW DIRECTION MARCH 2019 (SHALLOW WATER-BEARING ZONE)
- LOT LINE
- ▭ PROPERTY BOUNDARY
- ▭ KING COUNTY PARCEL BOUNDARY

**NOTES:**  
 DATE SAMPLED AND CONCENTRATIONS REPORTED AS:  
 SAMPLE DATE | DRO  
 ANALYTICAL RESULTS IN MICROGRAMS PER LITER (µg/l)

\*\* = INDICATES RESULTS ARE FROM A RECONNAISSANCE GROUNDWATER SAMPLE  
**BOLD** = CONCENTRATIONS THAT EXCEED THE SCREENING LEVEL (MTCA METHOD A CLEANUP LEVEL)  
 < = ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED  
 DRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS DIESEL-RANGE ORGANICS  
 MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION  
 NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988



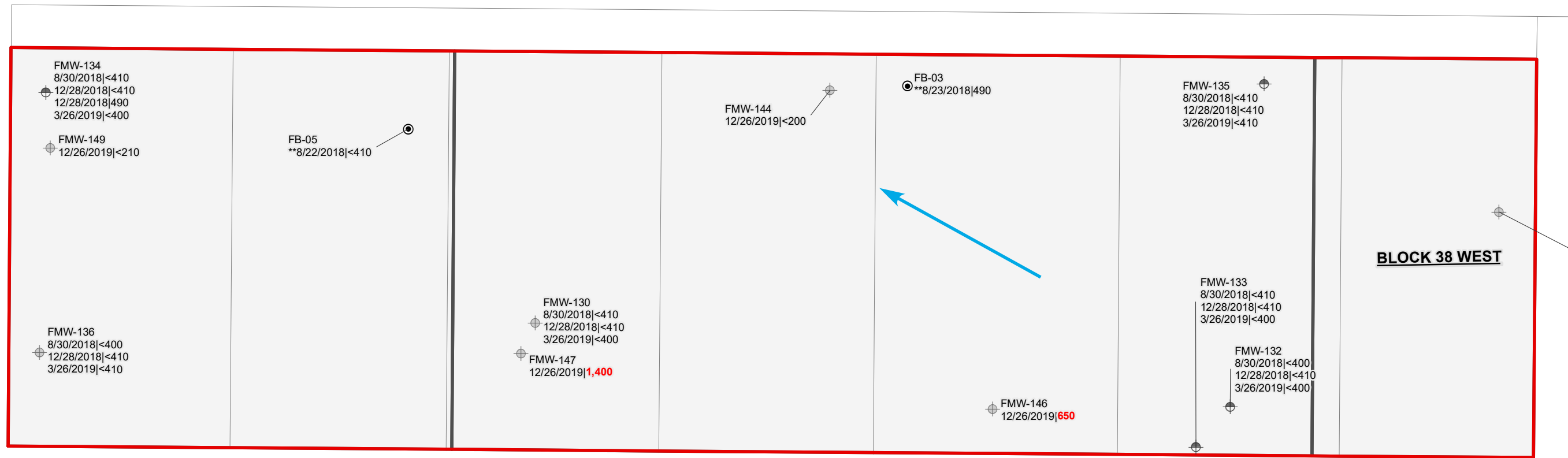
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**FIGURE 11**  
 GROUNDWATER ANALYTICAL RESULTS FOR DRO  
 BLOCK 38 WEST PROPERTY  
 SEATTLE, WASHINGTON  
 FARALLON PN: 397-019

WESTLAKE AVENUE NORTH

MERCER STREET



ALLEYWAY

**BLOCK 38 WEST**

**BLOCK 38 EAST**

**LEGEND**

- BORING
- ⊕ DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- ⊕ DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL

- ➔ INFERRED GROUNDWATER FLOW DIRECTION MARCH 2019 (SHALLOW WATER-BEARING ZONE)
- LOT LINE
- ▭ PROPERTY BOUNDARY
- ▭ KING COUNTY PARCEL BOUNDARY

NOTES:  
DATE SAMPLED AND CONCENTRATIONS REPORTED AS:  
SAMPLE DATE | ORO  
ANALYTICAL RESULTS IN MICROGRAMS PER LITER (µg/l)

- \*\* = INDICATES RESULTS ARE FROM A RECONNAISSANCE GROUNDWATER SAMPLE
- BOLD** = CONCENTRATIONS THAT EXCEED THE SCREENING LEVEL (MTCA METHOD A CLEANUP LEVEL)
- < = ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED
- ORO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS OIL-RANGE ORGANICS
- MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION
- NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988



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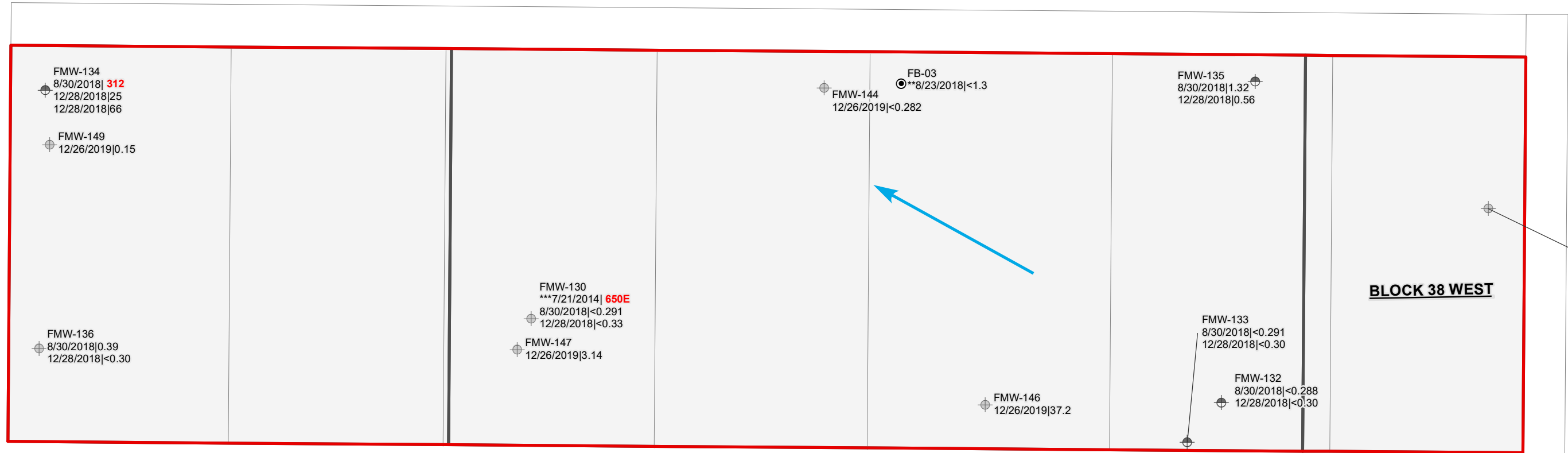
Washington  
Issaquah | Bellingham | Seattle  
Oregon  
Portland | Baker City  
California  
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**FIGURE 12**  
**GROUNDWATER ANALYTICAL RESULTS FOR ORO**  
**BLOCK 38 WEST PROPERTY**  
**SEATTLE, WASHINGTON**

FARALLON PN: 397-019

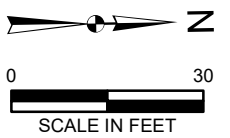
WESTLAKE AVENUE NORTH

MERCER STREET



ALLEYWAY

BLOCK 38 EAST



**LEGEND**

- BORING
- ⊕ DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- ⊕ DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- ➡ INFERRED GROUNDWATER FLOW DIRECTION MARCH 2019 (SHALLOW WATER-BEARING ZONE)
- LOT LINE
- ▭ PROPERTY BOUNDARY
- ▭ KING COUNTY PARCEL BOUNDARY

**NOTES:**

- DATE SAMPLED AND CONCENTRATIONS REPORTED AS:  
SAMPLE DATE | NAPHTHALENES  
ANALYTICAL RESULTS IN MICROGRAMS PER LITER (µg/l)
- \*\* = INDICATES RESULTS ARE FROM A RECONNAISSANCE GROUNDWATER SAMPLE
- BOLD** = CONCENTRATIONS THAT EXCEED THE SCREENING LEVEL (MTCA METHOD A CLEANUP LEVEL)
- < = ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED
- MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION
- NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988
- E** = CONCENTRATION IS ESTIMATED BASED ON THE REPORTED VALUE EXCEEDING THE QUANTITATION RANGE

\*\*\* = INDICATES RESULTS ARE FROM A RECONNAISSANCE GROUNDWATER SAMPLE THAT WAS SCREENED AT AN ELEVATION OF 7.2 TO 2.2 FEET RELATIVE TO THE NAVD88 DATUM.

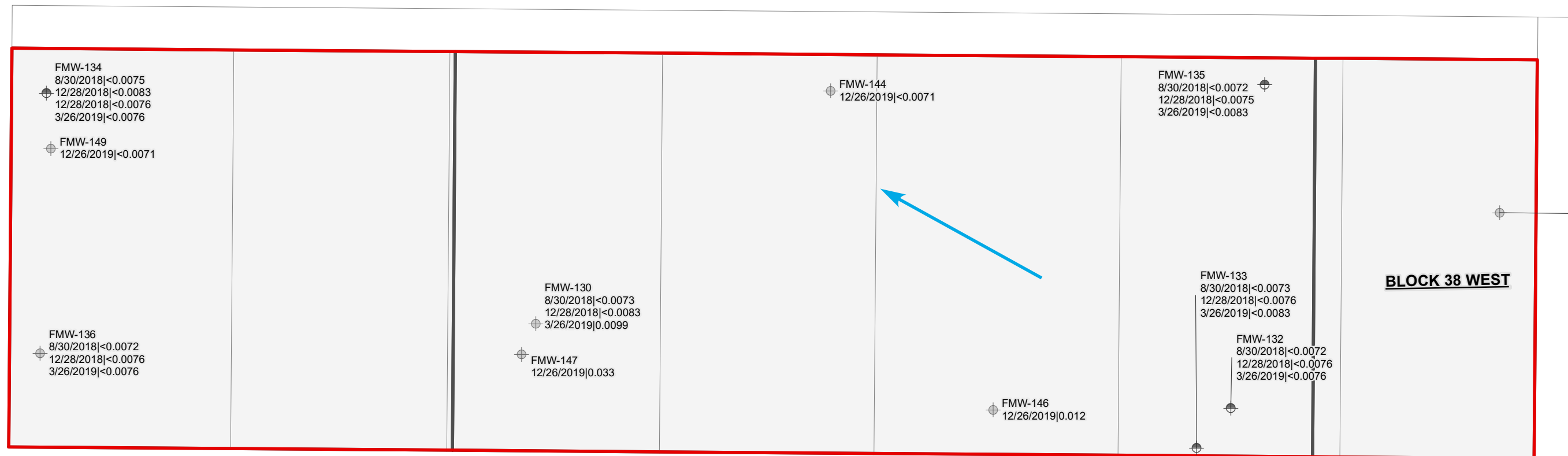
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**FIGURE 13**  
**GROUNDWATER ANALYTICAL RESULTS FOR NAPHTHALENES**  
**BLOCK 38 WEST PROPERTY**  
**SEATTLE, WASHINGTON**  
 FARALLON PN: 397-019

WESTLAKE AVENUE NORTH

MERCER STREET



ALLEYWAY

**BLOCK 38 WEST**

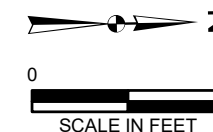
**BLOCK 38 EAST**

**LEGEND**

- ⊕ DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- ⊕ DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL

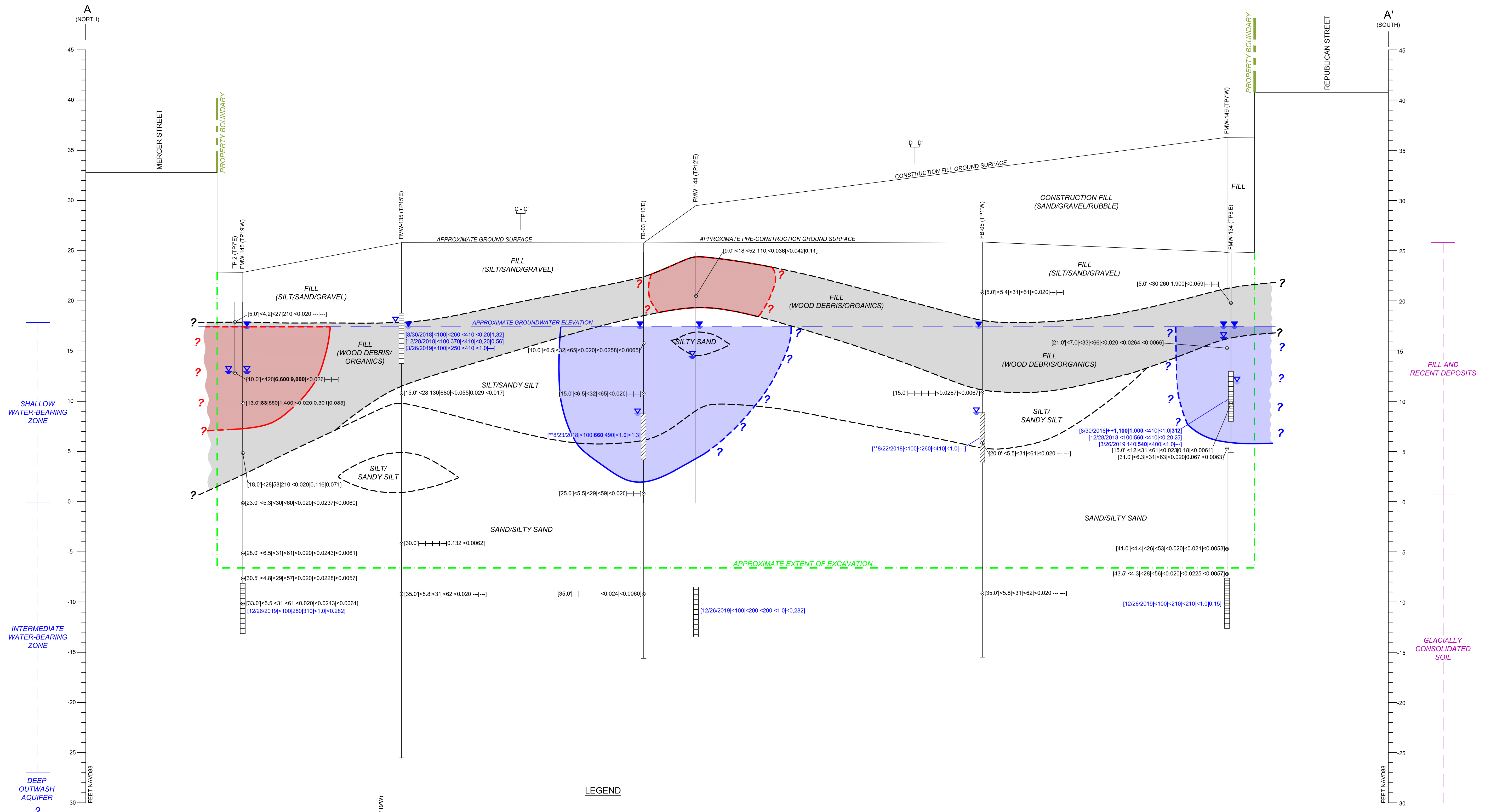
- ➔ INFERRED GROUNDWATER FLOW DIRECTION MARCH 2019 (SHALLOW WATER-BEARING ZONE)
- LOT LINE
- ▭ PROPERTY BOUNDARY
- ▭ KING COUNTY PARCEL BOUNDARY

NOTES:  
 DATE SAMPLED AND CONCENTRATIONS REPORTED AS:  
 SAMPLE DATE | cPAH TEC  
 ANALYTICAL RESULTS IN MICROGRAMS PER LITER (µg/l)  
 \*\* = INDICATES RESULTS ARE FROM A RECONNAISSANCE GROUNDWATER SAMPLE  
**BOLD** = CONCENTRATIONS THAT EXCEED THE SCREENING LEVEL (MTCA METHOD A CLEANUP LEVEL)  
 < = ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED FOR TOTAL TOXIC EQUIVALENT CONCENTRATION OF BENZO(A)PYRENE (µg/l)  
 cPAHs = CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS  
 TEC = TOXIC EQUIVALENT CONCENTRATION OF BENZO(A)PYRENE FOR cPAH MIXTURE  
 MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION



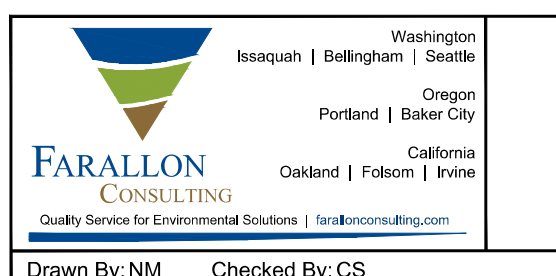
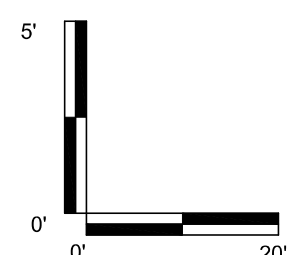
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|   |  |  |
|---|--|--|
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|   | Oregon<br>Portland   Baker City<br>California<br>Oakland   Folsom   Irvine   |  |
| Drawn By: tperrin   | Checked By: CS<br>Document Path: Q:\Projects\397 VULCAN\019_Block38\Mapfiles\014D Meeting_20200115\Figure-14_Groundwater_cPAHs.mxd | Date: 5/20/2020<br>Disc Reference:   |



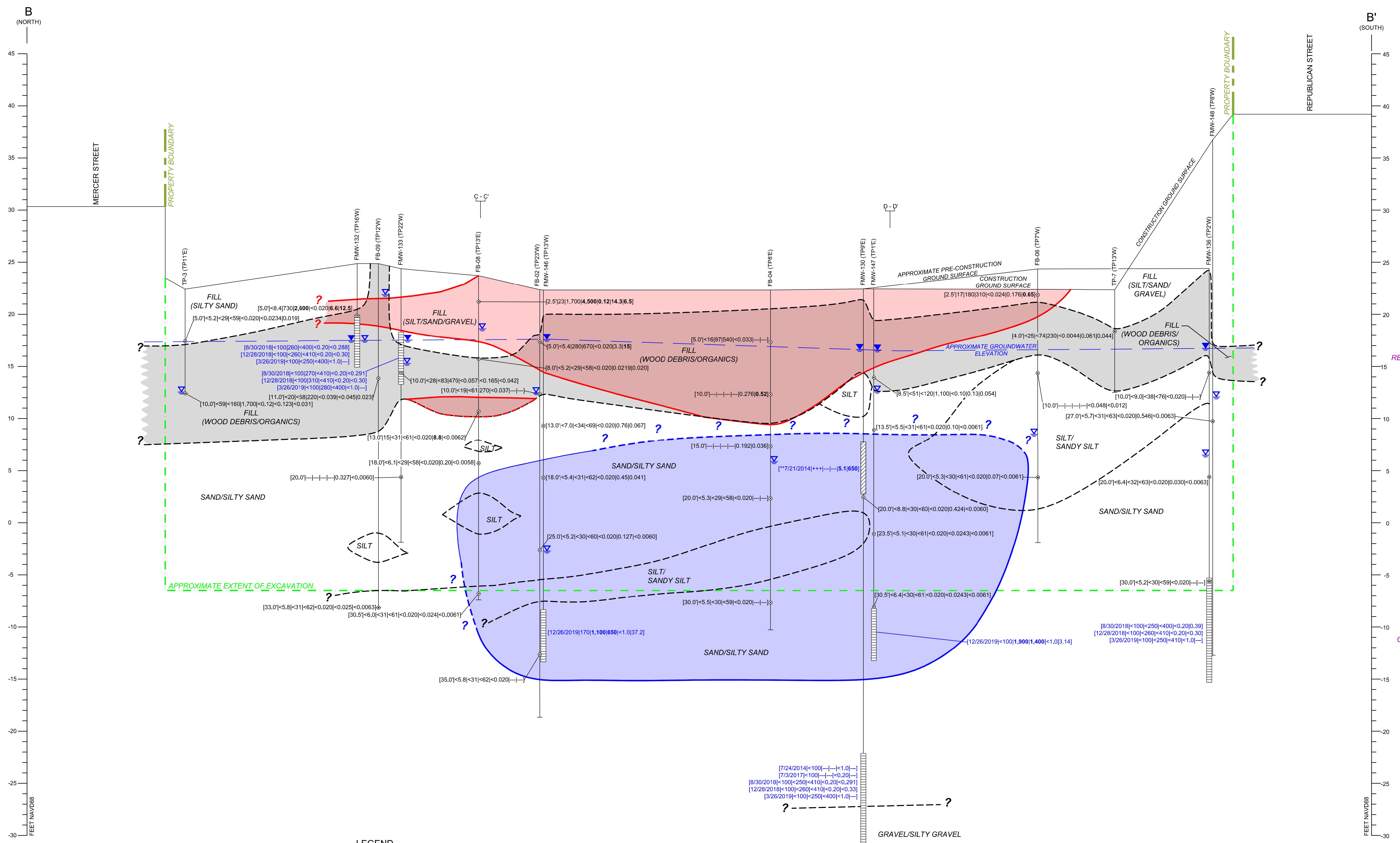
**LEGEND**

- BORING OR MONITORING WELL LOCATION TRANSPROSED (TP) IN FEET, EAST (E) OR WEST (W), TO CROSS-SECTION LINE
  - SOIL SAMPLE LOCATION
  - APPROXIMATE GROUNDWATER ELEVATION
  - STRATIGRAPHIC CONTACT
  - BLANK CASING OR BORING
  - STATIC GROUNDWATER ELEVATION (12/31/2019)
  - GROUNDWATER ELEVATION AT TIME OF DRILLING
  - TEMPORARY SCREEN INTERVAL
  - WELL SCREEN INTERVAL
  - APPROXIMATE AREA OF WOOD DEBRIS/ORGANICS LAYER
  - ESTIMATED EXTENT OF SOIL EXCEEDING MTCA CLEANUP LEVELS
  - ESTIMATED EXTENT OF GROUNDWATER EXCEEDING MTCA CLEANUP LEVELS
- ALL GROUNDWATER ANALYTICAL RESULTS IN MICROGRAMS PER LITER (µg/l)  
 GROUNDWATER ANALYTICAL RESULT [DATE SAMPLED]GRO[DR]ORO[BENZENE][TOTAL NAPHTHALENES]  
 \*\* DENOTES SAMPLE IS RECONNAISSANCE GROUNDWATER  
 ++ = GRO REPORTED AT A CONCENTRATION OF 1,100 µg/l. HOWEVER, RE-EVALUATION BY THE ANALYTICAL LABORATORY INDICATED THAT THE REPORTED CONCENTRATION OF GRO WAS ATTRIBUTED TO A SINGLE PEAK ON THE CHROMATOGRAM, WHICH WAS IN THE RANGE OF NAPHTHALENE. NAPHTHALENE WAS QUANTIFIED AT A CONCENTRATION OF 290 µg/l AND TOTAL NAPHTHALENES AT 312 µg/l IN THIS GROUNDWATER SAMPLE.  
 ALL SOIL ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)  
 SOIL ANALYTICAL RESULT [DEPTH IN FEET BELOW GROUND SURFACE]GRO[DR]ORO[BENZENE][TOTAL NAPHTHALENES][PAH TEC]  
 GRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS GASOLINE-RANGE ORGANICS  
 DRO = TPH AS DIESEL-RANGE ORGANICS  
 ORO = TPH AS OIL-RANGE ORGANICS  
 TOTAL NAPHTHALENES = SUM OF NAPHTHALENE, 1-METHYLNAPHTHALENE, AND 2-METHYLNAPHTHALENE  
 cPAH TEC = CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS TOXIC EQUIVALENT CONCENTRATION  
**BOLD** = INDICATES CONCENTRATIONS THAT EXCEED THE WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION (MTCA) CLEANUP LEVEL  
 --- = SAMPLE NOT ANALYZED FOR CONSTITUENT  
 < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED  
 NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988



**FIGURE 15**  
 CROSS SECTION A-A'  
 BLOCK 38 WEST PROPERTY  
 SEATTLE, WASHINGTON  
 FARALLON PN:397-019





SHALLOW WATER-BEARING ZONE

INTERMEDIATE WATER-BEARING ZONE

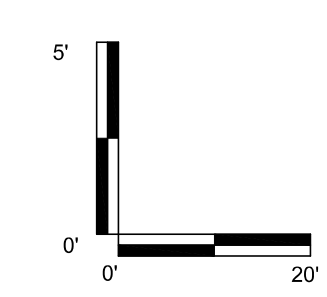
DEEP OUTWASH AQUIFER ?

FILL AND RECENT DEPOSITS

GLACIALLY CONSOLIDATED SOIL

**LEGEND**

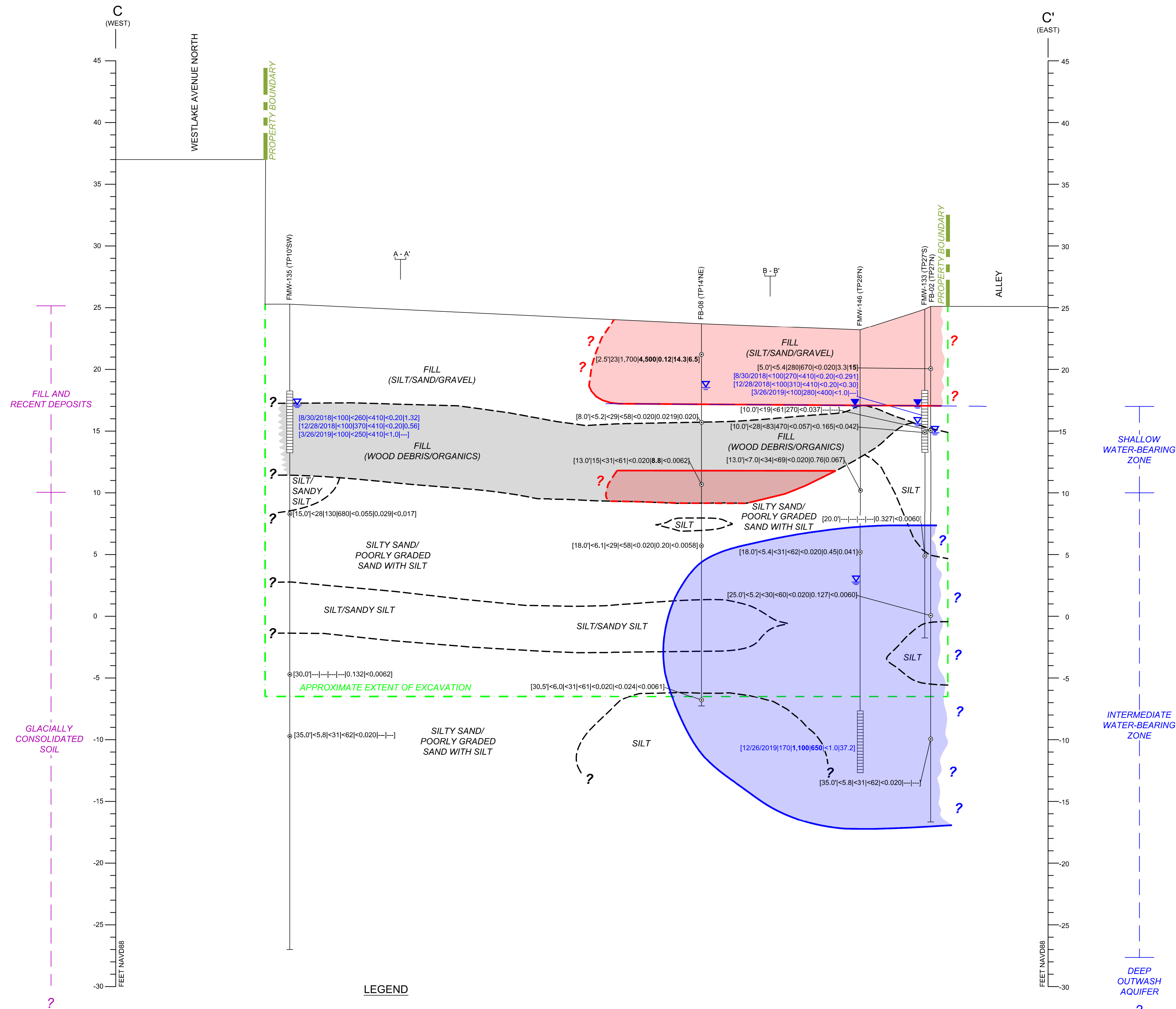
- TP-3 (TP11E) BORING OR MONITORING WELL LOCATION (TRANSPOSED (TP) IN FEET, EAST (E) OR WEST (W), TO CROSS-SECTION LINE)
  - SOIL SAMPLE LOCATION
  - APPROXIMATE GROUNDWATER ELEVATION
  - STRATIGRAPHIC CONTACT
  - BLANK CASING OR BORING
  - STATIC GROUNDWATER ELEVATION (12/31/2019)
  - GROUNDWATER ELEVATION AT TIME OF DRILLING
  - TEMPORARY SCREEN INTERVAL
  - WELL SCREEN INTERVAL
- ALL GROUNDWATER ANALYTICAL RESULTS IN MICROGRAMS PER LITER (µg/l)
- GROUNDWATER ANALYTICAL RESULT [DATE SAMPLED][GRO][DRO][ORO][BENZENE][TOTAL NAPHTHALENES] DENOTES SAMPLE IS RECONNAISSANCE GROUNDWATER
- +++ GRO REPORTED AT CONCENTRATION OF 2,100 µg/l, HOWEVER, RE-EVALUATION BY THE ANALYTICAL LABORATORY INDICATED THAT THE REPORTED CONCENTRATION WAS NOT SIMILAR TO A TYPICAL GAS
- ALL SOIL ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)
- SOIL ANALYTICAL RESULT [DEPTH IN FEET BELOW GROUND SURFACE][GRO][DRO][ORO][BENZENE][TOTAL NAPHTHALENES][CPAH TEC]
- GRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS GASOLINE-RANGE ORGANICS  
 DRO = TPH AS DIESEL-RANGE ORGANICS  
 ORO = TPH AS OIL-RANGE ORGANICS  
 TOTAL NAPHTHALENES = SUM OF NAPHTHALENE, 1-METHYLNAPHTHALENE, AND 2-METHYLNAPHTHALENE  
 cPAH TEC = CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS TOXIC EQUIVALENT CONCENTRATION
- BOLD** = INDICATES CONCENTRATIONS THAT EXCEED THE WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION (MTCA) CLEANUP LEVEL
- = SAMPLE NOT ANALYZED FOR CONSTITUENT  
 < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED  
 NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988
- APPROXIMATE AREA OF WOOD DEBRIS/ORGANICS LAYER
  - ESTIMATED EXTENT OF SOIL EXCEEDING MTCA CLEANUP LEVELS
  - ESTIMATED EXTENT OF GROUNDWATER EXCEEDING MTCA CLEANUP LEVELS



**FIGURE 16**  
 CROSS SECTION B-B'  
 BLOCK 38 WEST PROPERTY  
 SEATTLE, WASHINGTON

FARALLON PN:397-019

Drawn By: NM Checked By: CS Date: 1/22/2020



|  |  |
|--|--|
| <p>FB-08 (TP27N)</p> <p>SOIL SAMPLE LOCATION</p> <p>APPROXIMATE GROUNDWATER ELEVATION</p> <p>STRATIGRAPHIC CONTACT</p> <p>BLANK CASING OR BORING</p> <p>STATIC GROUNDWATER ELEVATION (12/31/2019)</p> <p>GROUNDWATER ELEVATION AT TIME OF DRILLING</p> <p>WELL SCREEN INTERVAL</p> | <p>BORING OR MONITORING WELL LOCATION TRANPOSED (TP) IN FEET, EAST (E) OR WEST (W), TO CROSS-SECTION LINE</p> <p>SOIL ANALYTICAL RESULT (DATE SAMPLED)[GRO][DRO][ORO][BENZENE][TOTAL NAPHTHALENES]</p> <p>ALL SOIL ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)</p> <p>SOIL ANALYTICAL RESULT DEPTH IN FEET BELOW GROUND SURFACE[GRO][DRO][ORO][BENZENE][PAH TEC]</p> <p>GRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS GASOLINE-RANGE ORGANICS</p> <p>DRO = TPH AS DIESEL-RANGE ORGANICS</p> <p>ORO = TPH AS OIL-RANGE ORGANICS</p> <p>TOTAL NAPHTHALENES = SUM OF NAPHTHALENE, 1-METHYLNAPHTHALENE, AND 2-METHYLNAPHTHALENE</p> <p>PAH TEC = CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS TOXIC EQUIVALENT CONCENTRATION</p> <p><b>BOLD</b> = INDICATES CONCENTRATIONS THAT EXCEED THE WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION (MTCR) CLEANUP LEVEL</p> <p>-- = SAMPLE NOT ANALYZED FOR CONSTITUENT</p> <p>&lt; = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED</p> <p>NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988</p> <p>--- --- APPROXIMATE AREA OF WOOD DEBRIS/ORGANICS LAYER</p> <p>■ ■ ■ ESTIMATED EXTENT OF SOIL EXCEEDING MTCR CLEANUP LEVELS</p> <p>■ ■ ■ ESTIMATED EXTENT OF GROUNDWATER EXCEEDING MTCR CLEANUP LEVELS</p> |
|--|--|

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**FIGURE 17**

CROSS SECTION C-C'  
BLOCK 38 WEST PROPERTY  
SEATTLE, WASHINGTON

FARALLON PN:397-019

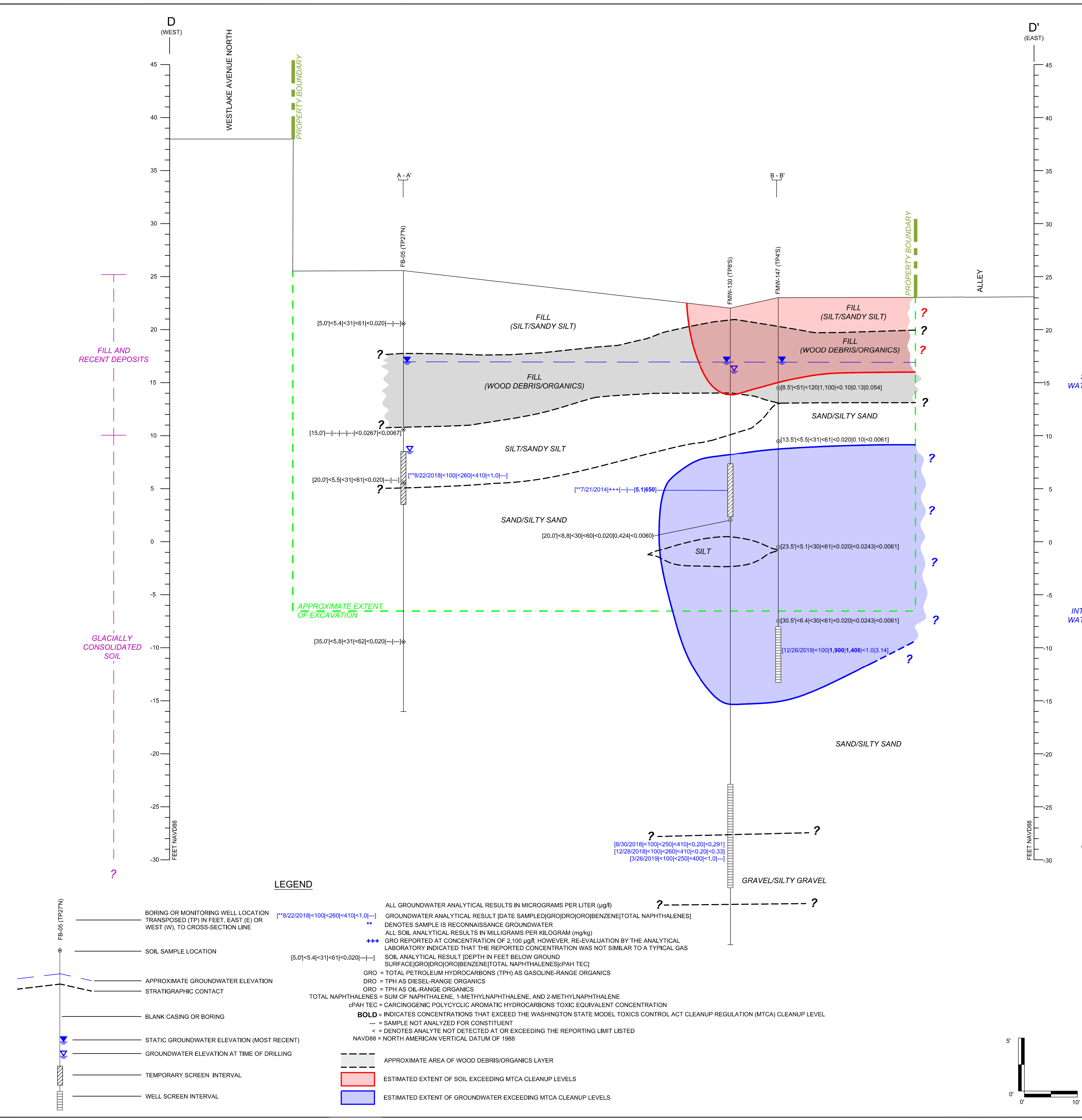
Washington  
Issaquah | Bellingham | Seattle

Oregon  
Portland | Baker City

California  
Oakland | Folsom | Irvine

Drawn By: NM    Checked By: CS    Date: 1/22/2020

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FILL AND RECENT DEPOSITS

GLACIALLY CONSOLIDATED SOIL

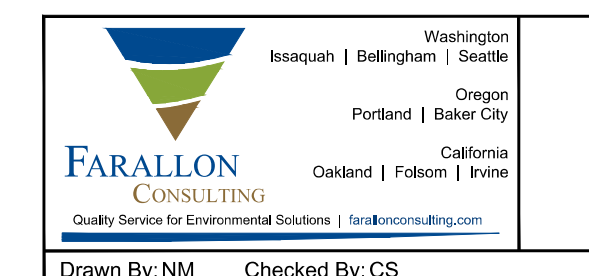
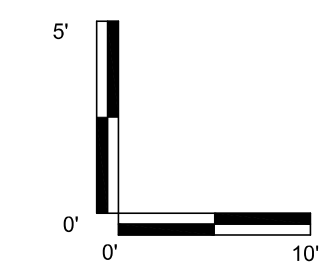
SHALLOW WATER-BEARING ZONE

INTERMEDIATE WATER-BEARING ZONE

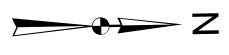
DEEP OUTWASH AQUIFER

**LEGEND**

- BORING OR MONITORING WELL LOCATION
  - TRANSPOSED (TP) IN FEET, EAST (E) OR WEST (W), TO CROSS-SECTION LINE
  - SOIL SAMPLE LOCATION
  - APPROXIMATE GROUNDWATER ELEVATION
  - STRATIGRAPHIC CONTACT
  - BLANK CASING OR BORING
  - STATIC GROUNDWATER ELEVATION (MOST RECENT)
  - GROUNDWATER ELEVATION AT TIME OF DRILLING
  - TEMPORARY SCREEN INTERVAL
  - WELL SCREEN INTERVAL
- ALL GROUNDWATER ANALYTICAL RESULTS IN MICROGRAMS PER LITER (µg/l)
- GROUNDWATER ANALYTICAL RESULT [DATE SAMPLED][GRO][DRO][ORO][BENZENE]TOTAL NAPHTHALENES]
- DENOTES SAMPLE IS RECONNAISSANCE GROUNDWATER
- ALL SOIL ANALYTICAL RESULTS IN MILLIGRAMS PER KILOGRAM (mg/kg)
- GRO REPORTED AT CONCENTRATION OF 2,100 µg/l. HOWEVER, RE-EVALUATION BY THE ANALYTICAL LABORATORY INDICATED THAT THE REPORTED CONCENTRATION WAS NOT SIMILAR TO A TYPICAL GAS
- SOIL ANALYTICAL RESULT [DEPTH IN FEET BELOW GROUND SURFACE][GRO][DRO][ORO][BENZENE]TOTAL NAPHTHALENES][cPAH TEC]
- GRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS GASOLINE-RANGE ORGANICS
- DRO = TPH AS DIESEL-RANGE ORGANICS
- ORO = TPH AS OIL-RANGE ORGANICS
- TOTAL NAPHTHALENES = SUM OF NAPHTHALENE, 1-METHYLNAPHTHALENE, AND 2-METHYLNAPHTHALENE
- cPAH TEC = CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS TOXIC EQUIVALENT CONCENTRATION
- BOLD** = INDICATES CONCENTRATIONS THAT EXCEED THE WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION (MTCR) CLEANUP LEVEL
- = SAMPLE NOT ANALYZED FOR CONSTITUENT
- < = DENOTES ANALYTE NOT DETECTED AT OR EXCEEDING THE REPORTING LIMIT LISTED
- NAVD88 = NORTH AMERICAN VERTICAL DATUM OF 1988
- APPROXIMATE AREA OF WOOD DEBRIS/ORGANICS LAYER
  - ESTIMATED EXTENT OF SOIL EXCEEDING MTCR CLEANUP LEVELS
  - ESTIMATED EXTENT OF GROUNDWATER EXCEEDING MTCR CLEANUP LEVELS



**FIGURE 18**  
CROSS SECTION D-D'  
BLOCK 38 WEST PROPERTY  
SEATTLE, WASHINGTON  
FARALLON PN:397-019



WESTLAKE AVENUE NORTH

MERCER STREET

FIRE WATER STORAGE VAULT

ELEVATORS/ELECTRICAL

BLOCK 38 WEST

ELECTRICAL AND MECHANICAL

FMW-130

FMW-147

FMW-150

FMW-144

FMW-151

FMW-146

FMW-132

FMW-133

FMW-137

STORMWATER RETENTION AND MECHANICAL

EMERGENCY GENERATOR

MECHANICAL

CRANE PAD FOOTING

ALLEYWAY

BLOCK 38 EAST

LEGEND

- BORING
- DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- DEEP OUTWASH AQUIFER MONITORING WELL
- PROPOSED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- POTENTIAL FUTURE SHALLOW WATER-BEARING ZONE MONITORING WELL
- POTENTIAL FUTURE INTERMEDIATE WATER-BEARING ZONE MONITORING WELL

- AREAS WITH BUILDING CODE OR ACCESS RESTRICTIONS
- DRO AND/OR ORO DETECTED AT CONCENTRATIONS EXCEEDING MTCA SCREENING LEVELS (? ESTIMATED EXTENT INFERRED)

- PILE
- TIEBACK
- LOT LINE
- PROPERTY BOUNDARY
- KING COUNTY PARCEL BOUNDARY

POTENTIAL FUTURE SHALLOW WATER-BEARING ZONE MONITORING WELLS WILL BE EVALUATED UPON COMPLETION OF SUPPLEMENTAL SUBSURFACE INVESTIGATION IN THE EAST-ADJACENT ALLEY.

DRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS DIESEL-RANGE ORGANICS  
 ORO = TPH AS OIL-RANGE ORGANICS  
 MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION

NOTES:  
 ALL LOCATIONS ARE APPROXIMATE.  
 FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.

Washington  
Issaquah | Bellingham | Seattle

Oregon  
Portland | Baker City

California  
Oakland | Folsom | Irvine

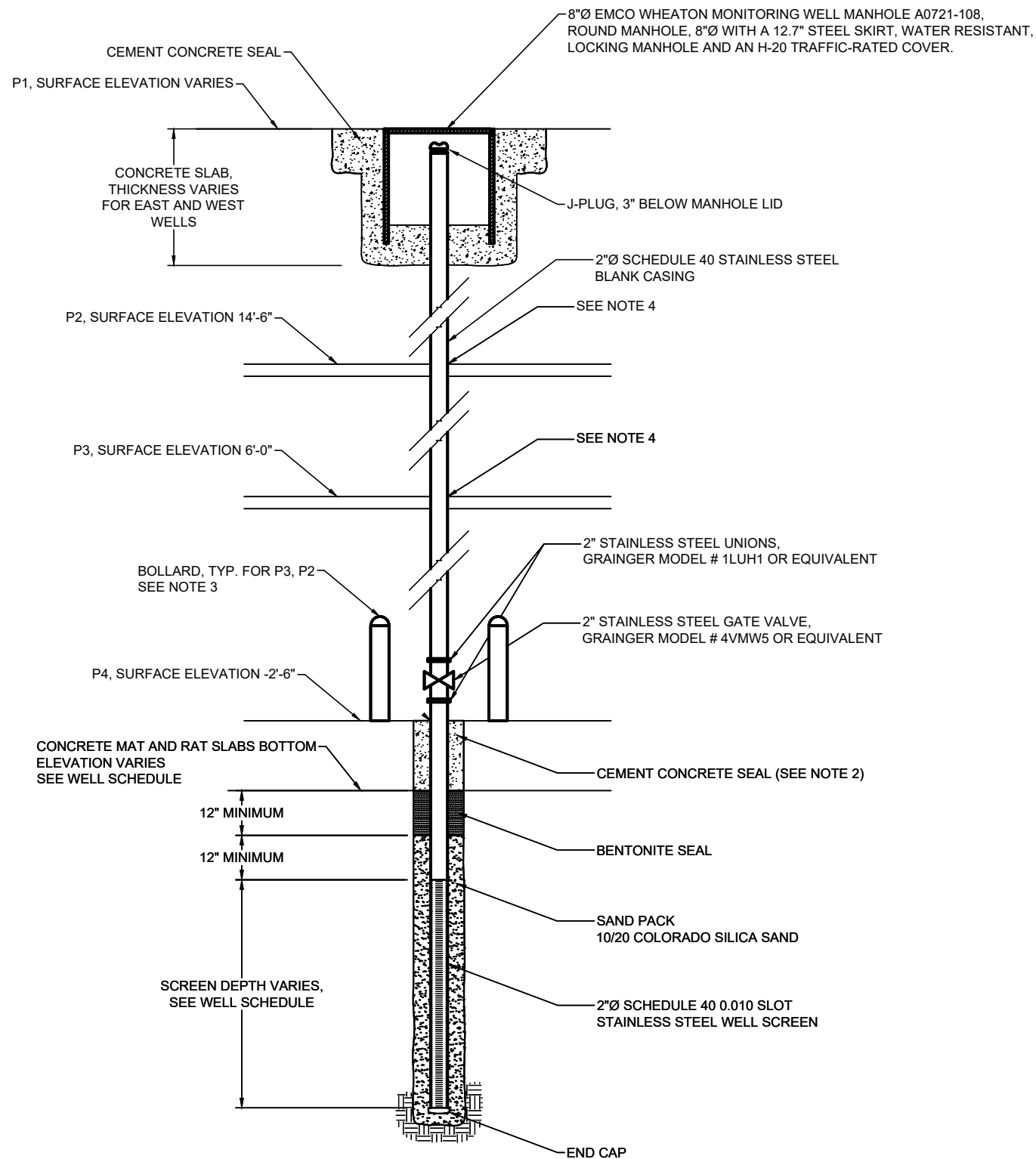
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**FIGURE 19**

**PROPOSED MONITORING WELL LOCATIONS WITHIN BUILDING FOOTPRINT BLOCK 38 WEST PROPERTY SEATTLE, WASHINGTON**

FARALLON PN: 397-019





### MONITORING WELL DETAIL (SEE NOTE 1)

NOT TO SCALE

| MONITORING WELL SCHEDULE |                |                |
|--------------------------|----------------|----------------|
|                          | FMW-150 (EAST) | FMW-151 (WEST) |
| VAULT ELEVATION          | 23' - 6 1/2"   | 23' - 0"       |
| TOP OF CASING ELEVATION  | 23' - 3 1/2"   | 22' - 9"       |
| P1 - BOTTOM OF SLAB      | 22' - 4 1/2"   | 22' 4"         |
| P4 - BOTTOM OF SLAB      | -6' - 6"       | -7' - 3 1/2"   |
| TOP OF WELL SCREEN       | -8' - 6"       | -9' - 3 1/2"   |
| BOTTOM OF WELL SCREEN    | -13' - 6"      | -14' - 3 1/2"  |

\* ELEVATION IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.

#### NOTES:

- MONITORING WELLS SHALL BE INSTALLED IN ACCORDANCE WITH WASHINGTON ADMINISTRATIVE CODE (WAC) 173-160-400: GENERAL REQUIREMENTS FOR RESOURCE PROTECTION WELL REQUIREMENTS.
- WELL CASING PENETRATION OF THE MAT AND RAT SLABS DETAIL TO BE PROVIDED BY OTHERS. SEALING THE WELL CASING SLAB PENETRATION AT THE P4 PARKING LEVEL TO BE SPECIFIED BY OTHERS.
- MONITORING WELLS COMPLETED ABOVE GRADE SHALL BE PROTECTED IN ACCORDANCE WITH WAC 173-160-420 FOR SURFACE PROTECTION REQUIREMENTS. PER WAC 173-160-420 WELL COMPLETED ABOVE GROUND SHALL BE PROTECTED FROM DAMAGE BY CEMENTING AT LEAST THREE METALS POSTS, AT LEAST THREE INCHES IN DIAMETER, IN A TRIANGULAR ARRAY AROUND THE CASING AND AT LEAST TWO FEET FROM IT. EACH BOLLARD SHALL BE ANCHORED TO THE CONCRETE SLAB. CONTRACTORS INSTALLING THE BOLLARDS SHALL PROVIDE ADEQUATE CONCRETE ANCHORS AND BRACING TO SUPPORT THE BOLLARDS. THE NUMBER OF BOLLARDS NEEDED FOR EACH MONITORING WELL SHALL BE DETERMINED BASED ON THE FINAL LOCATION RELATIVE TO FOUNDATION COLUMNS.
- WELL CASING SLAB PENETRATION DETAIL AT PARKING LEVELS P1 THROUGH P3 TO BE SPECIFIED BY OTHERS.



Drawn By: NM Checked By: SS

### FIGURE 20

MONITORING WELL DETAILS  
BLOCK 38 WEST PROPERTY  
SEATTLE, WASHINGTON

FARALLON PN: 397-019

## **TABLES**

**MONITORING WELL INSTALLATION**  
**Block 38 West Property**  
**500 through 536 Westlake Avenue North**  
**Seattle Washington**

**Farallon PN: 397-019**

**Table 1**  
**Soil Analytical Results for TPH and BTEX**  
**Block 38 West Property**  
**Seattle, Washington**  
**Farallon PN: 397-019**

| Sample Location                     | Sample Identification | Sample Depth<br>(feet) <sup>1</sup> | Sample Elevation<br>(feet NAVD88) <sup>1</sup> | Sample Date | Analytical Results (milligrams per kilogram) |              |                                       |              |                           |                               |          |              |          |
|-------------------------------------|-----------------------|-------------------------------------|--|-------------|--|--------------|---------------------------------------|--------------|---------------------------|-------------------------------|----------|--------------|----------|
|                                     |                       |                                     |  |             | NWTPH-Dx <sup>2</sup>                        |              | NWTPH-Dx with Silica Gel <sup>2</sup> |              | NWTPH-Gx <sup>3</sup>     | EPA Method 8021B <sup>4</sup> |          |              |          |
|                                     |                       |                                     |  |             | DRO  | ORO          | DRO                                   | ORO          | GRO                       | Benzene                       | Toluene  | Ethylbenzene | Xylenes  |
| FB-01                               | FB-01-5.0-082118      | 5.0                                 | 21.3   | 8/21/2018   | 520  | 3,700        | 510 N                                 | 1,100        | < 6.2                     | < 0.020                       | < 0.062  | < 0.062      | < 0.124  |
|                                     | FB-01-15.0-082118     | 15.0                                | 11.3   | 8/21/2018   | < 40   | 250          | < 40                                  | < 81         | < 9.1                     | < 0.020                       | < 0.091  | < 0.091      | < 0.182  |
|                                     | FB-01-30.0-082118     | 30.0                                | -3.7   | 8/21/2018   | < 29   | < 58         | ---                                   | ---          | < 5.1                     | < 0.020                       | < 0.051  | < 0.051      | < 0.102  |
| FB-02                               | FB-02-5.0-082018      | 5.0                                 | 20.1   | 8/20/2018   | 280 N  | 670          | ---                                   | ---          | < 5.4                     | < 0.020                       | < 0.054  | < 0.054      | < 0.108  |
|                                     | FB-02-10.0-082018     | 10.0                                | 15.1   | 8/20/2018   | < 61   | 270          | ---                                   | ---          | < 19                      | < 0.037                       | < 0.19   | < 0.19       | < 0.38   |
|                                     | FB-02-25.0-082018     | 25.0                                | 0.1  | 8/20/2018   | < 30   | < 60         | ---                                   | ---          | < 5.2                     | < 0.020                       | < 0.052  | < 0.052      | < 0.104  |
|                                     | FB-02-35.0-082018     | 35.0                                | -9.9   | 8/20/2018   | < 31   | < 62         | ---                                   | ---          | < 5.8                     | < 0.020                       | < 0.058  | < 0.058      | < 0.116  |
| FB-03                               | FB-03-10.0-082318     | 10.0                                | 15.8   | 8/23/2018   | < 32   | < 65         | ---                                   | ---          | < 6.5                     | < 0.020                       | < 0.065  | < 0.065      | < 0.130  |
|                                     | FB-03-15.0-082318     | 15.0                                | 10.8   | 8/23/2018   | < 32   | < 65         | ---                                   | ---          | < 6.5                     | < 0.020                       | < 0.065  | < 0.065      | < 0.130  |
|                                     | FB-03-25.0-082318     | 25.0                                | 0.8  | 8/23/2018   | < 29   | < 59         | ---                                   | ---          | < 5.5                     | < 0.020                       | < 0.055  | < 0.055      | < 0.110  |
| FB-04                               | FB-04-5.0-082118      | 5.0                                 | 17.0   | 8/21/2018   | 97 N   | 540          | ---                                   | ---          | < 16                      | < 0.033                       | < 0.16   | < 0.16       | < 0.32   |
|                                     | FB-04-20.0-082118     | 20.0                                | 2.0  | 8/21/2018   | < 29   | < 58         | ---                                   | ---          | < 5.3                     | < 0.020                       | < 0.053  | < 0.053      | < 0.106  |
|                                     | FB-04-30.0-082118     | 30.0                                | -8.0   | 8/21/2018   | < 30   | < 59         | ---                                   | ---          | < 5.5                     | < 0.020                       | < 0.055  | < 0.055      | < 0.110  |
| FB-05                               | FB-05-5.0-082218      | 5.0                                 | 20.5   | 8/22/2018   | < 31   | < 61         | ---                                   | ---          | < 5.4                     | < 0.020                       | < 0.054  | < 0.054      | < 0.108  |
|                                     | FB-05-20.0-082218     | 20.0                                | 5.5  | 8/22/2018   | < 31   | < 61         | ---                                   | ---          | < 5.5                     | < 0.020                       | < 0.055  | < 0.055      | < 0.110  |
|                                     | FB-05-35.0-082218     | 35.0                                | -9.5   | 8/22/2018   | < 31   | < 62         | ---                                   | ---          | < 5.8                     | < 0.020                       | < 0.058  | < 0.058      | < 0.116  |
| FB-06                               | FB-06-2.5-082218      | 2.5                                 | 22.9   | 8/22/2018   | 180  | 310          | ---                                   | ---          | 17 T                      | < 0.024                       | < 0.12   | < 0.12       | < 0.24   |
|                                     | FB-06-20.0-082218     | 20.0                                | 5.4  | 8/22/2018   | < 30   | < 61         | ---                                   | ---          | < 5.3                     | < 0.020                       | < 0.053  | < 0.053      | < 0.106  |
| FB-07                               | FB-07-24              | 24.0                                | -0.5   | 12/21/2019  | < 30   | < 60         | ---                                   | ---          | < 6.0                     | < 0.020                       | < 0.060  | < 0.060      | < 0.12   |
|                                     | FB-07-29              | 29.0                                | -5.5   | 12/21/2019  | < 30   | < 60         | ---                                   | ---          | < 5.4                     | < 0.020                       | < 0.054  | < 0.054      | < 0.108  |
|                                     | FB-07-31.5            | 31.5                                | -8.0   | 12/21/2019  | < 30   | < 60         | ---                                   | ---          | < 5.6                     | < 0.020                       | < 0.056  | < 0.056      | < 0.112  |
| FB-08                               | FB-08-2.5             | 2.5                                 | 21.2   | 12/21/2019  | 1,700 N                                      | 4,500        | ---                                   | ---          | 23 O                      | 0.12                          | 0.49     | 0.13         | 0.94     |
|                                     | FB-08-8               | 8.0                                 | 15.7   | 12/21/2019  | < 29   | < 58         | ---                                   | ---          | < 5.2                     | < 0.020                       | < 0.052  | < 0.052      | < 0.104  |
|                                     | FB-08-13              | 13.0                                | 10.7   | 12/21/2019  | < 31   | < 61         | ---                                   | ---          | 15 T                      | < 0.020                       | < 0.064  | < 0.064      | < 0.128  |
|                                     | FB-08-18              | 18.0                                | 5.7  | 12/21/2019  | < 29   | < 58         | ---                                   | ---          | < 6.1                     | < 0.020                       | < 0.061  | < 0.061      | < 0.122  |
|                                     | FB-08-30.5            | 30.5                                | -6.9   | 12/21/2019  | < 31   | < 61         | ---                                   | ---          | < 6.0                     | < 0.020                       | < 0.060  | < 0.060      | < 0.12   |
| FB-09                               | FB-09-11              | 11.0                                | 12.7   | 12/21/2019  | < 58   | 220          | ---                                   | ---          | < 20                      | < 0.039                       | < 0.20   | < 0.20       | < 0.4    |
|                                     | FB-09-33              | 33.0                                | -9.4   | 12/21/2019  | < 31   | < 62         | ---                                   | ---          | < 5.8                     | < 0.020                       | < 0.058  | < 0.058      | < 0.116  |
| FMW-130                             | F-MW-130-20.0-072114  | 20.0                                | 2.2  | 7/21/2014   | < 30   | < 60         | ---                                   | ---          | < 8.8                     | < 0.020                       | < 0.088  | < 0.088      | < 0.176  |
| FMW-132                             | FMW-132-5.0-082418    | 5.0                                 | 20.7   | 8/24/2018   | 730  | 2,600        | ---                                   | ---          | < 8.4                     | < 0.020                       | < 0.084  | < 0.084      | < 0.168  |
| FMW-133                             | FMW-133-10.0-082418   | 10.0                                | 15.3   | 8/24/2018   | < 83   | 470          | ---                                   | ---          | < 28                      | < 0.057                       | < 0.28   | < 0.28       | < 0.56   |
| FMW-134                             | FMW-134-5.0-082318    | 5.0                                 | 20.4   | 8/23/2018   | 260  | 1,900        | ---                                   | ---          | < 30                      | < 0.059                       | < 0.30   | < 0.30       | < 0.60   |
|                                     | FMW-134-15.0-082318   | 15.0                                | 10.4   | 8/23/2018   | < 31   | < 61         | ---                                   | ---          | < 12                      | < 0.023                       | < 0.12   | < 0.12       | < 0.24   |
| FMW-135                             | FMW-135-15.0-082418   | 15.0                                | 10.6   | 8/24/2018   | 130  | 680          | ---                                   | ---          | < 28                      | < 0.055                       | < 0.28   | < 0.28       | < 0.56   |
|                                     | FMW-135-35.0-082418   | 35.0                                | -9.4   | 8/24/2018   | < 31   | < 62         | ---                                   | ---          | < 5.8                     | < 0.020                       | < 0.058  | < 0.058      | < 0.116  |
| <b>Screening Levels<sup>5</sup></b> |                       |                                     |  |             | <b>2,000</b>                                 | <b>2,000</b> | <b>2,000</b>                          | <b>2,000</b> | <b>30/100<sup>6</sup></b> | <b>0.03</b>                   | <b>7</b> | <b>6</b>     | <b>9</b> |

**Table 1  
Soil Analytical Results for TPH and BTEX  
Block 38 West Property  
Seattle, Washington  
Farallon PN: 397-019**

| Sample Location                     | Sample Identification | Sample Depth (feet) <sup>1</sup> | Sample Elevation (feet NAVD88) <sup>1</sup> | Sample Date | Analytical Results (milligrams per kilogram) |              |                                       |              |                           |                               |          |              |          |
|-------------------------------------|-----------------------|----------------------------------|---|-------------|--|--------------|---------------------------------------|--------------|---------------------------|-------------------------------|----------|--------------|----------|
|                                     |                       |                                  |   |             | NWTPH-Dx <sup>2</sup>                        |              | NWTPH-Dx with Silica Gel <sup>2</sup> |              | NWTPH-Gx <sup>3</sup>     | EPA Method 8021B <sup>4</sup> |          |              |          |
|                                     |                       |                                  |   |             | DRO  | ORO          | DRO                                   | ORO          | GRO                       | Benzene                       | Toluene  | Ethylbenzene | Xylenes  |
| FMW-136                             | FMW-136-10.0-082218   | 10.0                             | 15.1  | 8/22/2018   | < 38   | < 76         | ---                                   | ---          | < 9.0                     | < 0.020                       | < 0.090  | < 0.090      | < 0.18   |
|                                     | FMW-136-20.0-082218   | 20.0                             | 5.1   | 8/22/2018   | < 32   | < 63         | ---                                   | ---          | < 6.4                     | < 0.020                       | < 0.064  | < 0.064      | < 0.128  |
|                                     | FMW-136-30.0-082218   | 30.0                             | -4.9  | 8/22/2018   | < 30   | < 59         | ---                                   | ---          | < 5.2                     | < 0.020                       | < 0.052  | < 0.052      | < 0.104  |
| FMW-144                             | FWM-144-9.0           | 9.0                              | 20.4  | 12/20/2019  | < 52   | 110          | ---                                   | ---          | < 18                      | < 0.036                       | < 0.18   | < 0.18       | < 0.36   |
| FMW-145                             | FMW-145-13.0          | 13.0                             | 9.9   | 12/20/2019  | 650  | 1,400        | ---                                   | ---          | <b>83 O</b>               | < 0.020                       | < 0.075  | < 0.075      | < 0.15   |
|                                     | FMW-145-18.0          | 18.0                             | 4.9   | 12/20/2019  | 58 N   | 210          | ---                                   | ---          | < 28 U1                   | < 0.020                       | < 0.080  | < 0.080      | < 0.16   |
|                                     | FMW-145-23.0          | 23.0                             | -0.1  | 12/20/2019  | < 30   | < 60         | ---                                   | ---          | < 5.3                     | < 0.020                       | < 0.053  | < 0.053      | < 0.106  |
|                                     | FMW-145-28.0          | 28.0                             | -5.1  | 12/20/2019  | < 31   | < 61         | ---                                   | ---          | < 6.5                     | < 0.020                       | < 0.065  | < 0.065      | < 0.13   |
|                                     | FMW-145-30.5          | 30.5                             | -7.6  | 12/20/2019  | < 29   | < 57         | ---                                   | ---          | < 4.8                     | < 0.020                       | < 0.048  | < 0.048      | < 0.096  |
| FMW-145-33.0                        | 33.0                  | -10.1                            | 12/20/2019                                  | < 31        | < 61   | ---          | ---                                   | < 5.5        | < 0.020                   | < 0.055                       | < 0.055  | < 0.11       |          |
| FMW-146                             | FMW-146-13.0          | 13.0                             | 10.2  | 12/21/2019  | < 34   | < 69         | ---                                   | ---          | < 7.0                     | < 0.020                       | < 0.070  | < 0.070      | < 0.14   |
|                                     | FMW-146-18.0          | 18.0                             | 5.2   | 12/21/2019  | < 31   | < 62         | ---                                   | ---          | < 5.4                     | < 0.020                       | < 0.054  | < 0.054      | < 0.108  |
| FMW-147                             | FMW-147-8.5           | 8.5                              | 14.3  | 12/21/2019  | < 120  | 1,100        | ---                                   | ---          | < 51                      | < 0.10                        | < 0.51   | < 0.51       | < 1.02   |
|                                     | FMW-147-13.5          | 13.5                             | 9.3   | 12/21/2019  | < 31   | < 61         | ---                                   | ---          | < 5.5                     | < 0.020                       | < 0.055  | < 0.055      | < 0.11   |
|                                     | FMW-147-23.5          | 23.5                             | -0.7  | 12/21/2019  | < 30   | < 61         | ---                                   | ---          | < 5.1                     | < 0.020                       | < 0.051  | < 0.051      | < 0.102  |
|                                     | FMW-147-30.5          | 30.5                             | -7.7  | 12/21/2019  | < 30   | < 61         | ---                                   | ---          | < 6.4                     | < 0.020                       | < 0.064  | < 0.064      | < 0.128  |
| FMW-148                             | FMW-148-27.0          | 27.0                             | 10.4  | 12/22/2019  | < 31   | < 63         | ---                                   | ---          | < 5.7                     | < 0.020                       | < 0.057  | < 0.057      | < 0.114  |
| FMW-149                             | FMW-149-21.0          | 21.0                             | 15.2  | 12/22/2019  | < 33   | < 66         | ---                                   | ---          | < 7.0                     | < 0.020                       | < 0.070  | < 0.070      | < 0.14   |
|                                     | FMW-149-31.0          | 31.0                             | 5.2   | 12/22/2019  | < 31   | < 63         | ---                                   | ---          | < 6.3                     | < 0.020                       | < 0.063  | < 0.063      | < 0.126  |
|                                     | FMW-149-41.0          | 41.0                             | -4.8  | 12/22/2019  | < 26   | < 53         | ---                                   | ---          | < 4.4                     | < 0.020                       | < 0.044  | < 0.044      | < 0.088  |
|                                     | FMW-149-43.5          | 43.5                             | -7.3  | 12/22/2019  | < 28   | < 56         | ---                                   | ---          | < 4.3                     | < 0.020                       | < 0.043  | < 0.043      | < 0.086  |
| H4                                  | H4-1.0-121319         | 1.0                              | 22.7  | 12/13/2019  | 600 N  | <b>5,000</b> | ---                                   | ---          | <b>31</b>                 | < 0.022                       | < 0.11   | < 0.11       | < 0.22   |
| TP-2                                | TP-2-20.0-121919      | 5.0                              | 20.0  | 12/19/2019  | < 27   | 210          | ---                                   | ---          | < 4.2                     | < 0.020                       | < 0.042  | < 0.042      | < 0.084  |
|                                     | TP-2-15.0-121919      | 10.0                             | 15.0  | 12/19/2019  | <b>6,600</b>                                 | <b>9,000</b> | ---                                   | ---          | < 420 U1                  | < 0.026                       | < 0.13   | < 0.13       | < 0.26   |
| TP-3                                | TP-3-20.0-121919      | 5.0                              | 20.0  | 12/19/2019  | < 29   | < 59         | ---                                   | ---          | < 5.2                     | < 0.020                       | < 0.052  | < 0.052      | < 0.104  |
|                                     | TP-3-15.0-121919      | 10.0                             | 15.0  | 12/19/2019  | < 160  | 1,700        | ---                                   | ---          | < 59                      | < 0.12                        | < 0.59   | < 0.59       | < 1.18   |
| TP-7                                | TP-7-4.0              | 4.0                              | 19.5  | 12/23/2019  | < 74   | 230          | ---                                   | ---          | < 25                      | < 0.0044                      | < 0.022  | < 0.0044     | < 0.0132 |
| <b>Screening Levels<sup>5</sup></b> |                       |                                  |   |             | <b>2,000</b>                                 | <b>2,000</b> | <b>2,000</b>                          | <b>2,000</b> | <b>30/100<sup>6</sup></b> | <b>0.03</b>                   | <b>7</b> | <b>6</b>     | <b>9</b> |

**NOTES:**

Results in **bold** denote concentrations exceeding applicable screening levels.

< denotes analyte not detected at or exceeding the laboratory reporting limit listed.

— denotes sample not analyzed.

<sup>1</sup>Depth in feet below ground surface. Elevation in feet referenced to North American Vertical Datum of 1988 (NAVD88).

<sup>2</sup>Analyzed by Northwest Method NWTPH-Dx. Results denoted as analyzed by NWTPH-Dx with silica gel were analyzed using a sample extract treated with sulfuric acid/silica gel cleanup procedure.

<sup>3</sup>Analyzed by Northwest Method NWTPH-Gx.

<sup>4</sup>Analyzed by U.S. Environmental Protection Agency (EPA) Method 8021B.

<sup>5</sup>Washington State Model Toxics Control Act Cleanup Regulation Method A Soil Cleanup Levels for Unrestricted Land Uses, Table 740-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as revised 2013.

<sup>6</sup>Screening level is 30 milligrams per kilogram if benzene is detected and 100 milligrams per kilogram if benzene is not detected.

BTEX = benzene, toluene, ethylbenzene, and xylenes

DRO = total petroleum hydrocarbons (TPH) as diesel-range organics

GRO = TPH as gasoline-range organics

N = hydrocarbons in the oil range are impacting the diesel-range result

ORO = TPH as oil-range organics

O = hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result

T = the sample chromatogram is not similar to a typical gasoline standard

U1 = the practical quantitation limit is elevated due to interferences present in the sample

Shaded cells represent soil removed during the independent remedial action.



**Table 2**  
**Soil Analytical Results for PAHs**  
**Block 38 West Property**  
**Seattle, Washington**  
**Farallon PN: 397-019**

| Sample Location | Sample Identification | Sample Composition | Sample Depth (feet) <sup>1</sup> | Sample Elevation (feet NAVD88) <sup>1</sup> | Sample Date | Analytical Results (milligrams per kilogram) <sup>2</sup> |                     |                     |                                   |              |                |            |                      |              |           |              |                   |                |                    |                      |                        |           |                        |                         |                                |
|-----------------|-----------------------|--------------------|----------------------------------|---|-------------|---|---------------------|---------------------|-----------------------------------|--------------|----------------|------------|----------------------|--------------|-----------|--------------|-------------------|----------------|--------------------|----------------------|------------------------|-----------|------------------------|-------------------------|--------------------------------|
|                 |                       |                    |                                  |   |             | Non-Carcinogenic PAHs                                     |                     |                     |                                   |              |                |            |                      |              |           |              | Carcinogenic PAHs |                |                    |                      |                        |           |                        |                         |                                |
|                 |                       |                    |                                  |   |             | Naphthalene   | 1-Methylnaphthalene | 2-Methylnaphthalene | Total Naphthalenes <sup>3,5</sup> | Acenaphthene | Acenaphthylene | Anthracene | Benzo(g,h,i)Perylene | Fluoranthene | Fluorene  | Phenanthrene | Pyrene            | Benzo(a)Pyrene | Benzo(a)Anthracene | Benzo(b)Fluoranthene | Benzo(j,k)Fluoranthene | Chrysene  | Dibenzo(a,h)Anthracene | Indeno(1,2,3-c,d)Pyrene | Total cPAHs TEC <sup>4,5</sup> |
| FB-01           | FB-01-5.0-082118      | Soil               | 5.0                              | 21.3  | 8/21/2018   | 0.99  | 1.1                 | 1.2                 | 3.29                              | 0.46         | 0.32           | 1.0        | 1.9                  | 4.8          | 0.46      | 5.4          | 6.8               | 2.5            | 2.6                | 2.9                  | 0.76                   | 3.1       | 0.45                   | 1.6                     | <b>3.4</b>                     |
|                 | FB-01-15.0-082118     | Soil               | 15.0                             | 11.3  | 8/21/2018   | < 0.011   | < 0.011             | < 0.011             | < 0.033                           | < 0.011      | < 0.011        | < 0.011    | < 0.011              | < 0.011      | < 0.011   | < 0.011      | < 0.011           | < 0.011        | < 0.011            | < 0.011              | < 0.011                | < 0.011   | < 0.011                | < 0.011                 | < 0.008                        |
| FB-02           | FB-02-5.0-082018      | Soil               | 5.0                              | 20.1  | 8/20/2018   | 1.1   | 0.86                | 1.3                 | 3.3                               | 1.4          | 0.45           | 3.3        | 8.5                  | 18           | 1.3       | 12           | 25                | 11             | 9.8                | 12                   | 3.5                    | 9.7       | 1.6                    | 8.0                     | <b>15</b>                      |
|                 | FB-02-25.0-082018     | Soil               | 25.0                             | 0.1   | 8/20/2018   | 0.083   | 0.020               | 0.024               | 0.127                             | 0.027        | < 0.0080       | < 0.0080   | < 0.0080             | < 0.0080     | < 0.0080  | < 0.0080     | < 0.0080          | < 0.0080       | < 0.0080           | < 0.0080             | < 0.0080               | < 0.0080  | < 0.0080               | < 0.0080                | < 0.0060                       |
| FB-03           | FB-03-10.0-082318     | Soil               | 10.0                             | 15.8  | 8/23/2018   | < 0.0086  | < 0.0086            | < 0.0086            | < 0.0258                          | < 0.0086     | < 0.0086       | < 0.0086   | < 0.0086             | 0.011        | < 0.0086  | 0.015        | 0.012             | < 0.0086       | < 0.0086           | < 0.0086             | < 0.0086               | < 0.0086  | < 0.0086               | < 0.0086                | < 0.0065                       |
|                 | FB-03-35.0-082318     | Soil               | 35.0                             | -9.2  | 8/23/2018   | < 0.0080  | < 0.0080            | < 0.0080            | < 0.024                           | < 0.0080     | < 0.0080       | < 0.0080   | < 0.0080             | 0.015        | < 0.0080  | 0.017        | 0.017             | < 0.0080       | < 0.0080           | < 0.0080             | < 0.0080               | < 0.0080  | < 0.0080               | < 0.0080                | < 0.0060                       |
| FB-04           | FB-04-10.0-082118     | Soil               | 10.0                             | 12.0  | 8/21/2018   | 0.12  | 0.057               | 0.099               | 0.276                             | 0.21         | 0.045          | 0.29       | 0.21                 | 0.97         | 0.22      | 1.0          | 1.1               | 0.36           | 0.67               | 0.47                 | 0.18                   | 0.95      | 0.041                  | 0.19                    | <b>0.52</b>                    |
|                 | FB-04-15.0-082118     | Soil               | 15.0                             | 7.0   | 8/21/2018   | 0.052   | 0.048               | 0.092               | 0.192                             | 0.049        | < 0.0082       | 0.029      | 0.018                | 0.078        | 0.043     | 0.16         | 0.1               | 0.027          | 0.027              | 0.025                | 0.0099                 | 0.028     | < 0.0082               | 0.017                   | 0.036                          |
| FB-05           | FB-05-15.0-082218     | Soil               | 15.0                             | 10.5  | 8/22/2018   | < 0.0089  | < 0.0089            | < 0.0089            | < 0.0267                          | < 0.0089     | < 0.0089       | < 0.0089   | < 0.0089             | < 0.0089     | < 0.0089  | < 0.0089     | < 0.0089          | < 0.0089       | < 0.0089           | < 0.0089             | < 0.0089               | < 0.0089  | < 0.0089               | < 0.0089                | < 0.0067                       |
| FB-06           | FB-06-2.5-082218      | Soil               | 2.5                              | 22.9  | 8/22/2018   | 0.087   | 0.044               | 0.045               | 0.176                             | 0.13         | 0.042          | 0.20       | 0.35                 | 0.81         | 0.094     | 0.89         | 1.1               | 0.49           | 0.47               | 0.52                 | 0.17                   | 0.50      | 0.054                  | 0.34                    | <b>0.65</b>                    |
|                 | FB-06-10.0-082218     | Soil               | 10.0                             | 15.4  | 8/22/2018   | < 0.016 H   | < 0.016 H           | < 0.016 H           | < 0.048                           | < 0.016 H    | < 0.016 H      | < 0.016 H  | < 0.016 H            | < 0.016 H    | < 0.016 H | < 0.016 H    | 0.020 H           | < 0.016 H      | < 0.016 H          | < 0.016 H            | < 0.016 H              | < 0.016 H | < 0.016 H              | < 0.016 H               | < 0.012                        |
|                 | FB-06-20.0-082218     | Soil               | 20.0                             | 5.4   | 8/22/2018   | 0.070   | < 0.0081            | < 0.0081            | 0.070                             | < 0.0081     | < 0.0081       | < 0.0081   | < 0.0081             | < 0.0081     | < 0.0081  | < 0.0081     | < 0.0081          | < 0.0081       | < 0.0081           | < 0.0081             | < 0.0081               | < 0.0081  | < 0.0081               | < 0.0081                | < 0.0061                       |
| FB-07           | FB-07-24              | Soil               | 24.0                             | -0.5  | 12/21/2019  | 0.028   | < 0.0081            | < 0.0081            | 0.028                             | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | < 0.0081       | < 0.0081           | < 0.0081             | < 0.0081               | < 0.0081  | < 0.0081               | < 0.0081                | < 0.0061                       |
|                 | FB-07-29              | Soil               | 29.0                             | -5.5  | 12/21/2019  | < 0.0080  | < 0.0080            | < 0.0080            | < 0.024                           | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | < 0.0080       | < 0.0080           | < 0.0080             | < 0.0080               | < 0.0080  | < 0.0080               | < 0.0080                | < 0.0060                       |
|                 | FB-07-31.5            | Soil               | 31.5                             | -8.0  | 12/21/2019  | < 0.0080  | < 0.0080            | < 0.0080            | < 0.024                           | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | < 0.0080       | < 0.0080           | < 0.0080             | < 0.0080               | < 0.0080  | < 0.0080               | < 0.0080                | < 0.0060                       |
| FB-08           | FB-08-2.5             | Soil               | 2.5                              | 21.2  | 12/21/2019  | 3.8   | 5.0                 | 5.5                 | <b>14.3</b>                       | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | 4.8            | 4.6                | 6.4                  | 2.0                    | 4.7       | 0.70                   | 3.1                     | <b>6.5</b>                     |
|                 | FB-08-8               | Soil               | 8.0                              | 15.7  | 12/21/2019  | 0.013   | < 0.0078            | 0.0089              | 0.022                             | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | 0.015          | 0.013              | 0.017                | < 0.0078               | 0.015     | < 0.0078               | 0.011                   | 0.020                          |
|                 | FB-08-13              | Soil               | 13.0                             | 10.7  | 12/21/2019  | 4.6   | 1.9                 | 2.3                 | <b>8.8</b>                        | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | < 0.0082       | < 0.0082           | < 0.0082             | < 0.0082               | < 0.0082  | < 0.0082               | < 0.0082                | < 0.0062                       |
|                 | FB-08-18              | Soil               | 18.0                             | 5.7   | 12/21/2019  | 0.12  | 0.040               | 0.040               | 0.20                              | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | < 0.0077       | < 0.0077           | < 0.0077             | < 0.0077               | < 0.0077  | < 0.0077               | < 0.0077                | < 0.0058                       |
|                 | FB-08-30.5            | Soil               | 30.5                             | -6.9  | 12/21/2019  | < 0.0081  | < 0.0081            | < 0.0081            | < 0.024                           | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | < 0.0081       | < 0.0081           | < 0.0081             | < 0.0081               | < 0.0081  | < 0.0081               | < 0.0081                | < 0.0061                       |
| FB-09           | FB-09-11              | Soil               | 11.0                             | 12.7  | 12/21/2019  | < 0.015   | < 0.015             | < 0.015             | < 0.045                           | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | 0.018          | < 0.015            | 0.021                | < 0.015                | < 0.015   | < 0.015                | < 0.015                 | 0.023                          |
|                 | FB-09-33              | Soil               | 33.0                             | -9.4  | 12/21/2019  | < 0.0083  | < 0.0083            | < 0.0083            | < 0.025                           | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | < 0.0083       | < 0.0083           | < 0.0083             | < 0.0083               | < 0.0083  | < 0.0083               | < 0.0083                | < 0.0063                       |
| FMW-130         | F-MW-130-20.0-072114  | Soil               | 20.0                             | 2.2   | 7/21/2014   | 0.38  | 0.016               | 0.028               | 0.424                             | 0.014        | < 0.0079       | < 0.0079   | < 0.0079             | < 0.0079     | < 0.0079  | < 0.0079     | < 0.0079          | < 0.0079       | < 0.0079           | < 0.0079             | < 0.0079               | < 0.0079  | < 0.0079               | < 0.0060                |                                |
| FMW-132         | FMW-132-5.0-082418    | Soil               | 5.0                              | 20.7  | 8/24/2018   | 2.0   | 2.0                 | 2.6                 | <b>6.6</b>                        | 1.5          | 0.10           | 3.3        | 4.4                  | 15           | 0.84      | 18           | 27                | 9.4            | 11                 | 10                   | 2.9                    | 13        | 1.4                    | 4.1                     | <b>12.5</b>                    |
| FMW-133         | FMW-133-10.0-082418   | Soil               | 10.0                             | 15.3  | 8/24/2018   | < 0.055   | < 0.055             | < 0.055             | < 0.165                           | < 0.055      | < 0.055        | < 0.055    | < 0.055              | < 0.055      | < 0.055   | < 0.055      | < 0.055           | < 0.055        | < 0.055            | < 0.055              | < 0.055                | < 0.055   | < 0.055                | < 0.055                 | < 0.042                        |
|                 | FMW-133-20.0-082418   | Soil               | 20.0                             | 5.3   | 8/24/2018   | 0.25  | 0.035               | 0.042               | 0.33                              | 0.021        | < 0.0080       | < 0.0080   | < 0.0080             | < 0.0080     | < 0.0080  | < 0.0080     | < 0.0080          | < 0.0080       | < 0.0080           | < 0.0080             | < 0.0080               | < 0.0080  | < 0.0080               | < 0.0080                | < 0.0060                       |
| FMW-134         | FMW-134-15.0-082318   | Soil               | 15.0                             | 10.4  | 8/23/2018   | 0.14  | 0.012               | 0.028               | 0.18                              | 0.014        | < 0.0081       | < 0.0081   | < 0.0081             | < 0.0081     | 0.016     | 0.021        | < 0.0081          | < 0.0081       | < 0.0081           | < 0.0081             | < 0.0081               | < 0.0081  | < 0.0081               | < 0.0081                | < 0.0061                       |
| FMW-135         | FMW-135-15.0-082418   | Soil               | 15.0                             | 10.6  | 8/24/2018   | 0.029   | < 0.022             | < 0.022             | 0.029                             | 0.039        | < 0.022        | < 0.022    | < 0.022              | 0.042        | < 0.022   | 0.068        | 0.073             | < 0.022        | < 0.022            | < 0.022              | < 0.022                | < 0.022   | < 0.022                | < 0.022                 | < 0.017                        |
|                 | FMW-135-30.0-082418   | Soil               | 30.0                             | -4.4  | 8/24/2018   | 0.12  | 0.012               | < 0.0082            | 0.132                             | < 0.0082     | < 0.0082       | < 0.0082   | < 0.0082             | < 0.0082     | < 0.0082  | < 0.0082     | < 0.0082          | < 0.0082       | < 0.0082           | < 0.0082             | < 0.0082               | < 0.0082  | < 0.0082               | < 0.0082                | < 0.0062                       |
| FMW-136         | FMW-136-20.0-082218   | Soil               | 20.0                             | 5.1   | 8/22/2018   | 0.030   | < 0.0084            | < 0.0084            | 0.030                             | < 0.0084     | < 0.0084       | < 0.0084   | < 0.0084             | < 0.0084     | < 0.0084  | < 0.0084     | < 0.0084          | < 0.0084       | < 0.0084           | < 0.0084             | < 0.0084               | < 0.0084  | < 0.0084               | < 0.0084                | < 0.0063                       |
| FMW-144         | FWM-144-9.0           | Soil               | 9.0                              | 20.4  | 12/20/2019  | < 0.014   | < 0.014             | < 0.014             | < 0.042                           | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | 0.085          | 0.033              | 0.088                | 0.025                  | 0.032     | < 0.014                | 0.081                   | <b>0.11</b>                    |
| FMW-145         | FMW-145-13.0          | Soil               | 13.0                             | 9.9   | 12/20/2019  | 0.075   | 0.17                | 0.056               | 0.301                             | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | 0.063          | 0.062              | 0.060                | 0.018                  | 0.11      | 0.011                  | 0.037                   | 0.083                          |
|                 | FMW-145-18.0          | Soil               | 18.0                             | 4.9   | 12/20/2019  | 0.018   | 0.054               | 0.044               | 0.116                             | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | 0.055          | 0.051              | 0.051                | 0.016                  | 0.066     | < 0.0096               | 0.035                   | 0.071                          |
|                 | FMW-145-23.0          | Soil               | 23.0                             | -0.1  | 12/20/2019  | < 0.0079  | < 0.0079            | < 0.0079            | < 0.0237                          | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | < 0.0079       | < 0.0079           | < 0.0079             | < 0.0079               | < 0.0079  | < 0.0079               | < 0.0079                | < 0.0060                       |
|                 | FMW-145-28.0          | Soil               | 28.0                             | -5.1  | 12/20/2019  | < 0.0081  | < 0.0081            | < 0.0081            | < 0.0243                          | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | < 0.0081       | < 0.0081           | < 0.0081             | < 0.0081               | < 0.0081  | < 0.0081               | < 0.0081                | < 0.0061                       |
|                 | FMW-145-30.5          | Soil               | 30.5                             | -7.6  | 12/20/2019  | < 0.0076  | < 0.0076            | < 0.0076            | < 0.0228                          | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | < 0.0076       | < 0.0076           | < 0.0076             | < 0.0076               | < 0.0076  | < 0.0076               | < 0.0076                | < 0.0057                       |
|                 | FMW-145-33.0          | Soil               | 33.0                             | -10.1                                       | 12/20/2019  | < 0.0081  | < 0.0081            | < 0.0081            | < 0.0243                          | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | < 0.0081       | < 0.0081           | < 0.0081             | < 0.0081               | < 0.0081  | < 0.0081               | < 0.0081                | < 0.0061                       |
| FMW-146         | FMW-146-13.0          | Soil               | 13.0                             | 10.2  | 12/21/2019  | 0.25  | 0.33                | 0.18                | 0.76                              | ---          | ---            | ---        | ---                  | ---          | ---       | ---          | ---               | 0.050          | 0.060              | 0.054                | 0.015                  | 0.059     | < 0.0091               | 0                       |                                |

**Table 2  
Soil Analytical Results for PAHs  
Block 38 West Property  
Seattle, Washington  
Farallon PN: 397-019**

| Sample Location                     | Sample Identification | Sample Composition | Sample Depth (feet) <sup>1</sup> | Sample Elevation (feet NAVD88) <sup>1</sup> | Sample Date | Analytical Results (milligrams per kilogram) <sup>2</sup> |                     |                     |                                   |                          |                |                           |                      |                          |                          |                   |                          |                |                    |                      |                        |          |                        |                         |                                |
|-------------------------------------|-----------------------|--------------------|----------------------------------|---|-------------|---|---------------------|---------------------|-----------------------------------|--------------------------|----------------|---------------------------|----------------------|--------------------------|--------------------------|-------------------|--------------------------|----------------|--------------------|----------------------|------------------------|----------|------------------------|-------------------------|--------------------------------|
|                                     |                       |                    |                                  |   |             | Non-Carcinogenic PAHs                                     |                     |                     |                                   |                          |                |                           |                      |                          |                          | Carcinogenic PAHs |                          |                |                    |                      |                        |          |                        |                         |                                |
|                                     |                       |                    |                                  |   |             | Naphthalene   | 1-Methylnaphthalene | 2-Methylnaphthalene | Total Naphthalenes <sup>3,5</sup> | Acenaphthene             | Acenaphthylene | Anthracene                | Benzo(g,h,i)Perylene | Fluoranthene             | Fluorene                 | Phenanthrene      | Pyrene                   | Benzo(a)Pyrene | Benzo(a)Anthracene | Benzo(b)Fluoranthene | Benzo(j,k)Fluoranthene | Chrysene | Dibenzo(a,h)Anthracene | Indeno(1,2,3-c,d)Pyrene | Total cPAHs TEC <sup>4,5</sup> |
| FMW-147                             | FMW-147-8.5           | Soil               | 8.5                              | 14.3  | 12/21/2019  | 0.095   | < 0.031             | 0.035               | 0.13                              | ---                      | ---            | ---                       | ---                  | ---                      | ---                      | ---               | ---                      | < 0.079 U1     | 0.054              | 0.042                | < 0.031                | 0.048    | < 0.031                | < 0.031                 | 0.054                          |
|                                     | FMW-147-13.5          | Soil               | 13.5                             | 9.3   | 12/21/2019  | 0.10  | < 0.0081            | < 0.0081            | 0.10                              | ---                      | ---            | ---                       | ---                  | ---                      | ---                      | ---               | ---                      | < 0.0081       | < 0.0081           | < 0.0081             | < 0.0081               | < 0.0081 | < 0.0081               | < 0.0081                | < 0.0061                       |
|                                     | FMW-147-23.5          | Soil               | 23.5                             | -0.7  | 12/21/2019  | < 0.0081  | < 0.0081            | < 0.0081            | < 0.0243                          | ---                      | ---            | ---                       | ---                  | ---                      | ---                      | ---               | ---                      | < 0.0081       | < 0.0081           | < 0.0081             | < 0.0081               | < 0.0081 | < 0.0081               | < 0.0081                | < 0.0061                       |
|                                     | FMW-147-30.5          | Soil               | 30.5                             | -7.7  | 12/21/2019  | < 0.0081  | < 0.0081            | < 0.0081            | < 0.0243                          | ---                      | ---            | ---                       | ---                  | ---                      | ---                      | ---               | ---                      | < 0.0081       | < 0.0081           | < 0.0081             | < 0.0081               | < 0.0081 | < 0.0081               | < 0.0081                | < 0.0061                       |
| FMW-148                             | FMW-148-27.0          | Soil               | 27.0                             | 10.4  | 12/22/2019  | 0.38  | 0.056               | 0.11                | 0.546                             | ---                      | ---            | ---                       | ---                  | ---                      | ---                      | ---               | ---                      | < 0.0084       | < 0.0084           | < 0.0084             | < 0.0084               | < 0.0084 | < 0.0084               | < 0.0084                | < 0.0063                       |
| FMW-149                             | FMW-149-21.0          | Soil               | 21.0                             | 15.2  | 12/22/2019  | < 0.0088  | < 0.0088            | < 0.0088            | < 0.0264                          | ---                      | ---            | ---                       | ---                  | ---                      | ---                      | ---               | ---                      | < 0.0088       | < 0.0088           | < 0.0088             | < 0.0088               | < 0.0088 | < 0.0088               | < 0.0088                | < 0.0066                       |
|                                     | FMW-149-31.0          | Soil               | 31.0                             | 5.2   | 12/22/2019  | 0.044   | 0.010               | 0.013               | 0.067                             | ---                      | ---            | ---                       | ---                  | ---                      | ---                      | ---               | ---                      | < 0.0084       | < 0.0084           | < 0.0084             | < 0.0084               | < 0.0084 | < 0.0084               | < 0.0084                | < 0.0063                       |
|                                     | FMW-149-41.0          | Soil               | 41.0                             | -4.8  | 12/22/2019  | < 0.0070  | < 0.0070            | < 0.0070            | < 0.021                           | ---                      | ---            | ---                       | ---                  | ---                      | ---                      | ---               | ---                      | < 0.0070       | < 0.0070           | < 0.0070             | < 0.0070               | < 0.0070 | < 0.0070               | < 0.0070                | < 0.0053                       |
|                                     | FMW-149-43.5          | Soil               | 43.5                             | -7.3  | 12/22/2019  | < 0.0075  | < 0.0075            | < 0.0075            | < 0.0225                          | ---                      | ---            | ---                       | ---                  | ---                      | ---                      | ---               | ---                      | < 0.0075       | < 0.0075           | < 0.0075             | < 0.0075               | < 0.0075 | < 0.0075               | < 0.0075                | < 0.0057                       |
| TP-3                                | TP-3-20.0-121918      | Soil               | 5.0                              | 20.0  | 12/19/2019  | < 0.0078  | < 0.0078            | < 0.0078            | < 0.0234                          | < 0.0078                 | < 0.0078       | < 0.0078                  | 0.0087               | 0.026                    | < 0.0078                 | 0.016             | 0.028                    | 0.015          | 0.012              | 0.014                | < 0.0078               | 0.012    | < 0.0078               | 0.0089                  | 0.019                          |
|                                     | TP-3-15.0-121919      | Soil               | 10.0                             | 15.0  | 12/19/2019  | < 0.041   | < 0.041             | < 0.041             | < 0.123                           | < 0.041                  | < 0.041        | < 0.041                   | < 0.041              | < 0.041                  | < 0.041                  | < 0.041           | < 0.041                  | < 0.041        | < 0.041            | < 0.041              | < 0.041                | < 0.041  | < 0.041                | < 0.041                 | < 0.031                        |
| TP-7                                | TP-7-4.0              | Soil               | 4.0                              | 19.5  | 12/23/2019  | 0.061   | < 0.020             | < 0.020             | 0.061                             | ---                      | ---            | ---                       | ---                  | ---                      | ---                      | ---               | ---                      | 0.031          | 0.033              | 0.044                | < 0.020                | 0.067    | < 0.020                | 0.025                   | 0.044                          |
| <b>Screening Levels<sup>6</sup></b> |                       |                    |                                  |   |             |   |                     |                     | <b>5</b>                          | <b>4,800<sup>7</sup></b> | <b>NE</b>      | <b>24,000<sup>7</sup></b> | <b>NE</b>            | <b>3,200<sup>7</sup></b> | <b>3,200<sup>7</sup></b> | <b>NE</b>         | <b>2,400<sup>7</sup></b> |                |                    |                      |                        |          |                        |                         | <b>0.1</b>                     |

**NOTES:**

Results in **bold** denote concentrations exceeding applicable screening levels.

--- denotes sample not analyzed.

< denotes analyte not detected at or exceeding the reporting limit listed.

<sup>1</sup>Depth in feet below ground surface. Elevation in feet referenced to North American Vertical Datum of 1988 (NAVD88).

<sup>2</sup>Analyzed by U.S. Environmental Protection Agency Method 8270D/SIM.

<sup>3</sup>Sum of naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.

<sup>4</sup>Total cPAHs derived using the total toxicity equivalency method in Section 708(8) of Chapter 173-340 of the Washington Administrative Code.

<sup>5</sup>For concentrations reported at less than the laboratory reporting limit, half the reporting limit was used to calculate total. If all constituent concentrations are non-detect, calculated total is indicated non-detect.

<sup>6</sup>Washington State Model Toxics Control Act Cleanup Regulation (MTCA) Method A Soil Cleanup Levels for Unrestricted Land Uses, Table 740-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as revised 2013, unless otherwise noted.

<sup>7</sup>Washington State Department of Ecology Cleanup Levels and Risk Calculations, under MTCA Standard Method B Formula Values for Soil (Unrestricted Land Use) - Direct Contact (Ingestion Only) and Leaching Pathway, <https://fortress.wa.gov/ecy/clarc/Reporting/ChemicalQuery.aspx>

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

H = sample analyzed outside of holding time

NE = not established

PAHs = polycyclic aromatic hydrocarbons

TEC = toxic equivalent concentration

Shaded cells represent soil removed during the independent remedial action.

**Table 3  
Groundwater Elevations  
Block 38 West Property  
Seattle, Washington  
Farallon PN: 397-019**

| <b>Location</b> | <b>Screened Interval<br/>(feet bgs)<sup>1</sup></b> | <b>Screened Interval<br/>(feet NAVD88)<sup>2</sup></b> | <b>Top of Casing<br/>Elevation<br/>(feet NAVD88)<sup>2</sup></b> | <b>Measurement Date</b> | <b>Depth to Water<br/>(feet)<sup>3</sup></b> | <b>Water Level Elevation<br/>(feet NAVD88)<sup>2</sup></b> |
|-----------------|---|--|--|-------------------------|--|--|
| FMW-130         | 45.0 to 55.0  | -22.8 to -32.8   | 21.86  | 8/30/2018               | 5.14   | 16.72  |
|                 |   |  |  | 12/28/2018              | 4.98   | 16.88  |
|                 |   |  |  | 3/26/2019               | 4.42   | 17.44  |
| FMW-132         | 5.0 to 10.0   | 20.7 to 15.7   | 25.48  | 8/30/2018               | 7.44   | 18.04  |
|                 |   |  |  | 12/28/2018              | 6.80   | 18.68  |
|                 |   |  |  | 3/26/2019               | 7.01   | 18.47  |
| FMW-133         | 6.5 to 11.5   | 18.8 to 13.8   | 24.87  | 8/30/2018               | 6.86   | 18.01  |
|                 |   |  |  | 12/28/2018              | 6.21   | 18.66  |
|                 |   |  |  | 3/26/2019               | 6.41   | 18.46  |
| FMW-134         | 12.0 to 17.0  | 13.4 to 8.4  | 24.98  | 8/30/2018               | 8.66   | 16.32  |
|                 |   |  |  | 12/28/2018              | 7.80   | 17.18  |
|                 |   |  |  | 3/26/2019               | 7.51   | 17.47  |
| FMW-135         | 7.0 to 12.0   | 18.6 to 13.6   | 25.29  | 8/30/2018               | 7.14   | 18.15  |
|                 |   |  |  | 12/28/2018              | 6.78   | 18.51  |
|                 |   |  |  | 3/26/2019               | 6.81   | 18.48  |
| FMW-136         | 30.0 to 40.0  | -4.9 to -14.9  | 24.79  | 8/30/2018               | 8.10   | 16.69  |
|                 |   |  |  | 12/28/2018              | 7.74   | 17.05  |
|                 |   |  |  | 3/26/2019               | 7.41   | 17.38  |
| FMW-137         | 72.0 to 85.0  | -41.9 to -54.9   | 30.09  | 11/20/2018              | 13.02  | 17.07  |
|                 |   |  |  | 12/28/2018              | 12.74  | 17.35  |
|                 |   |  |  | 3/14/2019               | 12.56  | 17.53  |
|                 |   |  |  | 5/6/2019                | 12.08  | 18.01  |
|                 |   |  |  | 7/8/2019                | 12.25  | 17.84  |
| FMW-138         | 90.0 to 100.0                                       | -49.96 to -59.96                                       | 40.44  | 11/20/2018              | 24.50  | 15.94  |
|                 |   |  |  | 12/28/2018              | 24.38  | 16.06  |
|                 |   |  |  | 3/14/2019               | 24.14  | 16.30  |
|                 |   |  |  | 5/6/2019                | 23.80  | 16.64  |
|                 |   |  |  | 7/8/2019                | 23.84  | 16.60  |
| FMW-144         | 38.0 to 43.0  | -8.0 to -13.0  | 29.41  | 12/23/2019              | 12.42  | 16.99  |
|                 |   |  |  | 12/26/2019              | 12.26  | 17.15  |
|                 |   |  |  | 12/30/2019              | 12.33  | 17.08  |
|                 |   |  |  | 12/30/2019              | 12.34  | 17.07  |
|                 |   |  |  | 12/31/2019              | 12.44  | 16.97  |
|                 |   |  |  | 12/31/2019              | 12.27  | 17.14  |

**Table 3  
Groundwater Elevations  
Block 38 West Property  
Seattle, Washington  
Farallon PN: 397-019**

| Location | Screened Interval<br>(feet bgs) <sup>1</sup> | Screened Interval<br>(feet NAVD88) <sup>2</sup> | Top of Casing<br>Elevation<br>(feet NAVD88) <sup>2</sup> | Measurement Date | Depth to Water<br>(feet) <sup>3</sup> | Water Level Elevation<br>(feet NAVD88) <sup>2</sup> |
|----------|--|---|--|------------------|---------------------------------------|---|
| FMW-145  | 31.0 to 36.0                                 | -8.0 to -13.0                                   | 22.90  | 12/23/2019       | 5.58                                  | 17.32   |
|          |  |   |  | 12/26/2019       | 5.65                                  | 17.25   |
|          |  |   |  | 12/30/2019       | 5.80                                  | 17.10   |
|          |  |   |  | 12/30/2019       | 5.83                                  | 17.07   |
|          |  |   |  | 12/31/2019       | 5.42                                  | 17.48   |
|          |  |   |  | 12/31/2019       | 5.63                                  | 17.27   |
| FMW-146  | 31.0 to 36.0                                 | -8.0 to -13.0                                   | 23.19  | 12/23/2019       | 6.38                                  | 16.81   |
|          |  |   |  | 12/26/2019       | 6.14                                  | 17.05   |
|          |  |   |  | 12/30/2019       | 6.18                                  | 17.01   |
|          |  |   |  | 12/30/2019       | 6.24                                  | 16.95   |
|          |  |   |  | 12/31/2019       | 6.00                                  | 17.19   |
|          |  |   |  | 12/31/2019       | 5.89                                  | 17.30   |
| FMW-147  | 31.0 to 36.0                                 | -8.0 to -13.0                                   | 22.82  | 12/23/2019       | 5.78                                  | 17.04   |
|          |  |   |  | 12/26/2019       | 5.75                                  | 17.07   |
|          |  |   |  | 12/30/2019       | 5.88                                  | 16.94   |
|          |  |   |  | 12/30/2019       | 5.82                                  | 17.00   |
|          |  |   |  | 12/31/2019       | 5.98                                  | 16.84   |
|          |  |   |  | 12/31/2019       | 5.70                                  | 17.12   |
| FMW-149  | 44.0 to 49.0                                 | -8.0 to -13.0                                   | 36.21  | 12/23/2019       | 19.01                                 | 17.20   |
|          |  |   |  | 12/26/2019       | 19.14                                 | 17.07   |
|          |  |   |  | 12/30/2019       | 19.18                                 | 17.03   |
|          |  |   |  | 12/30/2019       | 19.13                                 | 17.08   |
|          |  |   |  | 12/31/2019       | 18.94                                 | 17.27   |
|          |  |   |  | 12/31/2019       | 18.92                                 | 17.29   |

NOTES:

<sup>1</sup>Depth in feet below ground surface.

<sup>2</sup>In feet referenced to North American Vertical Datum of 1988 (NAVD88).

<sup>3</sup>In feet below top of well casing.

bgs = below ground surface

**Table 4  
Groundwater Analytical Results for TPH and BTEX  
Block 38 West Property  
Seattle, Washington  
Farallon PN: 397-019**

| Sample Location  | Sample Date | Sample Identification | Screened Interval<br>(feet NAVD88) <sup>1</sup> | Analytical Results (micrograms per liter) |                  |                              |                      |                      |                           |                      |
|--|-------------|-----------------------|---|---|------------------|------------------------------|----------------------|----------------------|---------------------------|----------------------|
|  |             |                       |   | DRO <sup>2</sup>                          | ORO <sup>2</sup> | GRO <sup>3</sup>             | Benzene <sup>4</sup> | Toluene <sup>4</sup> | Ethylbenzene <sup>4</sup> | Xylenes <sup>4</sup> |
| <b>Reconnaissance Groundwater Samples from Borings</b> |             |                       |   |   |                  |                              |                      |                      |                           |                      |
| FB-03  | 8/23/2018   | FB-03-082318          | 8.8 to 3.8                                      | <b>660</b>                                | 490              | < 100                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
| FB-05  | 8/22/2018   | FB-05-082218          | 8.5 to 3.5                                      | < 260                                     | < 410            | < 100                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
| FMW-130  | 7/21/2014   | F-MW-130-GW1-072114   | 7.2 to 2.2                                      | ---                                       | ---              | <b>2,100 T</b>               | <b>5.1</b>           | 7.5                  | 2.2                       | 6.7                  |
| <b>Groundwater Samples from Monitoring Wells</b>       |             |                       |   |   |                  |                              |                      |                      |                           |                      |
| FMW-130  | 7/24/2014   | F-MW-130-072414       | -22.8 to -32.8                                  | ---                                       | ---              | < 100                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
|  | 7/3/2017    | FMW-130-070317        |   | ---                                       | ---              | < 100                        | < 0.20               | < 1.0                | < 0.20                    | < 0.60               |
|  | 8/30/2018   | FMW-130-083018        |   | < 250                                     | < 410            | < 100                        | < 0.20               | < 1.0                | < 0.20                    | < 0.60               |
|  | 12/28/2018  | FMW130-122818         |   | < 260                                     | < 410            | < 100                        | < 0.20               | < 1.0                | < 0.20                    | < 0.60               |
|  | 3/26/2019   | FMW-130-032619        |   | < 250                                     | < 400            | < 100                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
| FMW-132  | 8/30/2018   | FMW-132-083018        | 20.7 to 15.7                                    | 260                                       | < 400            | < 100                        | < 0.20               | < 1.0                | < 0.20                    | < 0.60               |
|  | 12/28/2018  | FMW132-122818         |   | < 260                                     | < 410            | < 100                        | < 0.20               | < 1.0                | < 0.20                    | < 0.60               |
|  | 3/26/2019   | FMW-132-032619        |   | < 250                                     | < 400            | < 100                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
| FMW-133  | 8/30/2018   | FMW-133-083018        | 18.8 to 13.8                                    | 270                                       | < 410            | < 100                        | < 0.20               | < 1.0                | < 0.20                    | < 0.60               |
|  | 12/28/2018  | FMW133-122818         |   | 310                                       | < 410            | < 100                        | < 0.20               | < 1.0                | < 0.20                    | < 0.60               |
|  | 3/26/2019   | FMW-133-032619        |   | 280                                       | < 400            | < 100                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
| FMW-134  | 8/30/2018   | FMW-134-083018        | 13.4 to 8.4                                     | <b>1,000 M</b>                            | < 410            | <b>1,100 Z</b>               | < 1.0                | < 5.0                | < 1.0                     | < 3.0                |
|  | 12/28/2018  | FMW134-122818         |   | <b>560</b>                                | < 410            | < 100                        | < 0.20               | < 1.0                | < 0.20                    | < 0.60               |
|  | 12/28/2018  | FMW500-122818         |   | <b>680</b>                                | 490              | < 100                        | < 0.20               | < 1.0                | < 0.20                    | < 0.60               |
|  | 3/26/2019   | FMW-134-032619        |   | <b>540 M</b>                              | < 400            | 140 Z                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
| FMW-135  | 8/30/2018   | FMW-135-083018        | 18.6 to 13.6                                    | < 260                                     | < 410            | < 100                        | < 0.20               | < 1.0                | < 0.20                    | < 0.60               |
|  | 12/28/2018  | FMW135-122818         |   | 370                                       | < 410            | < 100                        | < 0.20               | < 1.0                | < 0.20                    | < 0.60               |
|  | 3/26/2019   | FMW-135-032619        |   | < 250                                     | < 410            | < 100                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
| FMW-136  | 8/30/2018   | FMW-136-083018        | -4.9 to -14.9                                   | < 250                                     | < 400            | < 100                        | < 0.20               | < 1.0                | < 0.20                    | < 0.60               |
|  | 12/28/2018  | FMW136-122818         |   | < 260                                     | < 410            | < 100                        | < 0.20               | < 1.0                | < 0.20                    | < 0.60               |
|  | 3/26/2019   | FMW-136-032619        |   | < 250                                     | < 410            | < 100                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
| FMW-144  | 12/26/2019  | FMW-144-122619        | -8.6 to -13.6                                   | < 200                                     | < 200            | < 100                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
| FMW-145  | 12/26/2019  | FMW-145-122619        | -8.1 to -13.1                                   | 280                                       | 310              | < 100                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
| FMW-146  | 12/26/2019  | FMW-146-122619        | -7.8 to -12.8                                   | <b>1,100</b>                              | <b>650</b>       | 170 T                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
| FMW-147  | 12/26/2019  | FMW-147-122619        | -8.2 to -13.2                                   | <b>1,900</b>                              | <b>1,400</b>     | < 100                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
| FMW-149  | 12/26/2019  | FMW-149-122619        | -7.8 to -12.8                                   | < 210                                     | < 210            | < 100                        | < 1.0                | < 1.0                | < 1.0                     | < 2.0                |
| <b>Screening Levels<sup>5</sup></b>                    |             |                       |   | <b>500</b>                                | <b>500</b>       | <b>800/1,000<sup>6</sup></b> | <b>5</b>             | <b>1,000</b>         | <b>700</b>                | <b>1,000</b>         |

**NOTES:**

Results in **bold** denote concentrations exceeding applicable screening levels.  
 < denotes analyte not detected at or exceeding the reporting limit listed.  
 --- denotes sample not analyzed.

<sup>1</sup>In feet referenced to North American Vertical Datum of 1988 (NAVD88).

<sup>2</sup>Analyzed by Northwest Method NWTPH-Dx.

<sup>3</sup>Analyzed by Northwest Method NWTPH-Gx.

<sup>4</sup>Analyzed by U.S. Environmental Protection Agency Method 8021B.

<sup>5</sup>Washington State Model Toxics Control Act Cleanup Regulation (MTCA) Method A Cleanup Levels for Groundwater, Table 721-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as amended 2013.

<sup>6</sup>Screening level is 800 micrograms per liter if benzene is detected and 1,000 micrograms per liter if benzene is not detected.

BTEX = benzene, toluene, ethylbenzene, and xylenes

DRO = total petroleum hydrocarbons (TPH) as diesel-range organics

GRO = TPH as gasoline-range organics

M = hydrocarbons in the gasoline range are impacting the diesel-range result

ORO = TPH as oil-range organics

T = the sample chromatogram is not similar to a typical gas

Z = the gasoline result is mainly attributed to a single peak (naphthalene)

**Table 5  
Groundwater Analytical Results for PAHs  
Block 38 West Property  
Seattle, Washington  
Farallon PN: 397-019**

| Sample Location  | Sample Date | Sample Identification | Screened Interval (feet NAVD88) <sup>1</sup> | Analytical Results (micrograms per liter) <sup>2</sup> |                     |                     |                                 |                        |                |                          |                      |                        |                        |              |                        |                |                    |                      |                        |          |                        |                         |                                |          |
|--|-------------|-----------------------|--|--|---------------------|---------------------|---------------------------------|------------------------|----------------|--------------------------|----------------------|------------------------|------------------------|--------------|------------------------|----------------|--------------------|----------------------|------------------------|----------|------------------------|-------------------------|--------------------------------|----------|
|  |             |                       |  | Non-Carcinogenic PAHs                                  |                     |                     |                                 |                        |                |                          |                      |                        |                        |              | Carcinogenic PAHs      |                |                    |                      |                        |          |                        |                         |                                |          |
|  |             |                       |  | Naphthalene  | 1-Methylnaphthalene | 2-Methylnaphthalene | Total Naphthalenes <sup>3</sup> | Acenaphthene           | Acenaphthylene | Anthracene               | Benzo(g,h,i)Perylene | Fluoranthene           | Fluorene               | Phenanthrene | Pyrene                 | Benzo(a)Pyrene | Benzo(a)Anthracene | Benzo(b)Fluoranthene | Benzo(j,k)Fluoranthene | Chrysene | Dibenzo(a,h)Anthracene | Indeno(1,2,3-c,d)Pyrene | Total cPAHs TEC <sup>4,5</sup> |          |
| <b>Reconnaissance Groundwater Samples from Borings</b> |             |                       |  |  |                     |                     |                                 |                        |                |                          |                      |                        |                        |              |                        |                |                    |                      |                        |          |                        |                         |                                |          |
| FB-03  | 8/23/2018   | FB-03-082318          | 8.8 to 3.8                                   | < 1.3  | ---                 | ---                 | < 1.3                           | ---                    | ---            | ---                      | ---                  | ---                    | ---                    | ---          | ---                    | ---            | ---                | ---                  | ---                    | ---      | ---                    | ---                     | ---                            |          |
| FMW-130  | 7/21/2014   | F-MW-130-GW1-072114   | 7.2 to 2.2                                   | 650 E  | ---                 | ---                 | <b>650 E</b>                    | ---                    | ---            | ---                      | ---                  | ---                    | ---                    | ---          | ---                    | ---            | ---                | ---                  | ---                    | ---      | ---                    | ---                     | ---                            |          |
| <b>Groundwater Samples from Monitoring Wells</b>       |             |                       |  |  |                     |                     |                                 |                        |                |                          |                      |                        |                        |              |                        |                |                    |                      |                        |          |                        |                         |                                |          |
| FMW-130  | 8/30/2018   | FMW-130-083018        | -22.8 to -32.8                               | < 0.097  | < 0.097             | < 0.097             | < 0.291                         | < 0.097                | < 0.097        | < 0.097                  | < 0.0097             | < 0.097                | < 0.097                | < 0.097      | < 0.097                | < 0.0097       | < 0.0097           | < 0.0097             | < 0.0097               | < 0.0097 | < 0.0097               | < 0.0097                | < 0.0073                       |          |
|  | 12/28/2018  | FMW130-122818         |  | < 0.11   | < 0.11              | < 0.11              | < 0.33                          | < 0.11                 | < 0.11         | < 0.11                   | < 0.011              | < 0.11                 | < 0.11                 | < 0.11       | < 0.11                 | < 0.11         | < 0.011            | < 0.011              | < 0.011                | < 0.011  | < 0.011                | < 0.011                 | < 0.011                        | < 0.0083 |
|  | 3/26/2019   | FMW-130-032619        |  | ---  | ---                 | ---                 | ---                             | ---                    | ---            | ---                      | ---                  | ---                    | ---                    | ---          | ---                    | ---            | < 0.011            | 0.015                | 0.011                  | < 0.011  | 0.015                  | < 0.011                 | < 0.011                        | 0.0099   |
| FMW-132  | 8/30/2018   | FMW-132-083018        | 20.7 to 15.7                                 | < 0.096  | < 0.096             | < 0.096             | < 0.288                         | 0.40                   | < 0.096        | < 0.096                  | < 0.0096             | < 0.096                | < 0.096                | < 0.096      | < 0.096                | < 0.0096       | < 0.0096           | < 0.0096             | < 0.0096               | < 0.0096 | < 0.0096               | < 0.0096                | < 0.0072                       |          |
|  | 12/28/2018  | FMW132-122818         |  | < 0.10   | < 0.10              | < 0.10              | < 0.30                          | 0.29                   | < 0.10         | < 0.10                   | < 0.010              | < 0.10                 | < 0.10                 | < 0.10       | < 0.10                 | < 0.010        | < 0.010            | < 0.010              | < 0.010                | < 0.010  | < 0.010                | < 0.010                 | < 0.0076                       |          |
|  | 3/26/2019   | FMW-132-032619        |  | ---  | ---                 | ---                 | ---                             | ---                    | ---            | ---                      | ---                  | ---                    | ---                    | ---          | ---                    | ---            | < 0.010            | < 0.010              | < 0.010                | < 0.010  | < 0.010                | < 0.010                 | < 0.010                        | < 0.0076 |
| FMW-133  | 8/30/2018   | FMW-133-083018        | 18.8 to 13.8                                 | < 0.097  | < 0.097             | < 0.097             | < 0.291                         | 0.38                   | < 0.097        | < 0.097                  | < 0.0097             | < 0.097                | 0.098                  | < 0.097      | < 0.097                | < 0.0097       | < 0.0097           | < 0.0097             | < 0.0097               | < 0.0097 | < 0.0097               | < 0.0097                | < 0.0073                       |          |
|  | 12/28/2018  | FMW133-122818         |  | < 0.10   | < 0.10              | < 0.10              | < 0.30                          | 0.33                   | < 0.10         | < 0.10                   | < 0.010              | < 0.10                 | < 0.10                 | < 0.10       | < 0.10                 | < 0.010        | < 0.010            | < 0.010              | < 0.010                | < 0.010  | < 0.010                | < 0.010                 | < 0.0076                       |          |
|  | 3/26/2019   | FMW-133-032619        |  | ---  | ---                 | ---                 | ---                             | ---                    | ---            | ---                      | ---                  | ---                    | ---                    | ---          | ---                    | ---            | < 0.011            | < 0.011              | < 0.011                | < 0.011  | < 0.011                | < 0.011                 | < 0.011                        | < 0.0083 |
| FMW-134  | 8/30/2018   | FMW-134-083018        | 13.4 to 8.4                                  | 290  | 10                  | 12                  | <b>312</b>                      | 8.3                    | 0.12           | < 0.099                  | < 0.0099             | < 0.099                | 1.6                    | 0.48         | < 0.099                | < 0.0099       | < 0.0099           | < 0.0099             | < 0.0099               | < 0.0099 | < 0.0099               | < 0.0099                | < 0.0075                       |          |
|  | 12/28/2018  | FMW134-122818         |  | 23   | 0.67                | 0.77                | 25                              | 0.71                   | < 0.11         | < 0.11                   | < 0.011              | < 0.11                 | < 0.11                 | < 0.11       | < 0.11                 | < 0.011        | < 0.011            | < 0.011              | < 0.011                | < 0.011  | < 0.011                | < 0.011                 | < 0.0083                       |          |
|  | 12/28/2018  | FMW500-122818         |  | 62   | 1.7                 | 2.3                 | 66                              | 1.6                    | < 0.10         | < 0.10                   | < 0.010              | < 0.10                 | 0.15                   | < 0.10       | < 0.10                 | < 0.010        | < 0.010            | < 0.010              | < 0.010                | < 0.010  | < 0.010                | < 0.010                 | < 0.0076                       |          |
|  | 3/26/2019   | FMW-134-032619        |  | ---  | ---                 | ---                 | ---                             | ---                    | ---            | ---                      | ---                  | ---                    | ---                    | ---          | ---                    | ---            | < 0.010            | < 0.010              | < 0.010                | < 0.010  | < 0.010                | < 0.010                 | < 0.010                        | < 0.0076 |
| FMW-135  | 8/30/2018   | FMW-135-083018        | 18.6 to 13.6                                 | 0.35   | 0.68                | 0.29                | 1.32                            | 0.39                   | < 0.096        | < 0.096                  | < 0.0096             | < 0.096                | < 0.096                | < 0.096      | < 0.096                | < 0.0096       | < 0.0096           | < 0.0096             | < 0.0096               | < 0.0096 | < 0.0096               | < 0.0096                | < 0.0072                       |          |
|  | 12/28/2018  | FMW135-122818         |  | < 0.099  | 0.45                | 0.11                | 0.56                            | 0.33                   | < 0.099        | < 0.099                  | < 0.0099             | < 0.099                | < 0.099                | < 0.099      | < 0.099                | < 0.0099       | < 0.0099           | < 0.0099             | < 0.0099               | < 0.0099 | < 0.0099               | < 0.0099                | < 0.0075                       |          |
|  | 3/26/2019   | FMW-135-032619        |  | ---  | ---                 | ---                 | ---                             | ---                    | ---            | ---                      | ---                  | ---                    | ---                    | ---          | ---                    | ---            | < 0.011            | < 0.011              | < 0.011                | < 0.011  | < 0.011                | < 0.011                 | < 0.011                        | < 0.0083 |
| FMW-136  | 8/30/2018   | FMW-136-083018        | -4.9 to -14.9                                | 0.39   | < 0.096             | < 0.096             | 0.39                            | < 0.096                | < 0.096        | < 0.096                  | < 0.0096             | < 0.096                | < 0.096                | < 0.096      | < 0.096                | < 0.0096       | < 0.0096           | < 0.0096             | < 0.0096               | < 0.0096 | < 0.0096               | < 0.0096                | < 0.0072                       |          |
|  | 12/28/2018  | FMW136-122818         |  | < 0.10   | < 0.10              | < 0.10              | < 0.30                          | < 0.10                 | < 0.10         | < 0.10                   | < 0.010              | < 0.10                 | < 0.10                 | < 0.10       | < 0.10                 | < 0.010        | < 0.010            | < 0.010              | < 0.010                | < 0.010  | < 0.010                | < 0.010                 | < 0.0076                       |          |
|  | 3/26/2019   | FMW-136-032619        |  | ---  | ---                 | ---                 | ---                             | ---                    | ---            | ---                      | ---                  | ---                    | ---                    | ---          | ---                    | ---            | < 0.010            | < 0.010              | < 0.010                | < 0.010  | < 0.010                | < 0.010                 | < 0.010                        | < 0.0076 |
| FMW-144  | 12/26/2019  | FMW-144-122619        | -8.6 to -13.6                                | < 0.094  | < 0.094             | < 0.094             | < 0.282                         | ---                    | ---            | ---                      | ---                  | ---                    | ---                    | ---          | ---                    | < 0.0094       | < 0.0094           | < 0.0094             | < 0.0094               | < 0.0094 | < 0.0094               | < 0.0071                |                                |          |
| FMW-145  | 12/26/2019  | FMW-145-122619        | -8.1 to -13.1                                | < 0.094  | < 0.094             | < 0.094             | < 0.282                         | ---                    | ---            | ---                      | ---                  | ---                    | ---                    | ---          | ---                    | < 0.0094       | < 0.0094           | < 0.0094             | < 0.0094               | < 0.0094 | < 0.0094               | < 0.0071                |                                |          |
| FMW-146  | 12/26/2019  | FMW-146-122619        | -7.8 to -12.8                                | 15   | 9.2                 | 13                  | 37.2                            | ---                    | ---            | ---                      | ---                  | ---                    | ---                    | ---          | ---                    | < 0.0094       | 0.043              | 0.013                | < 0.0094               | 0.036    | < 0.0094               | < 0.0094                | 0.012                          |          |
| FMW-147  | 12/26/2019  | FMW-147-122619        | -8.2 to -13.2                                | 2.0  | 0.57                | 0.57                | 3.14                            | ---                    | ---            | ---                      | ---                  | ---                    | ---                    | ---          | ---                    | 0.023          | 0.042              | 0.031                | < 0.010                | 0.033    | < 0.010                | 0.014                   | 0.033                          |          |
| FMW-149  | 12/26/2019  | FMW-149-122619        | -7.8 to -12.8                                | 0.15   | < 0.094             | < 0.094             | 0.15                            | ---                    | ---            | ---                      | ---                  | ---                    | ---                    | ---          | ---                    | < 0.0094       | < 0.0094           | < 0.0094             | < 0.0094               | < 0.0094 | < 0.0094               | < 0.0094                | < 0.0071                       |          |
| <b>Screening Levels<sup>6</sup></b>                    |             |                       |  |  |                     |                     | <b>160</b>                      | <b>960<sup>7</sup></b> | <b>NE</b>      | <b>4,800<sup>7</sup></b> | <b>NE</b>            | <b>640<sup>7</sup></b> | <b>640<sup>7</sup></b> | <b>NE</b>    | <b>480<sup>7</sup></b> |                |                    |                      |                        |          |                        |                         | <b>0.1</b>                     |          |

NOTES:  
 Results in **bold** denote concentrations exceeding applicable screening levels.  
 < denotes analyte not detected at or exceeding the reporting limit listed.  
 --- denotes sample not analyzed.

<sup>1</sup>In feet referenced to North American Vertical Datum of 1988 (NAVD88).  
<sup>2</sup>Analyzed by U.S. Environmental Protection Agency (EPA) Method 8270D/SIM. FB-03 and FMW-130 reconnaissance groundwater samples analyzed by EPA Method 8260C.  
<sup>3</sup>Sum of naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.  
<sup>4</sup>Total cPAHs derived using the total toxicity equivalency method in Section 708(8) of Chapter 173-340 of the Washington Administrative Code.  
<sup>5</sup>For concentrations reported at less than the laboratory reporting limit, half the reporting limit was used to calculate total. If all constituent concentrations are non-detect, calculated total is indicated non-detect.  
<sup>6</sup>Washington State Model Toxics Control Act Cleanup Regulation (MTCA) Method A Cleanup Levels for Groundwater, Table 720-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as revised 2013, unless  
<sup>7</sup>MTCA Cleanup Levels and Risk Calculations, Standard Method B Values for Groundwater, <https://fortress.wa.gov/ecy/clarc/CLARCHome.aspx>.

cPAHs = carcinogenic polycyclic aromatic hydrocarbons  
 E = result exceeded instrument quantitation range and is an estimate  
 NE = not established  
 PAHs = polycyclic aromatic hydrocarbons  
 TEC = toxic equivalent concentration

**Table 6**  
**Monitoring Well Summary**  
**Block 38 West Property**  
**Seattle, Washington**  
**Farallon PN: 397-019**

| Location | Water-Bearing Zone | Screened Interval (feet bgs) <sup>1</sup> | Screened Interval (feet NAVD88) <sup>2</sup> | Top of Casing Elevation (feet NAVD88) <sup>2</sup> | Monitoring Well Decommissioned | Date Decommissioned |
|----------|--------------------|---|--|--|--------------------------------|---------------------|
| FMW-130  | Intermediate       | 45.0 to 55.0                              | -22.8 to -32.8                               | 21.86  | Yes                            | 11/4/2019           |
| FMW-132  | Shallow            | 5.0 to 10.0                               | 20.7 to 15.7                                 | 25.48  | Yes                            | 11/4/2019           |
| FMW-133  | Shallow            | 6.5 to 11.5                               | 18.8 to 13.8                                 | 24.87  | Yes                            | 11/4/2019           |
| FMW-134  | Shallow            | 12.0 to 17.0                              | 13.4 to 8.4                                  | 24.98  | No                             | 2/13/2020           |
| FMW-135  | Shallow            | 7.0 to 12.0                               | 18.6 to 13.6                                 | 25.29  | Yes                            | 1/8/2020            |
| FMW-136  | Intermediate       | 30.0 to 40.0                              | -4.9 to -14.9                                | 24.79  | No                             | 2/13/2020           |
| FMW-144  | Intermediate       | 38.0 to 43.0                              | -8.0 to -13.0                                | 29.41  | Yes                            | 1/8/2020            |
| FMW-145  | Intermediate       | 31.0 to 36.0                              | -8.0 to -13.0                                | 22.90  | Yes                            | 1/8/2020            |
| FMW-146  | Intermediate       | 31.0 to 36.0                              | -8.0 to -13.0                                | 23.19  | Yes                            | 1/8/2020            |
| FMW-147  | Intermediate       | 31.0 to 36.0                              | -8.0 to -13.0                                | 22.82  | Yes                            | 1/8/2020            |
| FMW-148  | Intermediate       | 45.0 to 50.0                              | -8.0 to -13.0                                | Not surveyed                                       | Yes                            | 12/23/2019          |
| FMW-149  | Intermediate       | 44.0 to 49.0                              | -8.0 to -13.0                                | 36.21  | Yes                            | 1/8/2020            |

**NOTES:**

<sup>1</sup>Depth in feet below ground surface.

<sup>2</sup>In feet referenced to North American Vertical Datum of 1988 (NAVD88).

<sup>3</sup>In feet below top of well casing.

bgs = below ground surface

**ATTACHMENT A**  
**CONSTRUCTION PLAN EXCERPT – SHEETS A101 AND A102**

MONITORING WELL INSTALLATION  
Block 38 West Property  
500 through 536 Westlake Avenue North  
Seattle Washington

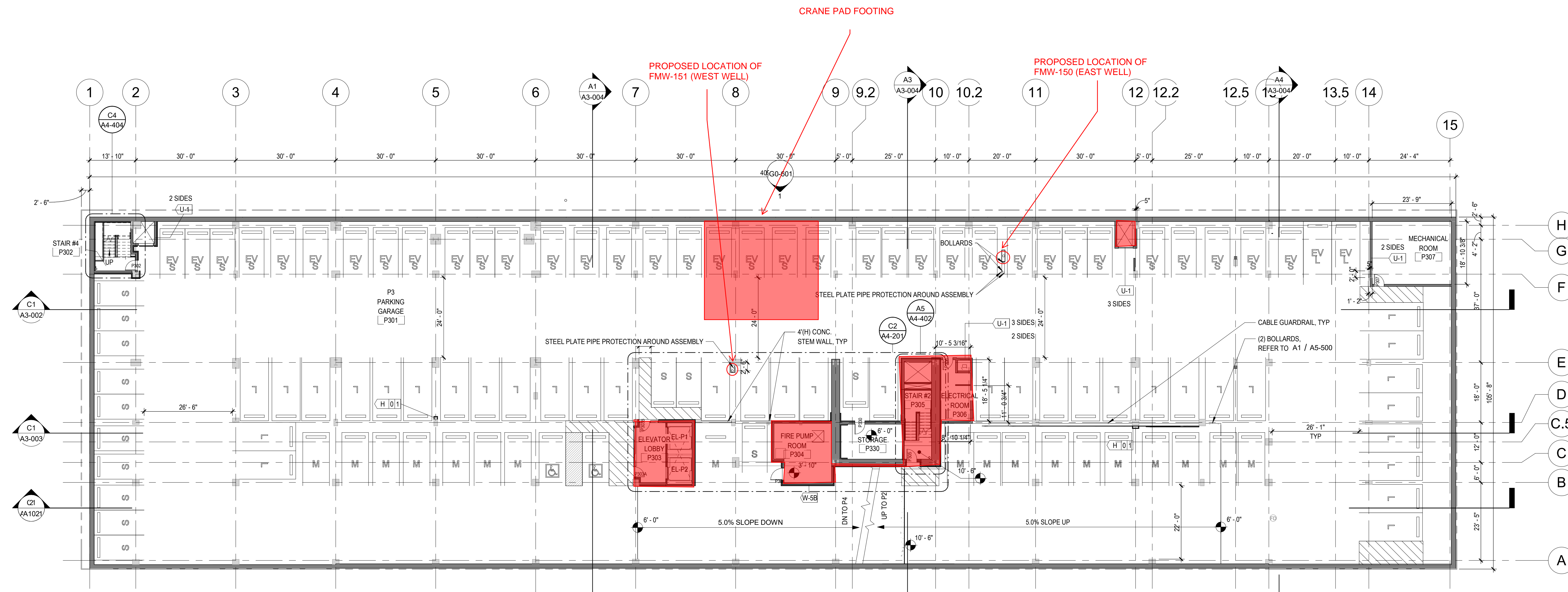
Farallon PN: 397-019



**FLOOR PLAN NOTES**

- TYPICAL PARTITION TYPE SHALL BE (A04), UNLESS OTHERWISE TAGGED.
- TYPICAL FURRING PARTITION TYPE SHALL BE (H04), UNLESS OTHERWISE TAGGED.
- THE BUTT EDGE OF FINISHED DOOR OPENINGS SHALL BE INSTALLED 1" FROM AN ADJACENT WALL. UNO. ALL THRESHOLDS SHALL BE 1/2" AFF MAX.
- PROVIDE 3-HR RATED FIRE PROOFING TO ALL PRIMARY STRUCTURAL STEEL FRAME.
- PROVIDE 2-HR RATED FIRE PROOFING TO ALL FLOOR CONSTRUCTION AND ASSOCIATED SECONDARY STEEL FLOOR FRAMING MEMBERS.
- PROVIDE 1-HR RATED FIRE PROOFING TO ALL ROOF CONSTRUCTION AND ASSOCIATED SECONDARY MEMBERS.

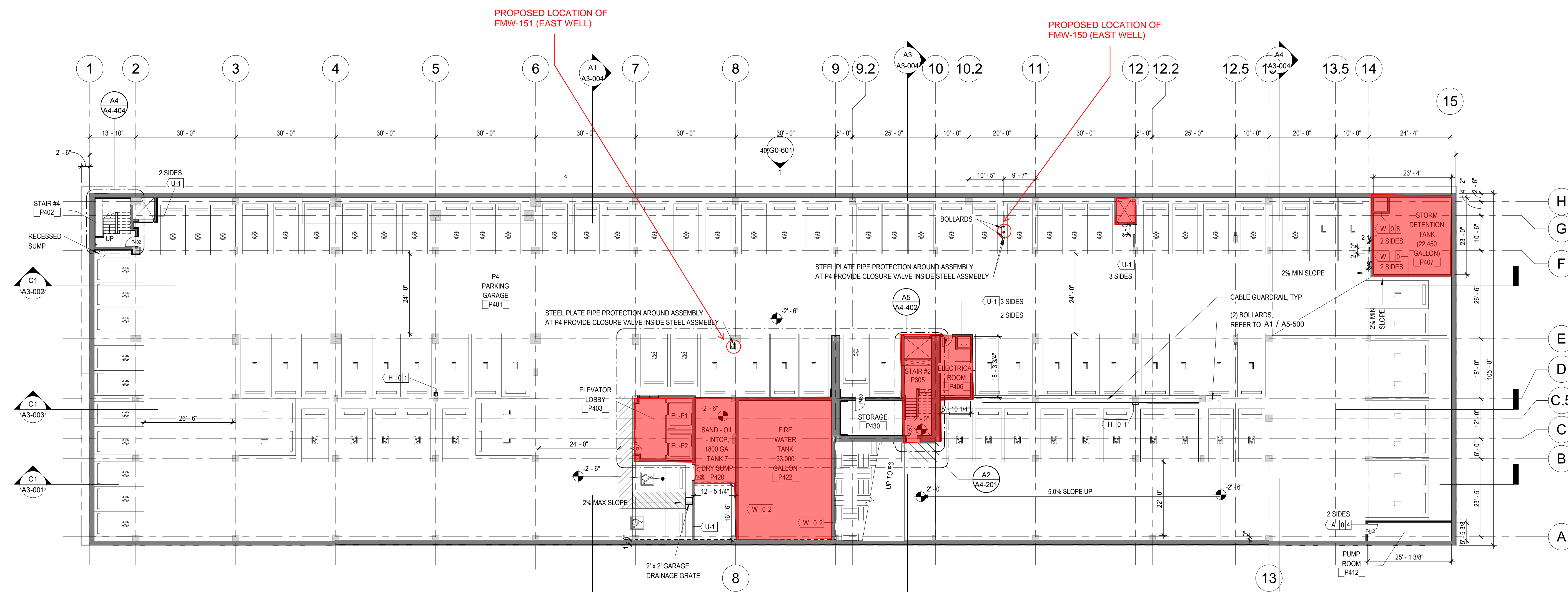
☐ DENOTES CARD READER - GENERAL LOCATION ONLY - SEE DETAILED MOUNTING INSTRUCTIONS



**C1 LEVEL P3 PLAN**  
SCALE: 1/16" = 1'-0"

**SCHEDULE - PARKING STALL COUNT**

| LEVEL            | TYPE                      | LABEL | WIDTH | DEPTH  | COUNT |
|------------------|---------------------------|-------|-------|--------|-------|
| LEVEL P4         | ACC STALL - LARGE         | VAN   | 8'-6" | 19'-0" | 1     |
| LEVEL P4         | ACC STALL - MEDIUM        | ACC   | 8'-0" | 16'-0" | 1     |
| LEVEL P4         | LARGE STALL SEATTLE       | L     | 8'-6" | 19'-0" | 37    |
| LEVEL P4         | MEDIUM STALL SEATTLE      | M     | 8'-0" | 16'-0" | 17    |
| LEVEL P4         | SMALL STALL SEATTLE       | S     | 7'-6" | 15'-0" | 46    |
| LEVEL P4: 102    |                           |       |       |        |       |
| LEVEL P3         | ACC STALL - MEDIUM        | ACC   | 8'-0" | 16'-0" | 2     |
| LEVEL P3         | LARGE STALL SEATTLE       | L     | 8'-6" | 19'-0" | 36    |
| LEVEL P3         | LARGE STALL SEATTLE - LEV | EV    | 8'-6" | 19'-0" | 2     |
| LEVEL P3         | MEDIUM STALL SEATTLE      | M     | 8'-0" | 16'-0" | 18    |
| LEVEL P3         | SMALL STALL SEATTLE       | S     | 7'-6" | 15'-0" | 14    |
| LEVEL P3         | SMALL STALL SEATTLE - LEV | EV    | 7'-6" | 15'-0" | 35    |
| LEVEL P3: 107    |                           |       |       |        |       |
| LEVEL P2         | ACC STALL - MEDIUM        | ACC   | 8'-0" | 16'-0" | 2     |
| LEVEL P2         | LARGE STALL SEATTLE       | L     | 8'-6" | 19'-0" | 35    |
| LEVEL P2         | LARGE STALL SEATTLE - LEV | EV    | 8'-6" | 19'-0" | 2     |
| LEVEL P2         | MEDIUM STALL SEATTLE      | M     | 8'-0" | 16'-0" | 19    |
| LEVEL P2         | SMALL STALL SEATTLE       | S     | 7'-6" | 15'-0" | 13    |
| LEVEL P2         | SMALL STALL SEATTLE - LEV | EV    | 7'-6" | 15'-0" | 35    |
| LEVEL P2: 106    |                           |       |       |        |       |
| LEVEL P1         | ACC VAN STALL             | VAN   | 8'-0" | 19'-0" | 2     |
| LEVEL P1         | LARGE STALL SEATTLE       | L     | 8'-6" | 19'-0" | 9     |
| LEVEL P1         | MEDIUM STALL SEATTLE      | M     | 8'-0" | 16'-0" | 12    |
| LEVEL P1         | SMALL STALL SEATTLE       | S     | 7'-6" | 15'-0" | 10    |
| LEVEL P1: 33     |                           |       |       |        |       |
| GRAND TOTAL: 348 |                           |       |       |        |       |



**A1 LEVEL P4 PLAN**  
SCALE: 1/16" = 1'-0"

**SCHEDULE - ELECTRICAL CHARGING PARKING STALL COUNT (EV)**

| LEVEL                 | TYPE                      | LABEL | WIDTH | DEPTH  | COUNT |
|-----------------------|---------------------------|-------|-------|--------|-------|
| LEVEL P3              | LARGE STALL SEATTLE - LEV | EV    | 8'-6" | 19'-0" | 2     |
| LEVEL P3              | SMALL STALL SEATTLE - LEV | EV    | 7'-6" | 15'-0" | 35    |
| LEVEL P3: 37          |                           |       |       |        |       |
| LEVEL P2              | LARGE STALL SEATTLE - LEV | EV    | 8'-6" | 19'-0" | 2     |
| LEVEL P2              | SMALL STALL SEATTLE - LEV | EV    | 7'-6" | 15'-0" | 35    |
| LEVEL P2: 37          |                           |       |       |        |       |
| GRAND TOTAL: 74 (21%) |                           |       |       |        |       |

**SCHEDULE - ACCESSIBLE STALL COUNT**

| LEVEL                             | TYPE               | LABEL | WIDTH | DEPTH  | COUNT |
|-----------------------------------|--------------------|-------|-------|--------|-------|
| LEVEL P4                          | ACC STALL - LARGE  | VAN   | 8'-6" | 19'-0" | 1     |
| LEVEL P4                          | ACC STALL - MEDIUM | ACC   | 8'-0" | 16'-0" | 1     |
| LEVEL P4: 2                       |                    |       |       |        |       |
| LEVEL P3                          | ACC STALL - MEDIUM | ACC   | 8'-0" | 16'-0" | 2     |
| LEVEL P3: 2                       |                    |       |       |        |       |
| LEVEL P2                          | ACC STALL - MEDIUM | ACC   | 8'-0" | 16'-0" | 2     |
| LEVEL P2: 2                       |                    |       |       |        |       |
| LEVEL P1                          | ACC VAN STALL      | VAN   | 8'-0" | 19'-0" | 2     |
| LEVEL P1: 2                       |                    |       |       |        |       |
| GRAND TOTAL: 8 (PER TABLE 1106.1) |                    |       |       |        |       |

BLOCK 38

PH 2 REV 2 - rough draft

6882573-PH

| MARK | DATE       | DESCRIPTION   |
|------|------------|---------------|
| 29   | 04/09/20   | ASH#16        |
| 23   | 03/24/20   | ASH#11        |
| 16   | 03/04/2020 | Phase 2 Rev 1 |
| 13   | 01/14/2020 | ASH#5         |
| 9    | 10/04/2019 | ASH#1         |
| 8    | 08/23/2019 | Phase 1 Rev 2 |
|      |            | RFIS          |

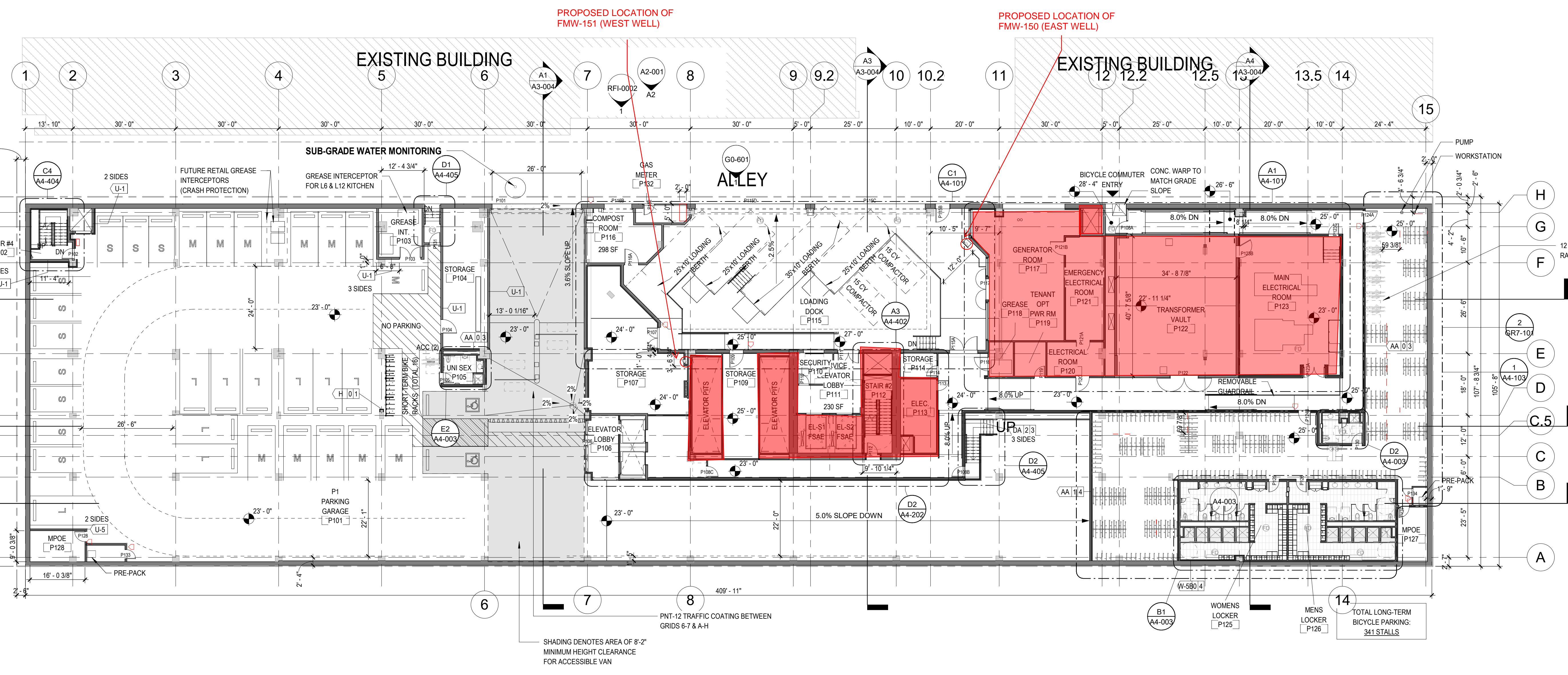
|                |                   |
|----------------|-------------------|
| SCALE          | PROJECT ARCHITECT |
| As indicated   | JC                |
| PROJECT NUMBER | 101292.00         |
| DATE           | 011420            |

SHEET NAME  
**FLOOR PLANS - LEVEL P4 & P3**

SHEET NUMBER  
**A1-001**  
SHEET OF 250

**FLOOR PLAN NOTES**

- TYPICAL PARTITION TYPE SHALL BE (A04), UNLESS OTHERWISE TAGGED.
  - TYPICAL FURRING PARTITION TYPE SHALL BE (H04), UNLESS OTHERWISE TAGGED.
  - THE BUTT EDGE OF FINISHED DOOR OPENINGS SHALL BE INSTALLED 6" FROM AN ADJACENT WALL UNO.
  - ALL THRESHOLDS SHALL BE 1/2" AFF MAX.
  - PROVIDE 3-HR RATED FIRE PROOFING TO ALL PRIMARY STRUCTURAL STEEL FRAME.
  - PROVIDE 3-HR RATED FIRE PROOFING TO ALL FLOOR CONSTRUCTION AND ASSOCIATED SECONDARY STEEL FLOOR FRAMING MEMBERS.
  - PROVIDE 1-HR RATED FIRE PROOFING TO ALL ROOF CONSTRUCTION AND ASSOCIATED SECONDARY MEMBERS.
- ⬢ DENOTES CARD READER - GENERAL LOCATION ONLY - SEE DETAILED MOUNTING INSTRUCTIONS



**C1 LEVEL P1 PLAN**  
 SCALE: 1/16" = 1'-0"

**SCHEDULE - PARKING STALL COUNT**

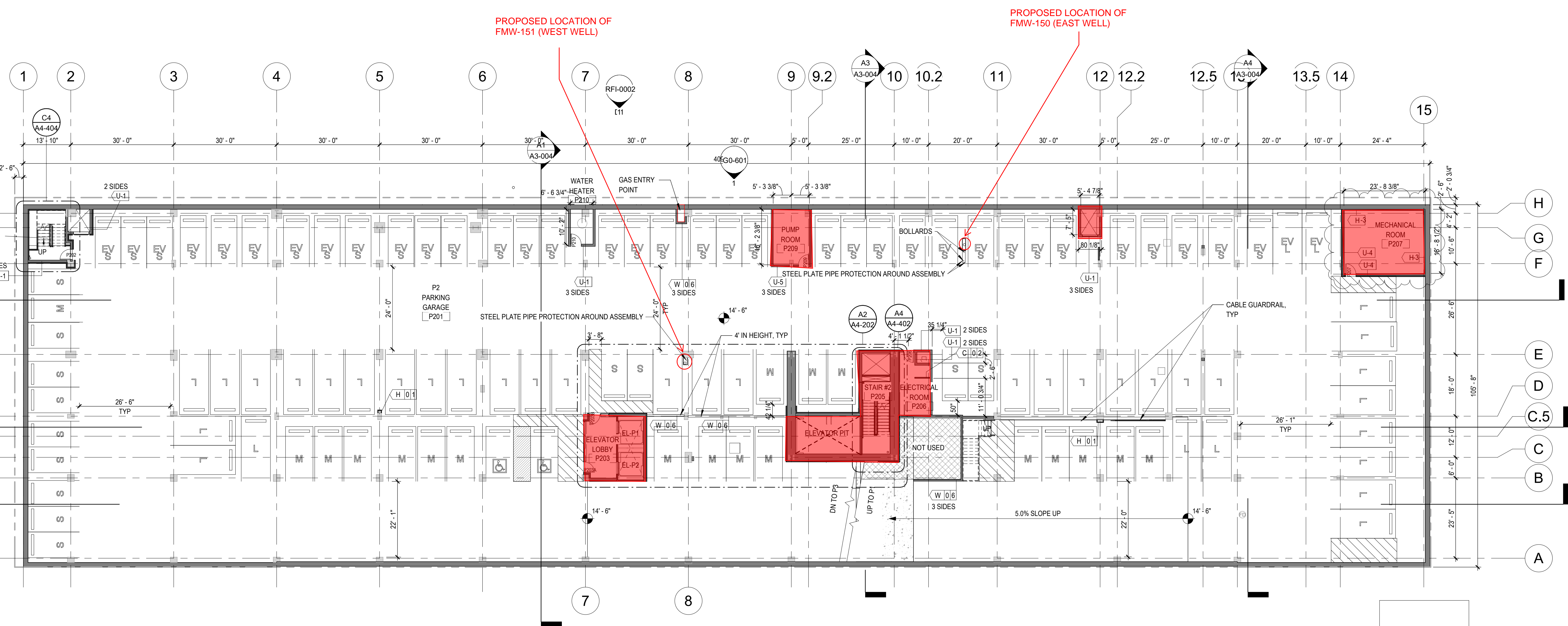
| LEVEL         | TYPE                      | LABEL | WIDTH | DEPTH  | COUNT |
|---------------|---------------------------|-------|-------|--------|-------|
| LEVEL P4      | ACC STALL - LARGE         | VAN   | 8'-6" | 19'-0" | 1     |
| LEVEL P4      | ACC STALL - MEDIUM        | ACC   | 8'-0" | 16'-0" | 1     |
| LEVEL P4      | LARGE STALL SEATTLE       | L     | 8'-6" | 19'-0" | 37    |
| LEVEL P4      | MEDIUM STALL SEATTLE      | M     | 8'-0" | 16'-0" | 17    |
| LEVEL P4      | SMALL STALL SEATTLE       | S     | 7'-6" | 15'-0" | 46    |
| LEVEL P4: 102 |                           |       |       |        |       |
| LEVEL P3      | ACC STALL - MEDIUM        | ACC   | 8'-0" | 16'-0" | 2     |
| LEVEL P3      | LARGE STALL SEATTLE       | L     | 8'-6" | 19'-0" | 36    |
| LEVEL P3      | LARGE STALL SEATTLE - LEV | EV    | 8'-6" | 19'-0" | 2     |
| LEVEL P3      | MEDIUM STALL SEATTLE      | M     | 8'-0" | 16'-0" | 18    |
| LEVEL P3      | SMALL STALL SEATTLE       | S     | 7'-6" | 15'-0" | 14    |
| LEVEL P3      | SMALL STALL SEATTLE - LEV | EV    | 7'-6" | 15'-0" | 35    |
| LEVEL P3: 107 |                           |       |       |        |       |
| LEVEL P2      | ACC STALL - MEDIUM        | ACC   | 8'-0" | 16'-0" | 2     |
| LEVEL P2      | LARGE STALL SEATTLE       | L     | 8'-6" | 19'-0" | 35    |
| LEVEL P2      | LARGE STALL SEATTLE - LEV | EV    | 8'-6" | 19'-0" | 2     |
| LEVEL P2      | MEDIUM STALL SEATTLE      | M     | 8'-0" | 16'-0" | 19    |
| LEVEL P2      | SMALL STALL SEATTLE       | S     | 7'-6" | 15'-0" | 13    |
| LEVEL P2      | SMALL STALL SEATTLE - LEV | EV    | 7'-6" | 15'-0" | 35    |
| LEVEL P2: 106 |                           |       |       |        |       |
| LEVEL P1      | ACC VAN STALL             | VAN   | 8'-0" | 19'-0" | 2     |
| LEVEL P1      | LARGE STALL SEATTLE       | L     | 8'-6" | 19'-0" | 9     |
| LEVEL P1      | MEDIUM STALL SEATTLE      | M     | 8'-0" | 16'-0" | 12    |
| LEVEL P1      | SMALL STALL SEATTLE       | S     | 7'-6" | 15'-0" | 10    |
| LEVEL P1: 33  |                           |       |       |        |       |
| GRAND TOTAL:  |                           |       |       |        | 348   |

**SCHEDULE - ELECTRICAL CHARGING PARKING STALL COUNT (EV)**

| LEVEL        | TYPE                      | LABEL | WIDTH | DEPTH  | COUNT    |
|--------------|---------------------------|-------|-------|--------|----------|
| LEVEL P3     | LARGE STALL SEATTLE - LEV | EV    | 8'-6" | 19'-0" | 2        |
| LEVEL P3     | SMALL STALL SEATTLE - LEV | EV    | 7'-6" | 15'-0" | 35       |
| LEVEL P3: 37 |                           |       |       |        |          |
| LEVEL P2     | LARGE STALL SEATTLE - LEV | EV    | 8'-6" | 19'-0" | 2        |
| LEVEL P2     | SMALL STALL SEATTLE - LEV | EV    | 7'-6" | 15'-0" | 35       |
| LEVEL P2: 37 |                           |       |       |        |          |
| GRAND TOTAL: |                           |       |       |        | 74 (21%) |

**SCHEDULE - ACCESSIBLE STALL COUNT**

| LEVEL        | TYPE               | LABEL | WIDTH | DEPTH  | COUNT                |
|--------------|--------------------|-------|-------|--------|----------------------|
| LEVEL P4     | ACC STALL - LARGE  | VAN   | 8'-6" | 19'-0" | 1                    |
| LEVEL P4     | ACC STALL - MEDIUM | ACC   | 8'-0" | 16'-0" | 1                    |
| LEVEL P4: 2  |                    |       |       |        |                      |
| LEVEL P3     | ACC STALL - MEDIUM | ACC   | 8'-0" | 16'-0" | 2                    |
| LEVEL P3: 2  |                    |       |       |        |                      |
| LEVEL P2     | ACC STALL - MEDIUM | ACC   | 8'-0" | 16'-0" | 2                    |
| LEVEL P2: 2  |                    |       |       |        |                      |
| LEVEL P1     | ACC VAN STALL      | VAN   | 8'-0" | 19'-0" | 2                    |
| LEVEL P1: 2  |                    |       |       |        |                      |
| GRAND TOTAL: |                    |       |       |        | 8 (PER TABLE 1106.1) |



**A1 LEVEL P2 PLAN**  
 SCALE: 1/16" = 1'-0"

BLOCK 38

PH 2 REV 2 - rough draft

6682573-PH

| MARK | DATE       | DESCRIPTION   |
|------|------------|---------------|
| 30   | 05/17/20   | PHASE 2 REV 2 |
| 29   | 04/09/20   | ASH#16        |
| 23   | 03/24/20   | ASH#11        |
| 19   | 02/20/20   | ASH#8         |
| 16   | 03/04/20   | Phase 2 Rev 1 |
| 13   | 01/14/20   | ASH#5         |
| 11   | 11/27/2019 | ASH#4         |
| 9    | 10/04/2019 | ASH#1         |
| 8    | 08/23/2019 | Phase 1 Rev 2 |
| 5    | 04/24/2019 | Phase 1 Rev 1 |
| 1    | 3/31/2016  | Revision 1    |
|      |            | RFIS          |

| SCALE          | PROJECT ARCHITECT |
|----------------|-------------------|
| As Indicated   | JC                |
| PROJECT NUMBER | 101292.00         |
| DATE           | 011420            |

SHEET NAME  
**FLOOR PLANS - LEVEL P2 & P1**

SHEET NUMBER  
**A1-002**  
 SHEET OF 250

**ATTACHMENT B**  
**SAMPLING AND ANALYSIS PLAN**

MONITORING WELL INSTALLATION  
Block 38 West Property  
500 through 536 Westlake Avenue North  
Seattle Washington

Farallon PN: 397-019

**SAMPLING AND ANALYSIS PLAN  
MONITORING WELL INSTALLATION**

**BLOCK 38 WEST PROPERTY  
500 THROUGH 536 WESTLAKE AVENUE NORTH  
SEATTLE, WASHINGTON**

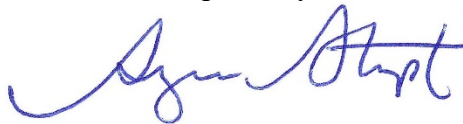
**Submitted by:  
Farallon Consulting, L.L.C.  
975 5<sup>th</sup> Avenue Northwest  
Issaquah, Washington 98027**

**Farallon PN: 397-019  
AGREED ORDER NO. DE 17963**

**For:  
City Investors IX LLC  
505 5<sup>th</sup> Avenue South  
Seattle, Washington 98104**

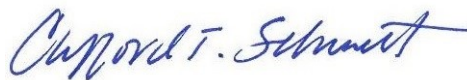
May 22, 2020

Prepared by:



Suzy Stumpf, P.E.  
Senior Design Engineer

Reviewed by:



Clifford T. Schmitt, L.G., L.H.G.  
Principal Hydrogeologist



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|            |  |            |
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Figure 1 *Site Plan with Proposed Sampling Locations*

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## 1.0 INTRODUCTION

Farallon Consulting, L.L.C. (Farallon) has prepared this Sampling and Analysis Plan (SAP) on behalf of City Investors IX L.L.C. (City Investors IX) to present specific methodologies for the collection, handling, and analysis of samples that will be conducted during the installation of compliance groundwater monitoring wells at the Block 38 West Site. The Block 38 West Site is generally located at 500 through 536 Westlake Avenue North in Seattle, Washington (Block 38 West Property) (Figure 1). This SAP has been prepared in accordance with the Washington State Model Toxics Control Act Cleanup Regulation (MTCA) as established in Section 820 of Chapter 173-340 of the Washington Administrative Code (WAC 173-340-820) and *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies* revised December 2016, prepared by the Washington State Department of Ecology (Ecology) (2004).

The purpose of the SAP is to define the specific requirements for sample collection and analytical activities to ensure that activities are conducted in accordance with technically acceptable protocols and that the results meet the data quality objectives. The SAP presents the protocols pertaining to sampling equipment and procedures and sample handling and analysis that will be used for the well installation at the Block 38 West Property. Sampling objectives, sample locations, and measurement frequencies also are described. The SAP provides a basis for conducting field activities and a mechanism for complying with quality assurance requirements.

### 1.1 PURPOSE

The purposes of this SAP are to:

- Describe the scope of work for the installation of monitoring wells associated with the independent remedial action being performed under the auspices of Agreed Order No. DE 17963 (AO) between the Washington State Department of Ecology (Ecology) and City Investors IX;
- Identify sample locations and media, sample quantities, analytical methods, and documentation protocols for the sampling program;
- Describe standard operating procedures (SOPs) for installation of monitoring wells, well development, and field sampling of soil; and
- Provide quality assurance (QA) and quality control (QC) protocols for field activities and laboratory analysis to ensure collection of representative and useable data.



## 2.0 PROJECT DESCRIPTION

This section provides a summary of the scope of work and Farallon's project organization and schedule.

### 2.1 SCOPE OF WORK

The rationale for the installation of two monitoring wells in the future building foundation is to evaluate groundwater conditions and the scope of work was discussed during communications between City Investors IX, Farallon, and Ecology, which included a site meeting conducted on March 12, 2020; email correspondence dated March 31, May 5, and May 15, 2019; and a conference call on May 20, 2020. The planned locations for the installation of two groundwater monitoring wells are shown on Figure 1. Table 1 lists the sampling locations and provides the scope of work and rationale for each sampling location.

The scope of work for the monitoring well installation includes:

- Advancement of two borings, and collection and retention of soil samples;
- Completion of the borings as monitoring wells;
- Development of the new monitoring wells; and
- Collection of depth-to-groundwater measurements and groundwater samples from new and existing wells once the construction dewatering system is turned off and the Intermediate Water-Bearing Zone has been allowed to equilibrate to steady-state conditions.

Table 2 shows the constituents of potential concern identified for the Block 38 West Site based on historical data compared to the most stringent MTCA screening levels. Analytical results from the independent remedial action will be compiled with historical data from the Block 38 West Site. These data will be used to evaluate for the presence of constituents of concern and potential concern and transport pathways for the Block 38 West Site following completion of redevelopment activities.

### 2.2 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization for conducting the scope of work described in the SAP, including identification of key personnel and their responsibilities, is presented below.





**Regulatory Agency.** Ecology is the lead regulatory agency for the Site. Ecology's Site manager for the Block 38 West Site is:

Ms. Tena Seeds, P.E.  
Washington State Department of Ecology  
Northwest Regional Office  
3190 160<sup>th</sup> Avenue Southeast  
Bellevue, Washington 98008  
Telephone: (425) 649-7008  
[tena.seeds@ecy.wa.gov](mailto:tena.seeds@ecy.wa.gov)

**Project Contact.** Farallon has been contracted by City Investors IX to plan and implement the SAP. The Project Contact for City Investors IX is:

Mr. Jim Broadlick  
City Investors IX L.L.C.  
505 5<sup>th</sup> Avenue South  
Seattle, Washington 98104  
Telephone: (206) 342-2000  
[JimBr@vulcan.com](mailto:JimBr@vulcan.com)

**Project Principal.** The Project Principal provides support for all project activities and reviews data and deliverables prior to their submittal to the Project Contact or Regulatory Agency. The Project Principal is:

Clifford T. Schmitt, L.G., L.H.G.  
Farallon Consulting, L.L.C.  
975 5<sup>th</sup> Avenue Northwest  
Issaquah, Washington 98027  
Telephone: (425) 295-0800  
[cschmitt@farallonconsulting.com](mailto:cschmitt@farallonconsulting.com)

**Project Manager.** The Project Manager has day-to-day responsibility for project implementation. The Project Manager will be responsible monitoring the quality of the technical and managerial aspects of the project, and implementing the SAP and corresponding corrective actions, if necessary. The Project Manager for Farallon is:

Ms. Suzy Stumpf, P.E.  
Farallon Consulting, L.L.C.  
1809 7<sup>th</sup> Avenue  
Seattle, Washington 98101  
Telephone: (425) 295-0800  
[sstumpf@farallonconsulting.com](mailto:sstumpf@farallonconsulting.com)



**Project Data Manager.** The Project Data Manager manages data as it is received from the laboratory and is responsible for data validation. Data validation responsibilities include reviewing laboratory reports, advising on data corrective action procedures, and performing QA/QC on analytical data reports. In addition, the Project Data Manager will directly transfer laboratory data into an EQUIS environmental data management system database (EQUIS database) and the Ecology Environmental Information Management System. The Data Manager for Farallon is:

Ms. Jeanette Mullin  
Farallon Consulting, L.L.C.  
975 5<sup>th</sup> Avenue Northwest  
Issaquah, Washington 98027  
Telephone: (425) 295-0800  
[jmullin@farallonconsulting.com](mailto:jmullin@farallonconsulting.com)

**Field Staff.** Members of the field staff supervise contractor procedures, manage collection of samples, coordinate sample deliveries to the laboratory, and document field-sampling activities. Field staff also will communicate progress updates to the Project Manager, including deviations from the SAP.

**Laboratory – Analytical Resources, Inc.** Analytical Resources, Inc. (On-Site) in Redmond, Washington will perform analytical services in support of the independent remedial action and will be responsible for implementing specific QA/QC requirements.

## 2.3 PROJECT SCHEDULE

The well installation component of the independent remedial action is currently planned for June 2020 following Ecology's approval of the scope of work.



## **3.0 FIELD PROCEDURES**

This section summarizes the protocols and procedures that will be followed for field data collection. Farallon SOPs for fieldwork, including detailed step-by-step protocols, are provided in Appendix A.

### **3.1 SOIL SAMPLING**

Soil samples will be collected from discrete depth intervals during drilling of borings. Boring locations are shown on Figure 1. Locations may be adjusted as necessary based on access and utilities. Farallon will use the one-call and private utility location services to confirm the location of subsurface utilities in accordance with Farallon SOP GN-02 (Appendix A).

The borings will be drilled to depths of approximately elevation -13 North American Vertical Datum of 1988 (NAVD88) using a hollow-stem auger drill rig. Soil samples will be collected at 5-foot intervals with a Dames & Moore sampler for lithologic description and potential laboratory analysis, depending on the sampling location and available soil and groundwater data from proximate locations.

Soil samples will be collected from borings and handled in accordance with the requirements of Farallon SOP SL-01 (Appendix A); Section 4, Sample Handling; and Section 7, Field Documentation. Borings will be completed as groundwater monitoring wells as described below in Section 3.2.

### **3.2 MONITORING WELL CONSTRUCTION, DEVELOPMENT, AND SURVEY**

Monitoring well locations are shown on Figure 1. Farallon field staff will observe monitoring well drilling and installation and document observations as described in Section 7, Field Documentation. Monitoring well construction and development will be performed in accordance with Farallon SOPs GW-01 and GW-02 (Appendix A).

Groundwater monitoring wells will be constructed in accordance with WAC 173-160-400 and will meet Washington State requirements for resource protection well construction. Monitoring wells will be installed using 2-inch-diameter Schedule-40 stainless steel well casings with a 0.010-inch slotted well screen. Monitoring well screen intervals will be set from approximate elevation -8 to -13 feet NAVD88, below the future building foundation and similar to the screened intervals at former monitoring wells FMW-146 and FMW-147. Each monitoring well will extend a minimum of 5 feet into the water-bearing unit.

Each monitoring well filter pack will consist of 10/20 Colorado Silica sand emplaced in the borehole annulus up to 1 foot above the top of the screen. The borehole will be sealed to within 2 feet of the surface with hydrated bentonite chips. The monitoring wells will be completed with flush-mounted steel monuments set in concrete.



New monitoring wells will be developed using a submersible pump. Each monitoring well will be developed until the majority of fine-grained sediment had been removed from the well screen and adjacent sand pack.

New monitoring wells will be surveyed using the Washington State Plane North coordinates system and measuring the top of casing elevations in North American Vertical Datum of 1988 by a Washington State Professionally Licensed Land Surveyor.

### **3.3 GROUNDWATER MONITORING**

A schedule for groundwater monitoring will be provided in the draft Remedial Investigation Work Plan. Performance and compliance groundwater activities cannot commence until the construction dewatering system is turned off and the Intermediate Water-Bearing Zone has been allowed to equilibrate to steady state conditions.

Groundwater monitoring events will include measuring depth-to-groundwater and collecting groundwater samples from each monitoring well. Procedures for measuring depth to groundwater and low-flow groundwater sampling are provided in Farallon SOPs GW-03 and GW-04 (Appendix A). Farallon will record observations and field data on Field Report forms as described in Section 7, Field Documentation.

### **3.4 DECONTAMINATION PROCEDURES**

Reusable equipment will be decontaminated in accordance with Farallon SOP EQ-01 (Appendix A).



## **4.0 SAMPLE HANDLING**

This section discusses the sample designation and labeling and sample-handling methods to be used during the independent remedial action. The protocols discussed include sample containers, preservation and holding times, sample documentation, collection of QA/QC samples, and sample packaging and shipment.

### **4.1 SAMPLE DOCUMENTATION**

Sample documentation includes sample labels, Field Report forms, Soil Sample Data Log forms, and Chain of Custody forms. Other sample documentation to be maintained by field personnel are provided in Appendix B.

Each sample container will be marked with a durable adhesive label and labeled with a unique identifier. The sample identifier for each sample will be constructed according to Section 4.2, Sample Designation, and recorded in the Field Report forms and on the sample Chain of Custody form (Appendix B). Sample labels will include the client name, project name and number, date and time sampled, sample identifier, sampler's initials, requested sample analysis, and analyte preservative(s), if any. The Chain of Custody form will include the sample identifier, date and time of sample collection, sampler's initials, number of containers, and requested sample analysis. Entries for all samples will be made on the Chain of Custody form prior to the transfer of the samples off the area of interest.

### **4.2 SAMPLE DESIGNATION**

Sample designation and labeling procedures for soil and groundwater samples are presented below.

#### **4.2.1 Soil Sample Identifiers**

Soil samples will be assigned a unique sample identifier that will include the sample location (e.g., boring identification) and the depth of the sample stated in feet below ground surface. For example, a soil sample collected from boring FMW-147 at a depth of 5 feet below ground surface would be assigned the identifier FMW-147-5.0. The sample identifier will be recorded on the sample label, Field Report form, Soil Sample Data Log, and Chain of Custody form.

#### **4.2.2 Groundwater Sample Identifiers**

The water samples will be assigned a unique sample identifier that will include the sample location identifier (e.g., boring or well identifier) and the sample date in the format YYMMDD (e.g., 190401).

For example, a groundwater sample collected from monitoring well FMW-01 on July 1, 2020 would be numbered FMW-01-200701. The sample identifier will be recorded on the sample label, Field Report form, and Chain of Custody form.



### **4.3 SAMPLE CONTAINERS, PRESERVATION PROCEDURES, AND HOLDING TIMES**

Sample container requirements for soil and groundwater and sampling are based on the medium to be sampled and the type(s) of analysis to be performed. The containers, preservation procedures, and hold times for soil and groundwater are shown in Table 3 and follow standard laboratory protocols.

### **4.4 FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES**

Field duplicate samples will be collected during sampling to assess the precision of laboratory analytical and field sampling methods. Soil sampling is subject to potentially wide ranges of variability due to the heterogeneity of the sample and the limited mass of soil sampled. Conversely, media such as groundwater are not as susceptible to the effects of heterogeneity and are more-reliable media for establishing measures of precision and/or accuracy. Field duplicate soil samples will not be collected. Field duplicates for groundwater sampling will be described in the RI Work Plan SAP. Field duplicates will not be collected for soil sampling activities.

### **4.5 SAMPLE PACKAGING AND SHIPMENT**

The samples shipped for laboratory analysis will be packaged according to applicable regulations and the recommendations of the laboratory performing the analysis. Samples will be expeditiously transported to the analytical laboratory after being sealed in coolers.

The following procedures (representing the minimum shipping and handling requirements) will be used for sample packaging:

- A sample label will be affixed to the corresponding sample container at the time of sample collection.
- Bubble-wrap bags or an equivalent will be used to protect sample containers.
- Sample containers will be placed into a cooler and checked against the Chain of Custody form to ensure that all samples are listed and are placed into the correct cooler.
- One copy of the Chain of Custody form will be detached and retained by the Farallon Field Scientist.
- Remaining paperwork will be sealed in a resealable plastic bag and taped to the inside of the cooler lid.
- One to three resealable bags will be filled with ice and/or a chemical equivalent and included in the cooler. Ice will be double-bagged in heavy-duty bags.
- The cooler will be sealed with a chain-of-custody seal and taped shut using strapping tape.
- The laboratory address will be affixed to the cooler.



- Extraneous stickers will be removed from the cooler.
- The cooler will be examined to ensure that Farallon's return address is affixed.

Upon transfer of the samples to laboratory personnel or arrival of the samples at the laboratory facility, the laboratory will assume responsibility for custody of the samples. Laboratory personnel will document the status of shipping and handling containers and will adhere to standard chain-of-custody procedures to track each sample through all of the stages of laboratory processing.



## **5.0 LABORATORY ANALYSIS**

This section describes the details of the laboratory analysis associated with soil and groundwater samples that will be collected during this independent remedial action. Laboratory analyses will be conducted by ARI. ARI is accredited by Ecology and meets the QA/QC requirements of Ecology and the U.S. Environmental Protection Agency (EPA).

### **5.1 LABORATORY ANALYSES**

Soil and/or groundwater samples may be analyzed for one or more of the following analytes, depending on the sample location:

- Total petroleum hydrocarbons as diesel-range and as oil-range organics by Northwest Method NWPTH-Dx; and
- Benzene and total naphthalenes by EPA Method 8260C.

Table 1 lists the analytes that will analyzed at each sampling location.

### **5.2 REPORTING LIMITS**

The analytical methods identified above result in the reporting limits (or practical quantitation limits) that are shown on Table 4. The laboratory reporting limits are based on current laboratory data and may be modified during the investigation as methodology is refined. Instances may arise where high sample concentration, nonhomogeneity of samples, or matrix interferences preclude achieving the laboratory reporting limits.





## **6.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE**

Investigation-derived waste soil, wastewater, and other products generated during the independent remedial action will be managed with the existing waste profiles. Based on the existing soil laboratory data from elevation -5.5 to -13 feet NAVD88, constituents of concern were less than MTCAs screening levels or reported at the laboratory practical quantitation limit. No soil laboratory analysis is anticipated for investigation-derived waste, and soil generated will be managed under the existing soil waste profiles for the Block 38 West Property. Wastewater generated during the monitoring well installation will be processed by the existing construction dewatering treatment system and permitted discharge.

### **6.1 WASTE SOIL**

Waste soil generated by the installation of observation wells and advancement of performance and confirmation borings will be stockpiled and then loaded into trucks for transportation and off-site disposal. Waste soil generated will be managed under the existing soil waste profiles for the ongoing independent remedial action. Waste soil temporarily stored at the Block 38 West Site will be tracked using a Waste Inventory Tracking Sheet (Appendix B).

### **6.2 WASTEWATER**

Wastewater generated by equipment decontamination and well development (if applicable) will be processed through the construction dewatering system and treated and discharged under the existing construction general stormwater permit issued for the independent remedial action for the Block 38 West Property.

If unable to process wastewater through the construction dewatering system, wastewater and purging water will be placed into Department of Transportation–approved 55-gallon drums for storage at the Block 38 West Site. Wastewater generated will be tracked using a Waste Inventory Tracking Sheet. Wastewater generated may be disposed of under existing waste profiles at a selected facility for treatment and disposal.

### **6.3 DISPOSABLES**

Disposable personal protective clothing (e.g., Tyvek suits, rubber gloves, boot covers) and disposable sampling devices (e.g., plastic soil sample plungers) will be cleaned, placed into plastic garbage bags, and disposed of as nonhazardous waste.



## **7.0 FIELD DOCUMENTATION**

Documentation of field activities will be provided on Field Report forms, boring logs, Low-Flow Well Purging and Sampling Data forms, Soil Sample Data Logs, sample and waste material labels, Waste Inventory forms, and Chain of Custody forms. Documentation generated during the field program will be retained in the project files and included in the reports generated, as appropriate. Filled forms and records will be maintained in the Farallon project files. Example forms and labels are provided in Appendix B.

### **7.1 FIELD REPORT FORM**

Field personnel will be required to keep a daily field log on a Field Report form. Field notes will be as descriptive and inclusive as possible, enabling independent parties to reconstruct the sampling situation from the recorded information. Language will be objective, factual, and free of inappropriate or ambiguous terms and/or opinions.

A summary of each day's events will be provided on the Field Report form. At a minimum, field documentation will include the date, job number, project identification and location, weather conditions, sample collection data, personnel present and responsibilities, field equipment used, and any activities performed in a manner other than as specified in this SAP. In addition, if other forms or documents such as well-head surveys or maps are completed or used, they will be cited in and attached to the Field Report form. Field personnel will sign the completed Field Report form.

### **7.2 BORING LOGS**

Boring logs will be prepared by a Farallon Scientist for each boring and/or monitoring well drilled. The log includes hydrologic conditions, lithologic descriptions using the Unified Soil Classification System, and information on the potential presence of contamination.

### **7.3 LOW-FLOW WELL PURGING AND SAMPLING DATA FORM**

A Low-Flow Well Purging and Sampling Data form will be used to record the depth to groundwater, well purging information, and other pertinent hydrologic measurements and supplementary information collected during groundwater sampling at each monitoring well. The form will be completed by the Field Scientist at the time of sample collection.

### **7.4 SOIL SAMPLE DATA LOG**

A Soil Sample Data Log will be used to record information pertaining to soil samples collected. This log includes entries for the sample location, identification, and depth; the time sampled; field-screening results; the types and number of containers collected; and a brief lithologic description.



## **7.5 SAMPLE LABEL**

Sample labels will be filled out and affixed to appropriate sample containers immediately prior to sample collection. The label will be filled out with indelible ink and includes the medium, date, time sampled, sample identifier (see Section 4.2, Sample Designation), project name, project number, sampler's initials, and analyte preservative(s) if any.

## **7.6 WASTE MATERIAL LABEL**

A waste material label is filled out and affixed to the appropriate waste container immediately upon filling. The label is filled out in indelible ink and includes the job number and name, address where the waste was generated, container contents, date, consultant's name and phone number, and sampler's initials.

## **7.7 WASTE INVENTORY FORM**

A Waste Inventory form will be used to document and track the wastes generated during the characterization field work. The form will include information on the waste container, origin of the waste, type of waste, date generated, date removed from the Site, transporter, and disposal location. A copy of the Waste Inventory form is included in Appendix B.

## **7.8 CHAIN OF CUSTODY FORM**

The Chain of Custody form provides an accurate written record that can be used to trace the possession and handling of the sample from the moment of its collection through analysis and reporting of analytical values. The Chain of Custody form should be updated whenever samples are collected, transferred, stored, analyzed, or destroyed. The Chain of Custody form includes the client name, project name and number, date and time sampled, sample identifier, sampler's initials, and requested sample analysis.



## 8.0 QUALITY ASSURANCE PROJECT PLAN

This section describes the analytical program to be conducted for each sample selected for chemical analysis, as well as the laboratory QA objectives and QC protocols required to be met to ensure collection of representative and useable data.

### 8.1 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) for this project will be used to develop and implement procedures to ensure that the data collected are of sufficient quality to adequately address the independent remedial action objectives. Observations and measurements will be made and recorded in a manner so as to yield results representative of the media and conditions observed and/or measured. Goals for representativeness will be met by ensuring that sampling locations are selected properly, a sufficient number of samples are collected, and field screening and laboratory analyses are conducted properly.

DQOs for this project include:

- Collect and retain soil samples from up to two borings for potential analysis to support disposal;
- Perform synoptic measurement of groundwater levels at the Block 38 West Site monitoring well network to evaluate groundwater gradient and flow direction once the construction dewatering system is turned off and the Intermediate Water-Bearing Zone has been allowed to equilibrate to steady state conditions;
- Achieve a practical quantitation limit sufficient for direct comparison against MTCA screening levels; and.
- Implement QA/QC protocols described in this SAP so that data collected are scientifically defensible.

The quality of the field sampling methods and laboratory data will be assessed using the parameters of precision, accuracy, representativeness, comparability, completeness, and sensitivity (PARCCS). QC procedures for PARCCS are described in the following sections. Quantitative DQOs for applicable parameters (i.e., precision, accuracy, and completeness) are provided following their definition. Laboratory DQOs have been established by the analytical laboratories and are specified in the individual analytical laboratory Quality Assurance Manuals. The applicable analytical laboratory Quality Assurance Manual will be kept on file at the Farallon corporate office in Issaquah, Washington.

#### 8.1.1 PRECISION

Precision is defined as the degree of agreement between or among independent, similar, or repeated measures, and is expressed in terms of analytical variability. For this project, analytical variability will be measured as the relative percent difference (RPD) or coefficient of variation between



analytical laboratory duplicates, and between the matrix spike (MS) and matrix spike duplicate (MSD) analyses. Monitoring and sampling variability will be measured by analysis of blind field-replicate samples.

The tolerance limit for percent differences between laboratory duplicates will be  $\pm 20$  percent; deviations from these criteria will be reported. If the criteria are not met, the laboratory will provide an explanation of why the limits were exceeded, and will implement appropriate corrective actions for laboratory control samples (LCSs)/LCS duplicates only. RPDs will be evaluated during data review and validation. If precision limit exceedances are linked to field sampling, those field sampling procedures will be reviewed, and any problems will be identified. Re-sampling and analysis may be required.

### **8.1.2 ACCURACY**

Accuracy (bias) is a statistical measurement of correctness and includes components of random error (i.e., variability due to imprecision) and systematic error. It therefore reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ excessively from the known concentration of the spike or standard.

Accuracy measures the bias in a measurement system and is difficult to measure for the entire data collection activity. Sources of error include the sampling process, field contamination, preservative handling, sample matrix effects, and sample preparation and analysis techniques. To confirm that the samples collected are not contaminated, laboratory method blank samples will be analyzed.

Laboratory MSs and surrogates will be carried out at the analytical laboratory in accordance with EPA SW-846 requirements for organic chemical analyses. The frequency for both MSs and MSDs analysis will be one per batch of 20 or fewer samples. Quantitative percent recovery criteria for organic analyses will be based on laboratory-derived control limits for surrogate recovery and MS results.

The resultant percent recovery will be compared to the acceptance criteria defined in the SAP, and deviations from specified limits will be reported. If the objective criteria are not met, the laboratory will provide an explanation of why acceptability limits were exceeded, and will implement appropriate corrective actions. Percent recoveries will be reviewed during data validation, and deviations from the specified limits will be noted. The data reviewer will comment on the effect of the deviations on reported data.

### **8.1.3 REPRESENTATIVENESS**

Representativeness is a qualitative assessment of how closely the measured results reflect the actual concentration or distribution of the constituent concentrations in the matrix sampled. The sampling plan design, sample collection techniques, sample handling protocols, sample analysis methods, and data review procedures have been developed to ensure that the results obtained are representative of site conditions. Representativeness also will be determined by evaluating holding



times, sample preservation, and blank contamination. Samples with expired holding times, improper preservation, or blank contamination may not be representative.

#### **8.1.4 COMPLETENESS**

Completeness, defined as the number of acceptable data points relative to the total number of data points, will be assessed for all samples within a given media (i.e., soil). The QA/QC objective for completeness for all components of this project is 95 percent. Data that were qualified as estimated because the QA/QC criteria were not met will be considered valid for the purpose of assessing completeness. Data that have been qualified as estimated will be further reviewed for usability. For this investigation, the primary use of the data is to perform initial screening of environmental chemical concentrations to identify potential chemicals and transport pathways of concern. Data that were qualified as rejected will not be considered valid for the purpose of assessing completeness. If a sample medium has an unacceptable completeness percentage after comparison to the individual data quality objectives described above, original samples will be re-analyzed if sufficient sample volume is available, archived samples will be analyzed if appropriate, or additional samples will be collected during the interim action and/or remedial investigation.

#### **8.1.5 COMPARABILITY**

Comparability is a qualitative parameter expressing the confidence with which one dataset can be compared to another. In order to ensure results are comparable, samples will be analyzed using standard EPA or Ecology methods and protocols. Calibration and reference standards will be traceable to certified standards, and standard data reporting formats will be employed. Data will also be reviewed to verify that precision and accuracy criteria were achieved and, if not, that data were appropriately qualified.

### **8.2 DATA QUALITY CONTROL**

Data will undergo two levels of QA/QC evaluation: one by the laboratory and one by Farallon. Initial data reduction, evaluation, and reporting will be performed by the laboratory, as specified in the laboratory Quality Assurance Manual. The analytical data will then be validated by Farallon under the supervision of the Project Data Manager. The following types of QC information will be reviewed, as appropriate:

- Method deviations;
- Sample extraction and hold times;
- Method reporting limits;
- Blank samples (e.g., equipment rinsate, trip, and laboratory method);
- Field duplicate samples;
- RPD (for precision);
- MS/MSD samples (for accuracy);



- Surrogate recoveries; and
- Percent completeness.

Farallon will review field records and the results of field observations and measurements to ensure that procedures were properly performed and documented. Field procedures will be reviewed for the following elements:

- Completeness and legibility of field logs;
- Preparation and frequency of field QC samples;
- Field equipment calibration and maintenance; and
- Chain of Custody forms.

### **8.3 LABORATORY DATA PACKAGE REQUIREMENTS**

Laboratory data packages will consist of a laboratory report and electronic data deliverable. Laboratory reports will include the following elements:

- Case narrative;
- Analytical notes;
- QC narrative;
- Sample inventory report;
- Analytical results; and
- Data qualifiers and abbreviations.

The electronic data deliverable will include at a minimum:

- Sample identification information;
- Sample media;
- Sampling, laboratory receiving, extraction, and analysis dates;
- Analyte and Chemical Abstracts Service Reference No.;
- Reported concentrations and reporting units;
- Analytical method detection limits;
- Machine reporting limits and reporting units; and
- QA/QC results, including identification of MS/MSD and surrogate samples.



## **8.4 CORRECTIVE ACTION**

Corrective action will be the joint responsibility of the Project Manager and the Project Data Manager. Corrective procedures may include:

- Identifying the source of deviation from the quality standards set forth in the SAP and its supporting documents;
- Re-analyzing soil and/or groundwater samples if hold-time criteria permit;
- Re-sampling and analyzing soil and/or groundwater if necessary to meet the quality standards set forth in this SAP;
- Evaluating and amending sampling, analytical, and/or data transfer procedures; and/or
- Qualifying data to indicate the level of uncertainty.

During field operations and sampling procedures, field team members will be responsible for identifying and correcting equipment malfunctions and documenting sampling procedures in a manner that will enable the Project Manager or the Project Data Manager to evaluate whether corrective action is warranted.

Equipment malfunctions, variances in sampling protocols, and corrective actions taken by field team members will be documented in the field notes. The Project Manager or the Project Data Manager will evaluate the field notes upon submittal to determine whether the corrective action taken was adequate to meet project quality standards or whether additional corrective action is required.

## **8.5 DATA MANAGEMENT**

The final repository for sample analytical information will be an EQUIS database. The electronic data deliverables received from the laboratories will be directly transferred into the EQUIS database, reducing the likelihood of data entry errors. The Project Data Manager will manage and maintain the EQUIS database.

Farallon will directly transfer the analytical data provided by the laboratory into the Ecology Environmental Information Management System, thus eliminating the likelihood of data entry errors inherent with manual data entry.

Field measurements and other data requiring manual entry will be reviewed by Farallon personnel other than the data entry staff prior to submission to the Environmental Information Management System. Ecology's confirmation of receipt of the data will be maintained in Farallon project files.

## **8.6 DATA VALIDATION**

Farallon will conduct a Level I Compliance Screening on all the analytical data.





All chemical data will be reviewed with regard to the following:

- Chain-of-custody/documentation;
- Sample preservation and holding times;
- Method blanks;
- Reporting limits;
- Surrogate recoveries;
- MS/MSD recoveries;
- LCS recoveries; and
- Laboratory and field duplicate RPDs.

Data validation will be based on the QA/QC criteria as recommended in the methods identified in this SAP and in the *National Functional Guidelines for Organic and/or Inorganic Methods Data Review* (EPA 2017a, 2017b).

Data usability, conformance with the QA/QC objectives, and any deviations that may have affected the quality of the data, as well as the basis of application of qualifiers, will be included in the final reporting of the data. Any required corrective actions based on the evaluation of the analytical data will be determined by the laboratory in consultation with the Farallon Project Manager and may include qualification or rejection of the data.



## 9.0 REFERENCES

U.S. Environmental Protection Agency (EPA). 2017a. *National Functional Guidelines for Organic Superfund Methods Data Review*. EPA Administrative Record EPA-540-R-2017-002. January.

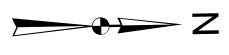
———. 2017b. *National Functional Guidelines for Organic Superfund Methods Data Review*. EPA Administrative Record EPA-540-R-2017-001. January.

Washington Department of Ecology (Ecology). 2004. *Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies*. Publication No. 04-03-030. Revised December 2016. July.

**FIGURE**

**SAMPLING AND ANALYSIS PLAN  
MONITORING WELL INSTALLATION  
Block 38 West Property  
500 through 536 Westlake Avenue North  
Seattle, Washington**

**Farallon PN: 397-019**



WESTLAKE AVENUE NORTH

MERCER STREET

FIRE WATER STORAGE VAULT

ELEVATORS/ELECTRICAL

BLOCK 38 WEST

ELECTRICAL AND MECHANICAL

FMW-130

FMW-147

FMW-150

FMW-144

FMW-151

FMW-135

FMW-145

FMW-136

FMW-148

FB-06

FB-07

FB-04

FB-05

FB-03

FB-08

FMW-132

FMW-133

FB-09

FB-01

FMW-138

STORMWATER RETENTION AND MECHANICAL

EMERGENCY GENERATOR

MECHANICAL

CRANE PAD FOOTING

ALLEYWAY

FMW-137

BLOCK 38 EAST

LEGEND

- BORING
- DECOMMISSIONED SHALLOW WATER-BEARING ZONE MONITORING WELL
- DECOMMISSIONED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- DEEP OUTWASH AQUIFER MONITORING WELL
- PROPOSED INTERMEDIATE WATER-BEARING ZONE MONITORING WELL
- POTENTIAL FUTURE SHALLOW WATER-BEARING ZONE MONITORING WELL
- POTENTIAL FUTURE INTERMEDIATE WATER-BEARING ZONE MONITORING WELL

- AREAS WITH BUILDING CODE OR ACCESS RESTRICTIONS
- DRO AND/OR ORO DETECTED AT CONCENTRATIONS EXCEEDING MTCA SCREENING LEVELS (? ESTIMATED EXTENT INFERRED)

- PILE
- TIEBACK
- LOT LINE
- PROPERTY BOUNDARY
- KING COUNTY PARCEL BOUNDARY

POTENTIAL FUTURE SHALLOW WATER-BEARING ZONE MONITORING WELLS WILL BE EVALUATED UPON COMPLETION OF SUPPLEMENTAL SUBSURFACE INVESTIGATION IN THE EAST-ADJACENT ALLEY.

DRO = TOTAL PETROLEUM HYDROCARBONS (TPH) AS DIESEL-RANGE ORGANICS  
 ORO = TPH AS OIL-RANGE ORGANICS  
 MTCA = WASHINGTON STATE MODEL TOXICS CONTROL ACT CLEANUP REGULATION

NOTES:  
 ALL LOCATIONS ARE APPROXIMATE.  
 FIGURES WERE PRODUCED IN COLOR. GRAYSCALE COPIES MAY NOT REPRODUCE ALL ORIGINAL INFORMATION.

Washington  
Issaquah | Bellingham | Seattle

Oregon  
Portland | Baker City

California  
Oakland | Folsom | Irvine

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**FIGURE 1**

**PROPOSED MONITORING WELL LOCATIONS WITHIN BUILDING FOOTPRINT BLOCK 38 WEST PROPERTY SEATTLE, WASHINGTON**

FARALLON PN: 397-019



## **TABLES**

**SAMPLING AND ANALYSIS PLAN  
MONITORING WELL INSTALLATION  
Block 38 West Property  
500 through 536 Westlake Avenue North  
Seattle, Washington**

**Farallon PN: 397-019**

**Table 1  
Scope of Work and Rationale  
Block 38 West Property  
Seattle, Washington  
Farallon PN: 397-019**

| Location         | Rationale   | Scope  | Analytes and Methods   |
|------------------|---|--|--|
| FMW-150          | Replacement well; approximate former well FMW-147 location.                   | 1) Advance one boring to approximate elevation -13 NAVD88.<br>2) Complete boring as monitoring well; develop monitoring well once groundwater returns to steady state conditions.<br>3) Survey monitoring well top of casing elevations in NAVD88 once top of casing and monument are set at the P1 parking garage level.<br>4) Conduct groundwater monitoring following termination of construction dewatering system, and once groundwater returns to steady state conditions. | 1) DRO and ORO by NWTPH-Dx<br>2) Benzene and Total Naphthalenes by EPA 8260C |
| FMW-151          | West of approximate extent of DRO and/or ORO exceeding MTCA screening levels. | 1) Advance one boring to approximate elevation -13 NAVD88.<br>2) Complete boring as monitoring well; develop monitoring well once groundwater returns to steady state conditions.<br>3) Survey monitoring well top of casing elevations in NAVD88 once top of casing and monument are set at the P1 parking garage level.<br>4) Conduct groundwater monitoring following termination of construction dewatering system, once groundwater returns to steady state conditions.     | 1) DRO and ORO by NWTPH-Dx<br>2) Benzene and Total Naphthalenes by EPA 8260C |
| To Be Determined | Replacement well; approximate former FMW-146 location.                        | 1) Advance one boring to approximate elevation -13 NAVD88.<br>2) Complete boring as monitoring well; develop monitoring well once groundwater returns to steady state conditions.<br>3) Survey monitoring well top of casing elevations in NAVD88 once top of casing and monument are set at the P1 parking garage level.<br>4) Conduct groundwater monitoring following termination of construction dewatering system, once groundwater returns to steady state conditions.     | 1) DRO and ORO by NWTPH-Dx<br>2) Benzene and Total Naphthalenes by EPA 8260C |

NOTES:  
 DRO = total petroleum hydrocarbons (TPH) as diesel-range organics  
 EPA = U.S. Environmental Protection Agency  
 MTCA = Washington State Model Toxics Control Act Cleanup Regulation  
 ORO = TPH as oil-range organics

**Table 2**  
**Summary of MTCA Screening Levels**  
**Block 38 West Property**  
**Seattle, Washington**  
**Farallon PN: 397-019**

| Parameter                               | Soil Cleanup Levels <sup>1</sup><br>(milligrams per kilogram) | Groundwater Screening Level <sup>2</sup><br>(micrograms per liter) |
|---|---|--|
| <b>Total Petroleum Hydrocarbons</b>     |   |  |
| Diesel-range Organics                   | 2,000 <sup>3</sup>  | 500 <sup>3</sup>   |
| Oil-range Organics                      |   |  |
| <b>Volatile Organic Compounds</b>       |   |  |
| Benzene                                 | 0.03  | 5.0  |
| <b>Polycyclic Aromatic Hydrocarbons</b> |   |  |
| Naphthalene                             | 5.0 <sup>4</sup>  | 160 <sup>4</sup>   |
| 1-Methylnaphthalene                     |   |  |
| 2-Methylnaphthalene                     |   |  |

NOTES:

<sup>1</sup>Washington State Model Toxics Control Act Cleanup Regulation (MTCA) Method A Soil Cleanup Levels for Unrestricted Land Uses, Table 740-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as revised 2013.

<sup>2</sup>Washington State Model Toxics Control Act Cleanup Regulation Method A Cleanup Levels for Groundwater, Table 720-1 of Section 900 of Chapter 173-340 of the Washington Administrative Code, as amended 2013.

<sup>3</sup>Screening level based on the sum of diesel-range organics and oil-range organics.

<sup>4</sup>Screening level based on sum of naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.

**Table 3**  
**Sample Containers, Preservatives, and Hold Times**  
**Block 38 West Property**  
**Seattle, Washington**  
**Farallon PN: 397-019**

| Parameter             | Analytical Method | Container Size and Type   | Holding Time  | Sample Preservation Technique                         |
|-----------------------|-------------------|---|---|---|
| <b>Soil</b>           |                   |   |   |   |
| Diesel-range Organics | NWTPH-Dx          | (1) 4-oz CWM Jar  | 14 days to extract, 40 days to analyze after extraction | Cool to 4°C ±2°C                                      |
| Oil-range Organics    |                   |   |   |   |
| Benzene               | EPA 8260D         | (2) 40-ml glass pre-weighed VOA vial with stir bar (5 gram soil sample), and (1) 40-ml glass pre-weighed VOA vial without a stir bar (5 gram soil sample) | 48 hours to freeze; 14 days to analyze                  | Cool to 4°C ±2°C in field; freeze ≤ 0°C in laboratory |
| Naphthalene           | EPA 8270E         | (1) 4-oz CWM Jar  | 14 days to extract, 40 days to analyze after extraction | Cool to 4°C ±2°C                                      |
| 1-Methylnaphthalene   |                   |   |   |   |
| 2-Methylnaphthalene   |                   |   |   |   |
| <b>Groundwater</b>    |                   |   |   |   |
| Diesel-range Organics | NWTPH-Dx          | (2) 500-ml amber  | 14 days to extract, 40 days to analyze after extraction | Preserve with HCl to pH <2; Cool to 4°C ±2°C          |
| Oil-range Organics    |                   |   |   |   |
| Benzene               | EPA 8260D         | (3) 40-ml glass VOA vials with Teflon septum  | 14 days to analyze                                      | Preserve with HCl to pH <2; Cool to 4°C ±2°C          |
| Naphthalene           | EPA 8270E         | (2) 1-liter amber   | 7 days to extract, 40 days to analyze after extraction  | Cool to 4°C ±2°C                                      |
| 1-Methylnaphthalene   |                   |   |   |   |
| 2-Methylnaphthalene   |                   |   |   |   |

**NOTES:**

°C = degrees Celsius  
CWM = clear wide-mouth  
EPA = U.S. Environmental Protection Agency  
HCl = hydrochloric acid  
ml = milliliter  
oz = ounce



**Table 4**  
**Soil and Groundwater Laboratory Reporting Limits**  
**Block 38 West Property**  
**Seattle, Washington**  
**Farallon PN: 397-019**

| <b>Parameter</b>                        | <b>Analytical Method</b> | <b>Soil PQL<sup>1</sup><br/>(mg/kg)</b> | <b>Groundwater PQL<br/>(µg/l)</b> |
|---|--------------------------|---|-----------------------------------|
| <b>Total Petroleum Hydrocarbons</b>     |                          |   |                                   |
| Diesel-range Organics                   | NWTPH-Dx                 | 25                                      | 250                               |
| Oil-range Organics                      | NWTPH-Dx                 | 50                                      | 400                               |
| <b>Volatile Organic Compounds</b>       |                          |   |                                   |
| Benzene                                 | EPA 8260D                | 0.001                                   | 0.20                              |
| <b>Polycyclic Aromatic Hydrocarbons</b> |                          |   |                                   |
| Naphthalene                             | EPA 8270E                | 0.0067                                  | 0.10                              |
| 1-Methylnaphthalene                     | EPA 8270E                | 0.0067                                  | 0.10                              |
| 2-Methylnaphthalene                     | EPA 8270E                | 0.0067                                  | 0.10                              |

**NOTES:**

<sup>1</sup> The MRL for project samples will vary with moisture content of the samples.

EPA = U.S. Environmental Protection Agency  
mg/kg = milligrams per kilogram  
µg/l = micrograms per liter  
PQL = practical quantitation limit

**APPENDIX A**  
**FARALLON STANDARD OPERATING PROCEDURES**

SAMPLING AND ANALYSIS PLAN  
MONITORING WELL INSTALLATION  
Block 38 West Property  
500 through 536 Westlake Avenue North  
Seattle, Washington

Farallon PN: 397-019

## **STANDARD OPERATING PROCEDURE EQ-01**

### **EQUIPMENT DECONTAMINATION PROCEDURES**

#### **PURPOSE AND APPLICATION**

The purpose of this standard operating procedure (SOP) is to provide field personnel with the methodology for decontaminating sampling equipment during various field activities. The step-by-step guidelines provided in this SOP are to be followed by the field crew during all site visits, as applicable.

#### **EQUIPMENT AND SUPPLIES/REAGENTS**

The following equipment is necessary to properly decontaminate field equipment during various field tasks:

- Rinse water or distilled water.
- Deionized water.
- Liquinox or other phosphate-free detergent.
- Paper towels.
- Labeled squirt bottles.
- Long-handled hard-bristle brushes (for sediment and soil).
- Cotton swabs.
- Plastic sheeting, garbage bags, and aluminum foil (for sediment and soil).
- Core liner caps or plastic wrap and rubber bands (for sediment and soil).
- Extension arm for cleaning core liners (for sediment and soil).
- Plastic 5-gallon bucket.
- U.S. Department of Transportation-approved drum(s) for decontamination water unless other water-handling arrangements have been made. Separate drums are needed for liquid and solid wastes (see Farallon SOP WM-01, Field-Handling of Investigation-Derived Waste). Liquid wastes should not be added to drums containing solid wastes.

Dilute Liquinox with distilled water in a squirt bottle in accordance with the instructions on the Liquinox package, and label the bottle. Fill another squirt bottle with distilled water, and label the bottle.



## **FIELD EQUIPMENT TO BE DECONTAMINATED AFTER USE**

Decontaminate the following field equipment at the conclusion of field work each day, in accordance with the procedures outlined in this SOP:

- Water-level meter.
- Horiba/YSI multiparameter probe.
- Bladder pump.
- Submersible pump.
- Sediment and soil collection and processing equipment.

## **WATER-LEVEL METER DECONTAMINATION**

Decontaminate the water-level meter after measuring the water level at a monitoring well before moving to a new monitoring well, using the following procedures:

- Spray the bottom half of a paper towel with the diluted Liquinox solution, and the upper half with deionized water.
- Grip the measuring tape of the water-level meter with the paper towel in one hand with the Liquinox side down toward the monitoring well casing.
- Begin slowly reeling up the water-level meter while maintaining firm contact between the measuring tape and the paper towel.
- Ensure that no debris or contamination remains on the measuring tape of the water-level meter once it has been reeled up.
- Use a clean new paper towel for each successive decontamination of the measuring tape of the water-level meter.

## **HORIBA/YSI MULTIPARAMETER PROBE DECONTAMINATION**

Decontaminate the Horiba/YSI multiparameter probe at the end of each workday or after sampling a monitoring well with high concentrations of contamination, using the following procedures:

- Remove the multiparameter probe from the flow-through cell, and thoroughly spray each component with deionized water.
- Use a cotton swab to gently clean around each sensor probe, ensuring that all contaminated water and material has been washed away.
- Refill the protective dissolved oxygen and pH probe caps with deionized water, and replace prior to storage.
- Once the multiparameter probe has been adequately cleaned, replace the protective shield, and return the probe to the case. If the device appears to be overly wet, allow it to air-dry with the case open.



- Do not use Liquinox to clean any probes on the Horiba multiparameter probe, as it may damage the device.

### **BLADDER PUMP DECONTAMINATION**

Decontaminate the bladder pump after sampling a well and at the end of each workday, using the following procedures:

- After extracting the bladder pump from the well, break down the pump, remove and dispose of the used bladder, and spray each component with the diluted Liquinox solution, followed by deionized water.
- Wipe away any visible contamination or debris with a paper towel.
- Capture cleaning water in a liquid waste drum for proper disposal in accordance with Farallon SOP WM-01, Field-Handling of Investigation-Derived Waste.
- Ensure that all contamination and Liquinox solution is washed off all components before reassembling the device, installing a new bladder, and moving to sample a new well.

### **SUBMERSIBLE PUMP DECONTAMINATION**

Decontaminate the submersible pump after purging water from any well, using the following procedures:

- After extracting the submersible pump from the well, thoroughly spray down the pump with the diluted Liquinox solution, followed by deionized water.
- Wipe away any visible contamination or debris with a paper towel.
- Purge clean water through the pump and tubing to ensure that contaminated water has been cleared from all lines.
- Capture cleaning water in a liquid waste drum for proper disposal in accordance with Farallon SOP WM-01, Field-Handling of Investigation-Derived Waste.

### **SEDIMENT AND SOIL SAMPLING AND PROCESSING EQUIPMENT DECONTAMINATION**

Decontaminate sampling equipment used to collect and process sediment and soil samples, using the following procedures:

- Place contaminated equipment and decontamination tools on plastic sheeting.
- Thoroughly rinse all used equipment with distilled water in a 5-gallon bucket to remove excess sediment or soil.
- Pour one capful of Liquinox solution into a 5-gallon bucket filled with tap water or distilled water.
- Using a long-handled hard-bristle brush, thoroughly scrub the equipment with the Liquinox solution until no sediment or soil particles remain.



- Holding the equipment over a 5-gallon bucket, double-rinse the equipment with distilled water until no Liquinox solution remains. Do not allow clean equipment to come into contact with a contaminated surface.
- Drain the equipment and place it in a clean, dry place to prevent recontamination.
- If decontaminated equipment will not be re-used immediately, wrap stainless steel equipment (e.g., bowls, spoons) in aluminum foil with the dull side facing the equipment. Seal polycarbonate core liners with core caps or cellophane plastic. Rubber-band ends to ensure a proper seal.
- After decontamination has been completed, place disposable items into a garbage bag, and store decontamination water in a drum in accordance with Farallon SOP WM-01, Field-Handling of Investigation-Derived Waste.

## **STANDARD OPERATING PROCEDURE (SOP) GN-02**

### **UTILITY LOCATE**

#### **PURPOSE**

The purpose of this SOP is to provide Farallon Consulting, L.L.C. (Farallon) personnel with the specific information needed to identify and locate utilities on sites where drilling or excavation activities will occur. Excavation is defined by Section 20 of Chapter 19.122 of the Revised Code of Washington (RCW 19.122.020) as “any operation, including the installation of signs, in which earth, rock, or other material on or below the ground is moved or otherwise displaced by any means.” For the purposes of this SOP, the excavation area refers to the area of an excavation or a perimeter around all proposed borings, test pits, soil gas sampling locations, and subslab soil gas sampling locations. Identifying utilities within the boundaries of a proposed excavation area prior to any digging is required by law and is necessary for the safety of Farallon personnel and contractors.

The guidelines provided in this SOP are to be followed by Farallon personnel who coordinate utility locating, mark locate boundaries, and/or observe field work that involves any type of excavation.

#### **EQUIPMENT AND SUPPLIES**

The following equipment and supplies are necessary to arrange and conduct utility locating:

- A map of the site with the proposed excavation area(s);
- Readable side sewer card figures, if applicable;
- Geographic information system (GIS) utility figures, if applicable;
- Readable American Land Title Association (ALTA) survey figures, if applicable;
- Any previous utility figures associated with the site;
- White marking products (e.g., paint, flags, stakes, grease marking pen, tape, chalk);
- Materials necessary to provide required documentation (e.g., Field Report form, camera, measuring wheel, global positioning system); and
- Personal protective equipment (PPE) as described in the site-specific Health and Safety Plan, or Level D PPE at a minimum.

## **PROCEDURES**

The following utility locating procedures have been developed for use before excavation occurs on a site. The procedures are divided into the following five parts:

- Call Before You Dig System;
- Private Utility Locating Services;
- Hand-Clearing Proposed Excavation Areas;
- Maintaining Public Utility Locate Marks; and
- Utility Line Damage.

The Project Manager should discuss the scope of work, details of the project location, and any essential information with the project field team before any of the procedures described below commence. When practicable, an on-site kickoff meeting involving a member of the field team and the Project Manager should be conducted to discuss the work to be performed, mark the boundaries of the excavation area, and mark potential boring locations, if applicable.

### **Call Before You Dig System**

According to RCW 19.122.030, excavators are required to mark the boundary of a proposed excavation area using white marking products. Marking products include paint, flags, and stakes. Boundary marks should conform to the following guidelines:

- A continuous line, hashed line, dots, or corner marks with arrows are acceptable ways to mark the boundary.
- Flags and stakes can be used if paint is not adequate.

The location(s) of the proposed excavation area(s) must be reviewed to verify that no visible utilities that would interfere with the proposed excavation area(s) are present. If utilities are present, the Project Manager and field personnel should communicate the changes to the excavation that are area necessary before the boundaries are marked with white paint.

After marking the boundaries of the proposed excavation area, Farallon personnel must provide notice of the scheduled excavation to the owner/operators of buried utilities at least 2 but no more than 10 business days in advance by calling 811 or 1-800-424-5555, or using the online tool at [www.callbeforeyoudig.org](http://www.callbeforeyoudig.org). Use of the online tool is preferred.

A map with the excavation area boundaries depicted and/or photos of the white paint marks is helpful in conveying the scope of work to the Call Before You Dig service.

The following information should be available to provide the Call Before You Dig service at the time of initial contact:

- Scope of work, including the start date and time.
- Contact information for the Project Manager and a field person able to answer questions from public utility locators regarding project details.



- Site address, township/range/section quarter, and name of property owner.

Once the Call Before You Dig system has been notified of the upcoming work, the system provides a ticket number, which

- Should be referenced whenever the Call Before You Dig service is contacted about the job.
- Provides proof that the Call Before You Dig system was notified prior to excavation. Public utility locators, inspectors, and law enforcement personnel may ask for the ticket number.
- Should be supplied to any subcontractors doing work on the site for reference when contacting the system for their own ticket number.

Call Before You Dig personnel will provide a list of public utilities present on the site, and will notify public utility operators of the planned work.

Public utility operators have 2 full business days after the day notification was received to locate and mark their lines, or to provide reasonable information on lines that they are not able to locate. The day notice is given is not included as 1 of these 2 days. Therefore, if excavation work is planned to start on a Monday, for example, the Call Before You Dig system must be notified by Wednesday the week before.

Two full business days must elapse between Call Before You Dig notification and the start of excavation. No excavation is to take place until all known utilities are marked or otherwise accounted for with information provided by the facility operator.

Locators mark their lines with colored hash marks. The American Public Works Association determines the colors to be used to denote different kinds of lines:

|                                   |                             |
|-----------------------------------|-----------------------------|
| Red: Power Lines and Cable        | Yellow: Gas, Oil, Petroleum |
| Orange: Telephone and Cable       | Blue: Drinking Water        |
| Green: Sewer (Storm and Sanitary) | Purple: Non-Potable Water   |
| Pink: Survey Marks                | White: Excavator Marks      |

Public utility operators are required to mark their lines only to the meter. Utility lines located beyond the meter are the responsibility of the property owner. Public utility operators should indicate by marking if no public utilities are present.

Public utility locators are required to mark their lines with reasonable accuracy. According to RCW 19.122.020, “reasonable accuracy means location within twenty-four inches of the outside dimensions of both sides of an underground facility.”

At this time, public utility companies are not required to mark abandoned or deactivated lines in Washington.

An individual not following the protocols established by the Call Before You Dig system can be held liable for up to three times the cost to repair a utility line damaged during excavation.

Records of ticket numbers and communications with the Call Before You Dig service should be stored in the project folder and supplied to on-site project personnel.

Before any excavation work is started, Farallon personnel should verify that all public utility marks are present on the site. The public utility company/ies listed on the Call Before You Dig system ticket should be contacted if marks for that utility/ies are not present.

### **Private Utility Locating Services**

After the public utility companies have marked their lines and before excavation begins, it is standard practice to have a private utility locating service clear areas that will be excavated.

Private locates generally are scheduled for the day before or the morning of the start of excavation.

Areas where excavation will occur must be cleared for conductible utilities by a private locator. Depending on the nature of the site and the proximity of utility lines, the private locator may also mark non-conductible utilities.

If possible, the excavation contractor should be on the site during the private utility locating to verify with the private locator that all proposed excavation areas are accessible.

When working with private utility locators, Farallon personnel should:

- Study existing figures of the site, noting the locations of known utilities.
- Use available side sewer cards or geographic information system utility figures to verify utility locations at the site.
- Verify that all public utilities have been marked by physically verifying that colored paint marks are present for all of the public utility companies listed on the One Call Before You Dig ticket. If any public utilities have not been marked, the utility company must be contacted and requested to mark the area, or to provide confirmation that the area is clear of their utility.
- Discuss the scope of work/excavation areas with the private locator.
- Document the name of the locating company and the name of the locator.
- Observe the locator clear the excavation area(s).
- Document the locate marks with photos, and note any uncertainties in the Field Report form.
- Identify the locations of shut-off valves for utilities such as water and natural gas.
- Contact the Project Manager or Principal to discuss relocating the excavation area if a proposed excavation area is in conflict with a utility identified by the private locator.
- Sign the locator's paperwork, if necessary, and depart the site if no additional field work is to be performed that day.

Private location of conductible utilities should sweep the excavation area in two perpendicular directions.

Private location of non-conductible utilities (typically storm and sanitary sewer) can use either a probe or a camera for accessible lines. Appropriately colored paint marks are applied by the private locator based on a signal sent from the probe or camera. For inaccessible lines, a ground-penetrating radar or magnetometer can be used to approximate the line locations. Marks based on this method should be considered approximate.

### **Hand-Clearing Excavation Areas**

Prior to conducting certain excavation activities, excavators will clear the proposed excavation area to verify that no utilities are present. This can be accomplished through use of an air knife/vacuum truck, post-hole digging, hand-augering, or use of other hand tools that allow the excavation location be explored sufficiently to verify that no utilities are present. Farallon Project Managers will confirm the method of clearing and depths with the field team before the excavation work is performed. Farallon Project Managers also need to discuss shallow soil sampling needs with the field team if clearing activities are being performed. Clearing activities should be conducted according to the following guidelines:

- **Hollow-Stem Auger Drilling:** Hand-clear to a minimum depth of 5 feet below ground surface (bgs) using an air knife/vacuum truck whenever possible. Alternative methods such as post-hole digging or hand-augering also may be used.
- **Sonic Drilling:** Hand-clear to a minimum depth of 5 feet bgs using an air knife/vacuum truck whenever possible. Alternative methods such as post-hole digging or hand-augering also may be used.
- **Geoprobe Drilling:** Clearing activity requirements are dependent on known utilities and results of the public and private utility location procedures completed above. Hand-clear using a post-hole digger or hand-auger to a maximum depth of 5 feet bgs is necessary. An air knife/vacuum truck may be used to hand clear each boring location to a maximum depth of 5 feet bgs, if available.
- **Test Pit Excavation:** No hand-clearing is necessary. Excavation contractors should be directed to dig cautiously in the upper 5 feet bgs in the event an unknown utility is present. A test pit excavation or regular excavation using machinery (e.g., track hoe, backhoe) should include using a spotter to watch for unidentified utility lines. Ideally, the spotter should be provided by the excavation contractor.
- **Rotary Hammer for Soil Gas Sampling:** No hand-clearing is necessary.
- **Rotary Hammer for Subslab Soil Gas Sampling:** No-hand clearing is necessary.

Some drilling contractors require that a utility line be exposed prior to drilling if the proposed drilling location is within a certain distance of the utility line. Farallon personnel should confirm drilling contractor requirements prior to conducting drilling activities.

If a utility line is encountered during clearing, excavators should verify that the utility has not been damaged, and Farallon personnel should document the encounter on the Field Report form with photos and details. RCW 19.122.020 states that “damage” includes the substantial weakening of

structural or lateral support of an underground facility, penetration, impairment, or destruction of any underground protective coating, housing, or other protective device, or the severance, partial or complete, of any underground facility to the extent that the project owner of the affected facility operator determines that repairs are required. The Project Manager or Principal should be notified immediately if a utility line is encountered during hand-clearing, and an alternate location will be proposed. A hand-cleared area having an exposed utility line should be backfilled with a bentonite seal and finished to match existing grade.

### **Maintaining Public Utility Locate Marks**

According to RCW 19.122.030, “public utility locate marks expire 45 days from the date the excavator provides notice,” and “it is the responsibility of the excavator to maintain the public utility marks for 45 days, or for the length of the project–whichever is shortest. In any case, the public utility locate marks expire after 45 days.”

Locate marks can be maintained digitally through both photos and figures drawn to scale.

Locate marks can be maintained in the field using white paint. White paint can be applied between original hash marks, on either side of the hash marks, or on both ends. Offset paint or staking can be used if placed a uniform distance from the original marks with a clear indication of the direction and distance from the original marks. The original marks should not be painted over, and white paint should never be applied over colored paint. White marks should include a letter identifying the type of buried line.

### **Utility Line Damage**

A utility line does not need to be ruptured or severed to be considered damaged. Scratching or denting a utility line or its protective tape also is considered damage, as the integrity of the line may have damaged even if the damage does not appear to be significant. Before excavation work begins, shut-off valve locations for applicable utilities should be documented. If a utility is believed to be damaged, the utility should be shut down if practicable and safe to do so. According to RCW 19.122.053, “all facility operators and excavators who observe or cause damage to an underground facility must report the damage event to the Washington State Utilities and Transportation Commission.”

If a utility line is hit and public safety is a concern, 911 should be the first call made after the immediate area has been evacuated. If a utility line is hit and the public is not at risk, the field team should notify the Project Manager, who will notify the Principal and the corporate Health and Safety Coordinator immediately. The Project Manager should then contact the utility that owns the damaged line, and report to the field team any instructions issued by the utility owner, and an expected timeframe for arrival of a utility owner representative at the site. Repairs to a utility line will not be attempted by Farallon personnel or contractors.

Damage must be reported through the Common Ground Alliance Damage Information Reporting Tool website, hosted by the Washington State Utilities and Transportation Commission: <http://www.utc.wa.gov/publicSafety/pipelineSafety/Pages/Damagereportingrequirements.aspx>

Access to damaged utility lines should be maintained to allow inspection by the utility company. An exposed utility should not be backfilled or patched until instruction to do so has been provided by the Project Manager or Principal.

## **DOCUMENTATION**

Farallon personnel should document in the Field Report form the work performed and methods used by private utility locators, and photos from multiple angles with good reference points for each utility line in the excavation area(s).

## **REFERENCES**

Washington Utilities Coordinating Council. 2014. *Guide to Safe Digging, Washington State Law and Industry Best Practices*.

## **STANDARD OPERATING PROCEDURE GW-01**

### **MONITORING WELL CONSTRUCTION**

#### **PURPOSE AND APPLICATION**

The purpose of this standard operating procedure (SOP) is to provide field personnel with the methodology for monitoring well construction and installation. Monitoring well construction ultimately is at the discretion of the Project Manager, and is based on the geology at the site and the use of the monitoring well. Groundwater monitoring wells in the Puget Sound region, for example, typically are constructed using 2-inch-diameter Schedule 40 polyvinyl chloride well casing with 0.010-inch slotted screens because of the finer-grained materials prevalent in the region. Slot and sand sizes may be increased at the discretion of the Project Manager, depending on local geology. Monitoring wells must be installed and decommissioned by a licensed well driller, and constructed in general accordance with Chapter 173-360, Minimum Standards for Construction and Maintenance of Wells, of the Washington Administrative Code in Washington; with Rule 0410 of Division 240 of Chapter 690, Well Construction Standards – General, of the Oregon Administrative Rules in Oregon; with Bulletins 74-81 and 74-90, California Well Standards, from the California Department of Water Resources in California; and with the federal and/or state standards established for well construction specified in the project-specific field sampling plan in other states.

#### **EQUIPMENT AND SUPPLIES/REAGENTS**

The following equipment is necessary for the construction and installation of monitoring wells:

- Monitoring well construction equipment (e.g., water-level meter, photoionization detector, tape measure, camera, plastic sheeting), as applicable.
- Monitoring well construction materials (e.g., well casing [screened and blank], filter pack sand, bentonite and/or Volclay Grout annular seal material, concrete, locking casing cap, well-head monument [flush-mounted or stove-pipe monument, as appropriate] complete with locking top, bollards for placement around well-head monument as applicable), provided by the driller.
- Materials necessary to provide required documentation, including Boring Log, Monitoring Well Construction Data form, and Field Report form.
- Personal protective equipment as described in the site-specific Health and Safety Plan.
- Decontamination equipment as specified in Farallon SOP EQ-01, Equipment Decontamination Procedures.
- U.S. Department of Transportation-approved drum(s) for decontamination wastewater and excess soil cuttings. Separate drums are needed for liquid and solid wastes (refer to Farallon SOP WM-01, Field-Handling of Investigation-Derived Waste). Liquid wastes should not be added to drums containing solid wastes.



## DECONTAMINATION

Before arrival at the site, upon relocation at the site, and upon demobilization from the site, decontaminate equipment that will come into contact with potentially contaminated soil and groundwater, in accordance with Farallon SOP EQ-01, Equipment Decontamination Procedures.

## PROCEDURES

Follow the instructions below for monitoring well construction and installation:

- Don appropriate personal protective equipment as described in the site-specific Health and Safety Plan.
- Before installing the casing, discuss the geology and groundwater conditions at the site with the Project Manager to confirm the depth the monitoring well screen should be placed at, and the length of screen to be used.
- Measure the depth to the bottom of the borehole to calculate the appropriate placement and length of the screened interval, filter pack, annular seal, and concrete surface seal. Calculate the approximate volumes of the filter pack and the seal material required for the specific monitoring well bore annulus and monitoring well casing diameter. Ensure that the filter pack extends from the bottom of the monitoring well intake to approximately 2 to 5 feet above the top of the monitoring well intake, and is approximately 2 to 4 inches thick. The monitoring well casing should be centered in the borehole. Ensure that the annular seal is a minimum of 2 feet thick above the top of the filter pack, and that the concrete seal is a minimum of 2 feet in depth from the surface.
- Prior to installation, measure and check the lengths of the monitoring well screen and the blank casing, and confirm the slot size and the sand filter pack size, the type of bentonite seal and/or Volclay Grout seal, and the monitoring well-head monument. For boreholes completed to depths deeper than the planned installation depth of the monitoring well casing, backfill the borehole with bentonite, sand, or pea gravel. Record the type and brand of the monitoring well construction materials used on a Monitoring Well Construction Data form.
- Record on a Field Report form the start and completion times for the various stages of monitoring well construction such as installation of the monitoring well casing into the borehole, filter pack and seal emplacement, and well-head monument placement.
- Record on a Monitoring Well Construction Data form the volumes of filter pack, the bentonite seal, and the concrete used to construct the monitoring well, and check against calculated volumes to confirm proper placement and amount. During the construction process, record any irregularities such as bridging of the filter pack or seal material that could indicate construction problems.
- Upon completion of monitoring well installation, measure the total monitoring well depth and the depth to groundwater, and record the measurements on the Monitoring Well Construction Data form.



- Place a mark or notch on the northern side of the top of the monitoring well casing to provide a monument for the measurement of water levels.

## **DOCUMENTATION**

Document monitoring well construction activities on the Monitoring Well Construction Data form and the Field Report form.

## **REFERENCES**

U.S. Environmental Protection Agency. 1991. *Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells*. EPA160014-891034. March.

———. 1996. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*. EPA/540/S-95/504. April.



## **STANDARD OPERATING PROCEDURE GW-02**

### **MONITORING WELL DEVELOPMENT**

#### **PURPOSE AND APPLICATION**

The purpose of this standard operating procedure (SOP) is to provide field personnel with the methodology for monitoring well development. All monitoring wells should be developed to create an effective filter pack around the monitoring well screen, rectify damage to the formation caused by drilling, remove fine particulates from the formation near the borehole, and assist in restoring the natural water quality of the aquifer in the vicinity of the monitoring well. The step-by-step guidelines provided in this SOP are to be followed by the field crew performing or overseeing monitoring well development.

#### **EQUIPMENT AND SUPPLIES/REAGENTS**

The following equipment is necessary to properly develop a groundwater monitoring well:

- Monitoring well key, socket wrench or speed wrench, socket set, padlock key, or other monitoring well-access equipment.
- Electric water-level meter long enough to reach the bottom of the monitoring well, calibrated to 0.01 foot.
- Two-inch-diameter (or appropriately sized) surge block.
- Monitoring well-purging equipment (e.g., silicone line, polyvinyl chloride pipe, plug, submersible or non-submersible pump, tubing, power supply, extension cord), as applicable.
- U.S. Department of Transportation-approved drum(s) for decontamination wastewater unless other water-handling arrangements have been made. Separate drums are needed for liquid and solid wastes (see Farallon SOP WM-01, Field Handling of Investigation-Derived Waste). Liquid wastes should not be added to drums containing solid wastes.
- Materials necessary to provide required documentation (e.g., Field Report form, Monitoring Well Construction Data form, and Waste Inventory Tracking Sheet).
- Personal protective equipment as described in the site-specific Health and Safety Plan.
- Decontamination equipment as specified in Farallon SOP EQ-01, Equipment Decontamination Procedures.

#### **DECONTAMINATION**

Before arrival at the site, upon relocation at the site, and upon demobilization from the site, decontaminate equipment that will come into contact with groundwater, in accordance with SOP EQ-01, Equipment Decontamination Procedures.



## PROCEDURES

Follow the instructions below for each monitoring well:

- Don appropriate personal protective equipment as described in the site-specific Health and Safety Plan.
- Brush away soil and vegetation, and pump standing water away from the monitoring well opening.
- Open the monitoring well cap.
- Measure the depth to water and the total depth of the monitoring well to the nearest 0.01 foot using a decontaminated water-level meter in accordance with Farallon SOP GW-03, Groundwater Level Measurements in Monitoring Wells. Record the measurements on the Monitoring Well Construction Data form.
- Calculate the unit purge volume using the formula and the input values from the table below:

$$V = [X(\text{monitoring well depth} - \text{water level})] + [Y(\text{monitoring well depth} - \text{bottom of seal or water level, whichever is lowest in depth})]$$

Where:

V = monitoring well volume, including annular space

X = internal casing volume per unit length (gallons per linear foot)

Y = annular volume per unit length (gallons per linear foot)

| Borehole Diameter (inches) | Casing Diameter (inches) | Volume <sub>casing</sub> (X) (gallons per linear foot) | Volume <sub>annulus</sub> (Y) (gallons per linear foot) |
|----------------------------|--------------------------|--|---|
| 7                          | 2                        | 0.17   | 0.68  |
| 8                          | 2                        | 0.17   | 0.98  |
| 10                         | 4                        | 0.65   | 1.34  |
| 12                         | 4                        | 0.65   | 2.07  |
| 12                         | 6                        | 1.47   | 1.70  |
| 14                         | 8                        | 2.61   | 1.98  |

### Development Procedures – Existing and New Monitoring Wells

Existing wells in a monitoring well network may require redevelopment if an excessive amount of fines are present in the monitoring well casing that could interfere with stabilization of water-quality parameters or collection of representative water-quality samples.



The instructions below are to be followed for development of existing and new monitoring wells:

**For existing monitoring wells only:**

- Remove the pump and/or any dedicated tubing from the monitoring well.

**For existing and new monitoring wells:**

- Attach one length of twine to the decontaminated surge block (or use a drill rig or tripod) and lower the surge block to within 0.25 foot of the bottom of the monitoring well.
- Surge the monitoring well by vigorously moving the surge block up and down from 0.25 foot from the bottom of the monitoring well to 1 foot above the top of the screened interval for a minimum of 5 minutes to create a surging action across the screened interval, which will bring finer-grained material into suspension. Move the surge block up and down in 3-foot sections until the entire monitoring well screen length has been surged. Record on the Monitoring Well Construction Data form the number of times the surge block is raised and lowered, and total surge time.
- Remove the surge block.
- If a submersible pump is to be used for monitoring well development, gently lower the pump into the monitoring well to within 1 foot of the bottom of the screened interval. If a non-submersible pump is to be used, lower the tubing to within 1 foot of the bottom of the screened interval.
- Begin purging the monitoring well at a rate sufficient to remove fines without pumping the monitoring well dry. Record on the Monitoring Well Construction Data form the volume of water pumped from the monitoring well.
- Surge and pump the monitoring well, including saturated annular space, a minimum of three and a maximum of five monitoring well volumes. If the monitoring well runs dry, let the monitoring well recharge. Then commence purging until a minimum of three monitoring well volumes have been purged. If this event is the first time the monitoring well has been developed and water was added during the drilling process, remove the volume of water introduced during drilling and monitoring well construction. Purging has been completed when *one* of the following has occurred:
  - The minimum purge volume has been removed; OR
  - Five purge volumes and the drilling process water volume have been removed.
- Measure the total depth of the monitoring well after development, and record on the Monitoring Well Construction Data form the total volume of water pumped from the monitoring well.
- Record on the Monitoring Well Construction Data form a description of the suspended particle content, and additional information such as unique odor or water color.



- Containerize the purge water in a U.S. Department of Transportation-approved drum(s) unless other water-handling arrangements have been made. Separate drums are needed for liquid and solid wastes (refer to Farallon SOP WM-01, Field-Handling of Investigation-Derived Waste). Liquid wastes should not be added to drums containing solid wastes.
- Upon completion of monitoring well development, properly seal, secure, and label the drums in accordance with Farallon SOP WM-01, , Field-Handling of Investigation-Derived Waste. Record the number and contents of the drums on a Waste Inventory Tracking Sheet. At a minimum, the drum label(s) should include:
  - Boring/monitoring well ID.
  - Facility name.
  - Drum contents.
  - Date.
  - Drum number.
- Close the monitoring well and record any monitoring well-integrity concerns on the Field Report form and the Monitoring Well Construction Data form.
- Decontaminate all equipment in accordance with Farallon SOP EQ-01, Equipment Decontamination Procedures.

## **DOCUMENTATION**

Document monitoring well development activities on the Monitoring Well Construction Data form. Record the number and contents of the drums on a Waste Inventory Tracking Sheet.

## **REFERENCE**

U.S. Environmental Protection Agency. 1991. *Handbook of Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells*. Document No. 160014-891034. March.

## **STANDARD OPERATING PROCEDURE GW-03**

### **GROUNDWATER LEVEL MEASUREMENT IN MONITORING WELLS**

#### **PURPOSE AND APPLICATION**

The purpose of this standard operating procedure (SOP) is to provide field personnel with the methodology for measuring and documenting the depth to groundwater in monitoring wells. The step-by-step guidelines provided in this SOP are to be followed by the field crew to ensure consistent and representative measurements of depth to groundwater in monitoring wells. When multiple wells are present at a site, all water-level measurements typically are taken as quickly as possible to aid in the creation of potentiometric surface maps that are representative of a “single” point in time.

#### **EQUIPMENT AND SUPPLIES/REAGENTS**

The following equipment is necessary to properly measure the depth to groundwater in monitoring wells:

- Monitoring well key, hand drill, socket set, Allen wrench, speed handle, padlock key, or other monitoring well-access equipment specific to the monitoring well monument cover plate.
- Electronic water-level meter (Solinst or equivalent) narrow enough to fit in the monitoring well, calibrated to 0.01 foot, with sufficient line to reach the bottom of the monitoring well.
- Oil-water interface probe, if light nonaqueous-phase liquid (LNAPL) is known or suspected to be present.
- Disposable bailer if LNAPL is known or suspected to be present, and the Project Manager requests that LNAPL be bailed from the well.
- Tape measure.
- Materials necessary to provide required documentation, including Groundwater Level Measurement Summary Forms and Field Report forms.
- Personal protective equipment as described in the site-specific Health and Safety Plan.
- Decontamination equipment as specified in Farallon SOP EQ-01, Equipment Decontamination Procedures.

#### **DECONTAMINATION**

Before arrival at the site, upon relocation at the site, and upon demobilization from the site, decontaminate equipment that will come into contact with groundwater, in accordance with Farallon SOP EQ-01, Equipment Decontamination Procedures.



## PROCEDURES

Follow the instructions below for measuring water levels at each monitoring well:

- Don appropriate personal protective equipment as described in the site-specific Health and Safety Plan.
- Check the operation of the water-level meter by turning on the indicator switch and pressing the test button.
- Remove soil or vegetation from the monitoring well site.
- Open the monitoring well-head enclosure, and use a bilge pump or cup to remove standing water inside the monitoring well monument before opening the monitoring well cap. Dispose of standing water to the ground surface.
- Open the monitoring well cap.
- Monitor air quality at the monitoring well-head if volatile contaminants are suspected to be present, or if it is unknown whether volatile contaminants are present.
- Repeat above procedure until all monitoring wells are open.
- Allow the water level to equilibrate with ambient atmospheric pressure for approximately 15 minutes before measuring.
- Before taking any measurements, carefully measure the length of the sonde to the nearest 0.01 foot. The additional 2 to 3 inches from the zero point of the sonde to the tip of the sonde **must be discounted** for **all** total depth measurements.
- Measure and record the depth to water using a water-level meter that has been decontaminated in accordance with Farallon SOP EQ-01, Equipment Decontamination Procedures. With the water-level meter turned on to a medium level of sensitivity, slowly lower the meter into the monitoring well casing until it reaches the groundwater table. The probe will beep when it reaches the interface of the groundwater table (when the electronic circuit is first completed). Stop lowering the probe, hold the graduated water-level cable to the notch or mark on the northern side of the top of the monitoring well casing, and note the length measurement. Repeat this process to collect a second water-level measurement. If the two readings differ by more than 0.01 foot, repeat the measurements until the readings stabilize. Repeat the process until three consecutive stabilized readings have been measured. Record the water-level measurement **only** in relation to the probe being lowered into the monitoring well, *not* as it is raised out of the monitoring well. If you cannot see the top of the monitoring well casing when the water level beeps, grasp the tape with your thumb and index finger exactly at the measuring point corresponding with the notch or mark at the top of the monitoring well casing. Slowly pull the cable out of the monitoring well and read the measurement. Repeat until readings stabilize.
- Remove the cable from the monitoring well, and record the stabilized depth-to-water measurement on the Groundwater Level Measurement Summary Form to the nearest 0.01 foot.



- Measure the total monitoring well depth. **NOTE:** If groundwater samples are to be collected, measure the total monitoring well depth **after** all groundwater samples have been collected, to avoid resuspension of settled solids in the monitoring well, impacting the samples. If the monitoring well does not have a dedicated pump, lower the water-level indicator probe to the bottom of the monitoring well to measure the total depth of the monitoring well. Gently bounce the probe on the monitoring well bottom, and pull the slack in the cord to read the total monitoring well depth. Repeat three times to ensure that the monitoring well depth measurement is reproducible, and is representative of the true depth. Note on the Groundwater Level Measurement Summary Form whether the bottom of the monitoring well is hard or soft.
- Remove the cable from the monitoring well, and record the monitoring well depth measurement on the Groundwater Level Measurement Summary Form to the nearest 0.01 foot.
- Decontaminate the water-level meter in accordance with Farallon SOP EQ-01, Equipment Decontamination Procedures.
- If the presence of LNAPL is suspected or if site conditions are unknown, check for the presence of LNAPL by one of two methods:
  - Use of a bailer: Use a new 3-foot-long disposable bailer attached to a nylon rope. Slowly lower the bailer until the bottom of the bailer is approximately 2 feet below the water surface. Slowly retrieve the bailer, and measure the product thickness using a tape measure. Record the information on the Groundwater Level Measurement Summary Form. Dispose of the bailer and product or wastewater in accordance with Farallon SOP WM-01, Field Handling of Investigation-Derived Waste.
  - Use of an oil-water interface probe: Decontaminate the oil-water interface probe in accordance with Farallon SOP EQ-01, Equipment Decontamination Procedures. With the oil-water interface probe meter turned on to a medium level of sensitivity, slowly lower the probe into the monitoring well casing until it reaches the top of the LNAPL. The probe will have a steady beep when it reaches the interface of the LNAPL (when the electronic circuit is first completed). Stop lowering the probe, hold the graduated oil-water interface cable to the notch or mark on the northern side of the top of the monitoring well casing, and note the length measurement. Repeat this process to collect a second LNAPL measurement. If the two readings differ by more than 0.01 foot, repeat the measurements until the readings stabilize. Repeat the process until three consecutive stabilized readings have been measured. Record the depth to LNAPL measurement **only** in relation to the probe being lowered into the monitoring well, *not* as it is raised out of the monitoring well. If you cannot see the top of the monitoring well casing when the oil-water interface probe beeps, grasp the tape with your thumb and index finger exactly at the measuring point corresponding with the notch or mark at the top of the monitoring well casing. Slowly pull the cable out of the monitoring well and read the



measurement. Repeat until readings stabilize. Once the depth to LNAPL has been recorded, collect the water-level measurement as described above using the oil-water interface probe. Once the depth to LNAPL and the depth to the groundwater table have been determined, subtract the depth to LNAPL from the depth to the groundwater table to determine LNAPL thickness.

- Close the monitoring well as appropriate based on monitoring well-head construction. Record any concerns about monitoring well integrity on the Groundwater Level Measurement Summary Form and on the Field Report form.

### **DOCUMENTATION**

Document monitoring well water-level measurements on the Groundwater Level Measurement Summary Form. Document any additional information on the Field Report form.

### **REFERENCE**

U.S. Environmental Protection Agency. 1992. *RCRA Ground-Water Monitoring: Draft Technical Guidance*. Office of Solid Waste. November.



## **STANDARD OPERATING PROCEDURE GW-04**

### **LOW-FLOW GROUNDWATER SAMPLING PROCEDURES**

#### **PURPOSE AND APPLICATION**

The purpose of this standard operating procedure (SOP) is to provide field personnel with the methodology for collecting and documenting groundwater samples from monitoring wells using U.S. Environmental Protection Agency (EPA) low-flow groundwater sampling procedures (EPA 1996, 2017) for chemical analysis to ensure consistent and representative sampling. The step-by-step guidelines provided in this SOP are to be followed by the field crew conducting groundwater sampling.

#### **EQUIPMENT AND SUPPLIES/REAGENTS**

The following equipment is necessary to properly purge and sample a monitoring well:

- Monitoring well key, hand drill, socket set, padlock key, or other monitoring well-access equipment.
- Electronic water-level meter long enough to reach the bottom of the monitoring well, calibrated to 0.01 foot. Alternatively, to measure for light nonaqueous-phase liquid thickness in addition to groundwater, use an oil-water interface probe.
- Monitoring well purging and sampling equipment:
  - Submersible pump (bladder or Grundfos): the pump, control box, and power source (typically a portable generator or a 12-volt battery); or
  - Peristaltic pump: the pump with pump head, silicone tubing, tubing connectors (as needed), and power source (typically a 12-volt battery).
- Sample tubing of project- and site-specific type and length.
- Bailer, if a pump is not used, or if light nonaqueous-phase liquid requires removal.
- Sufficient number of 55-gallon drums, including lids, gaskets, and fasteners, to contain all purge water, unless other water-handling arrangements have been made.
- Flow-through water-quality meter(s) to measure temperature, pH, specific conductivity, dissolved oxygen, oxidation-reduction potential (ORP), and turbidity.
- Air-space monitoring equipment if required (photoionization detector or multi-gas meter).
- Decontamination equipment and supplies (e.g., buckets, scrub brushes, deionized or distilled water, potable water, Liquinox detergent).
- Materials necessary to provide required documentation, (e.g., sample labels, Field Report forms, Low-Flow Well Purging and Sampling Data form, Chain of Custody form, Waste Inventory Tracking Sheet).



- Sample containers with the chemical preservatives appropriate for the samples, as described in project-specific plans, or as required by the analytical laboratory at a minimum.
- Personal protective equipment as described in the site-specific Health and Safety Plan (HASP).
- Sampling-support equipment (e.g., sample coolers, ice, bubble wrap, clear tape, duct tape, resealable plastic bags, garbage bags, paper towels, distilled water, nitrile gloves, shipping supplies).
- U.S. Department of Transportation-approved drum(s) for purge water, unless other water-handling arrangements have been made. Separate drums are needed for liquid and solid wastes (Refer to Farallon SOP WM-01, Field Handling of Investigation-Derived Waste). Liquid wastes should not be added to drums containing solid wastes.

## **DECONTAMINATION**

Before arrival at the site, upon relocation at the site, and upon demobilization from the site, decontaminate reusable equipment that will come into contact with the monitoring well(s) and/or be used to acquire samples, in accordance with Farallon SOP EQ-01, Equipment Decontamination Procedures.

## **PROCEDURES FOR LOW-FLOW GROUNDWATER SAMPLING**

Low-flow groundwater sampling procedures have been developed for monitoring wells with a dedicated pump (dedicated monitoring wells) and for monitoring wells without a dedicated pump (non-dedicated monitoring wells). Setup, purging, sample collection, and post-sampling procedures for dedicated and non-dedicated monitoring wells are presented below.

### **Setup**

Setup procedures differ slightly for dedicated versus non-dedicated monitoring wells. Follow the instructions below for the monitoring wells as indicated:

- Calibrate the water-quality meter for the field parameters specified in the project-specific plans. At a minimum, collect temperature, pH, and specific conductivity during purging and prior to sampling. Record on the Field Report form the equipment calibration and maintenance performed. Decontaminate the water-quality meter between monitoring wells by rinsing with distilled or deionized water. Manage the rinsate water used in collecting these measurements in the same manner as for purge water, as defined in project-specific plans, and in accordance with Farallon SOP WM-01, Field Handling of Investigation-Derived Waste.
- Don appropriate personal protective equipment as described in the site-specific HASP, including nitrile gloves for activities that might involve contact with groundwater or equipment. Change gloves between each monitoring well at a minimum, or when



contaminants could be introduced into a monitoring well or onto decontaminated equipment.

- Brush away soil and/or vegetation, and pump standing water away from the monitoring well opening. If necessary, place a plastic drop cloth around the monitoring well-head to prevent sampling equipment from contacting the ground surface.
- Inspect the condition of the monitoring well (e.g., locked monitoring well cap, tightness of monitoring well cap, well-marked measuring point on casing, disturbance of surface casing, straightness of monitoring well casing, condition of concrete pad). Indicate the monitoring well condition on the Low-Flow Well Purging and Sampling Data form.
- Open the monitoring well cap. If the site-specific HASP identifies organic compounds as potential contaminants of concern, screen the monitoring well headspace and the breathing zone headspace (if specified in the HASP) for organic vapors using the appropriate field monitoring instrument (e.g., photoionization detector, multi-gas meter).
- Measure and record the depth to water using a decontaminated water-level meter in accordance with Farallon SOP GW-03, Groundwater Level Measurements in Monitoring Wells.
- If light nonaqueous-phase liquid may be present (see site-specific plans), obtain a sample from the monitoring well using a bailer (if a dedicated pump is not in use), as specified in Farallon SOP GW-03, Groundwater Level Measurements in Monitoring Wells. Alternatively, measure free-floating product thickness using an oil-water interface probe.
- Calculate the monitoring well casing volume as follows:

Monitoring well casing volume in gallons =  $(\pi * r^2) * h(7.48 \text{ gallons/cubic foot})$

Where:

$r$  = radius of the inside of the monitoring well casing in feet

$h$  = length of the water column in the monitoring well casing (i.e., the depth to the bottom of the monitoring well minus the depth to water, both measured from the mark at the top of the monitoring well casing), in feet

- **For monitoring wells with dedicated pumps and tubing:** Set up a flow-through cell in preparation for purging. Connect dedicated tubing from the monitoring well to the flow-through cell. Set tubing and/or pump to the correct water depth in accordance with the constituents being sampled for, as described in project-specific plans. **DO NOT IMMERSE water-quality probes or meters in purge water containing nonaqueous-phase liquids, which could damage the probes.** Turn the pump controller to its lowest setting, set the memory in the flow-through cell to record readings every 3 minutes, and turn on the pump. Begin purging slowly (i.e., less than 500 milliliters per minute [ml/min]) to prevent drawing down the water table.



- **For monitoring wells with non-dedicated pumps:** Connect dedicated silicon tubing to the peristaltic pump. Place the tubing intake at the midpoint of the screen, or at the depth pre-determined in the project-specific plans. If using a bladder pump, insert the bladder pump and attach the dedicated polyethylene tubing so the pump intake is at the approximate midpoint of the screened interval, or set the pump intake to the depth pre-determined in the project-specific plans.

### **Purging Procedures**

The purging instructions below are to be followed for dedicated and non-dedicated monitoring wells:

- Begin purging, and initiate water-quality testing for temperature, pH, specific conductivity, dissolved oxygen, ORP, and turbidity. Purge monitoring wells using a peristaltic or bladder pump, and dedicated polyethylene and silicon tubing. Record water-quality parameters every 3 minutes.
- Record water levels every 3 minutes, as possible. It is imperative that the water level not drop by more than 0.33 foot during the low-flow purging process. If the water level drops more than 0.33 foot during purging, reduce the flow rate on the pump. Recommended purge rates generally are less than 500 ml/min. Actual purge rates will vary based on aquifer material and monitoring well construction. If the water level continues to drop by more than 0.33 foot during the low-flow purging at a rate less than 100 ml/min, notify and consult with the Project Manager on how to proceed.
- Record flow rates every 3 minutes. Ensure that the flow rate does not exceed 500 ml/min during the low-flow purging process.

### **Purging Requirements**

Continue purging at a constant rate until the water-quality parameters have stabilized for three successive measurements according to the stability criteria provided in the table below. Before samples can be collected from each monitoring well, the groundwater must stabilize according to following criteria:

- Drawdown is no greater than 0.33 foot for low-flow sampling, and
- The water-quality parameters should stabilize according to the criteria specified below:



| Water-Quality Parameter       | Stability Criterion   |
|-------------------------------|---|
| Turbidity (if required)       | 10% for values greater than 5 NTU or three consecutive values < 5 NTU       |
| Dissolved oxygen              | 10% for values greater than 0.5 mg/l, or three consecutive values <0.5 mg/l |
| Specific conductivity         | 3%  |
| Oxidation-reduction potential | +/- 10 millivolts   |
| pH                            | +/- 0.1 unit  |
| Temperature                   | 3%  |

Notes:

mg/l = milligrams per liter

NTU = nephelometric turbidity unit

Although under some circumstances, a monitoring well may not stabilize according to the above criteria, the monitoring well can still be sampled if the monitoring well does not meet stability criteria due to the instrument accuracy, or the water level drops below the minimum value using low-flow sampling procedures. For example, a fluctuation in ORP greater than 10 millivolts does not meet the stability criterion. However, because the accuracy range of the ORP instrument is  $\pm 20$  millivolt, the stability criterion would be considered satisfied and within the range of instrument accuracy. Consult the manual for the instrument to determine the accuracy range.

Also, if the water level drops below the minimum value using low-flow sampling procedures (i.e., the pump intake, or the top of the screen if the aquifer is confined) during purging and one monitoring well volume of groundwater has been removed from the monitoring well, or the monitoring well runs dry during the purging procedure, sample the monitoring well as soon as the water level has recovered sufficiently to allow collection of the volume of groundwater necessary for all samples. Use the following equation to determine the minimum volume of groundwater to remove before sampling:

$$\text{Minimum purge volume} = 2 * [500 \text{ milliliters} + M * (\text{length of tubing in feet})]$$

Where: M = volume (in milliliters) contained in a 1-foot length of tubing

The value of M is provided below for the inner diameters of tubing listed:

| Inner Diameter (inches) | M (milliliters) |
|-------------------------|-----------------|
| 0.125                   | 2.4             |
| 0.25                    | 9.7             |
| 0.5                     | 39              |

Record on the Field Report form and the Low-Flow Well Purging and Sampling Data form if any monitoring well did not meet the drawdown and stability criteria and explain the rationale for sampling the monitoring well at the time it was sampled. If stability criteria have not been achieved following completion of all entries in the Low-Flow Well Purging and Sampling Data form, notify



and consult with the Project Manager whether to continue purging until stability criteria have been achieved or begin sample collection.

### **Sample Collection**

During low-flow sampling, do not stop pumping once the purging requirements have been met. Turn down the flow rate on the pump so the water flow is minimal, but maintain sufficient pressure in the system to prevent water from the tubing or flow-through cell from flowing back into the monitoring well. Disconnect the pump discharge hose from the flow-through cell, or cut the tubing just before the connection to the flow-through cell. It is imperative not to lower the water table or disturb the water column. Fill pre-cleaned laboratory-supplied sample containers directly from the pump discharge tube into the proper sample container, and fill to capacity. Place a bucket beneath the sampling tube to catch any unsampled water between filling the sample jars. When collecting groundwater samples for multiple analyses, collect the samples in the order listed below per the EPA (1992) groundwater sampling technical guidance:

- Volatile organic compounds (VOCs);
- Dissolved gases and total organic carbon;
- Semivolatile organic compounds;
- Metals and cyanide;
- Major water quality cations and anions;
- Radionuclides; and
- Dissolved (filtered) inorganics (if required).

When collecting samples for VOCs, adjust the flow rate as low as possible without introducing air bubbles into the system. When filling the VOC containers, hold the cap in hand to minimize contamination, and direct the flow from the pump discharge tubing down the side of the sample container to minimize aeration. Fill all VOC sample containers to the top, ensuring a positive meniscus when the cap is screwed down on the container. Tap the filled VOC container, and invert several times to ensure no air bubbles are present in the sample container. If an air bubble is present, the VOC sample must be recollected using a fresh VOC sample container. If sampling for other analytes, the flow rate may be increased.

If dissolved inorganics are required, attach a new disposable 0.45-micrometer filter cartridge to the discharge line. Collect filtered samples last. Pre-rinse the disposable filter cartridges by running a minimum of 0.25 gallon of groundwater through them (collecting the groundwater into a waste bucket) prior to collecting the samples directly into the sample container. Alternate field filtration methods may be specified in the project-specific plans. Remove the pump and/or tubing from the monitoring well.



## Post-Sampling

- Record the depth to water of well to determine whether the water level changed from the original reading.
- Close and lock the monitoring well or tap and record any monitoring well integrity concerns on the Field Report form and the Low-Flow Well Purging and Sampling Data form.
- Transfer purge, wash, and rinse water into a U.S. Department of Transportation-approved drum(s) and label. Separate drums are needed for liquid and solid wastes, in accordance with SOP WM-01, Field Handling of Investigation-Derived Waste. Do not add liquid wastes to drums containing solid wastes.

## PROCEDURES FOR RECONNAISSANCE GROUNDWATER SAMPLING

Collect reconnaissance groundwater samples from borings using direct-push or hollow-stem auger drilling methods and 0.75- or 2-inch-inside-diameter temporary monitoring well casing and 0.010-inch slotted screen. In some cases, alternate well casing diameters or screen slot sizes may be appropriate based on the drilling equipment or project-specific requirements. Follow the instructions below for reconnaissance groundwater sample collection:

- Withdraw the drill casing when the desired sampling depth has been reached, so the temporary monitoring well screen is exposed to water-bearing material.
- Insert disposable polyethylene tubing to the approximate midpoint of the temporary monitoring well screen. Attach the appropriate length of pre-cleaned disposable silicon tubing from the polyethylene tubing to connect with the peristaltic or bladder pump.
- Set up the peristaltic or bladder pump in preparation for purging. Turn the pump to its lowest setting and turn on the pump. Begin purging slowly to prevent drawing down the water table.
- Purge each temporary monitoring well point using a peristaltic or bladder pump until visual turbidity is as low as possible, or until the temporary monitoring well is purged dry of water.
- Purge a minimum of 1 to 2 liters before sample collection, if possible. If the temporary monitoring well is completely dewatered during purging, collect samples when sufficient recharge has occurred to allow filling of the sample containers.
- Slow the pumping rate to less than 500 ml/min to reduce the potential for volatilization of chemicals during sample collection.
- Collect the sample as described above.
- If insufficient groundwater is available to collect a sample using a peristaltic or bladder pump (i.e., the boring pumps dry or cannot maintain a sufficient flow of less than 100 ml/min) or if the depth to groundwater exceeds the maximum practicable limit for sampling using a peristaltic or bladder pump, use a disposable polyethylene bailer lowered



into the monitoring well screen to collect a groundwater sample from the screened interval, if possible.

## **DOCUMENTATION**

Document the monitoring well purging and sampling activities on the Low-Flow Well Purging and Sampling Data form and on the Field Report form. Track samples on a Chain of Custody form. Track waste generated during groundwater sampling on a Waste Inventory Tracking Sheet.

## **REFERENCES**

- U.S. Environmental Protection Agency. 1992. *RCRA Ground-Water Monitoring: Draft Technical Guidance*. Office of Solid Waste. November.
- . 1996. *Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures*. EPA/540/S-95/504. April.
- . 2017. *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells*. EQASOP-GW4. September.



## **STANDARD OPERATING PROCEDURE SL-01**

### **SOIL CORE SAMPLING**

#### **PURPOSE AND APPLICATION**

The purpose of this standard operating procedure (SOP) is to provide field personnel with the methodology for collecting and documenting soil core samples using a hollow-stem-auger drill rig, a direct-push drill rig, and a sonic drill rig. All drilling operations will be conducted by a licensed drilling subcontractor in accordance with subcontractor SOPs. This SOP presents the procedures that will be performed by Farallon field staff once the soil core has been collected by the drilling subcontractor. The step-by-step guidelines provided in this SOP are to be followed by the field crew conducting subsurface soil sampling.

#### **EQUIPMENT AND SUPPLIES/REAGENTS**

The following equipment is necessary to properly collect soil samples from borings:

- Personal protective equipment (PPE) as described in the site-specific Health and Safety Plan.
- Differential global positioning system, if required in project-specific plans. Discuss the methodology for recording the location of the sample point with the Project Manager before conducting the field work.
- Photoionization detector (PID) to monitor and record soil headspace readings.
- Applicable soil sampling equipment, including:
  - Stainless steel hand-auger.
  - Wooden or steel stakes to stabilize cores on table while sampling.
  - Folding table.
  - Utility knife.
  - Stainless steel spoons or scoops.
  - Six-mil plastic sheeting.
  - Resealable plastic bags.
  - Duct tape.
  - Aluminum foil.
  - Tape measure.
  - Five-gallon buckets, and scrub brushes.
  - Alconox phosphate-free cleanser.
  - Laboratory-provided certified pre-cleaned sample containers.



- Soil sample plunger and syringes for sampling volatile organic compounds (VOCs) using U.S. Environmental Protection Agency (EPA) Method 5035A.
- Materials necessary to provide required documentation, including:
  - Camera.
  - White board and dry-erase markers, if specified in project-specific plan.
  - Sample labels.
  - Field Report forms.
  - Boring Log forms.
  - Chain of Custody forms.
  - Chain-of-custody seals for the sample cooler(s).
- U.S. Department of Transportation-approved drum(s) for decontamination wastewater and excess soil cuttings. Separate drums are needed for liquid and solid wastes (refer to Farallon SOP WM-01, Field Handling of Investigation-Derived Waste). Liquid wastes should not be added to drums containing solid wastes.
- Decontamination equipment as specified in Farallon SOP EQ-01, Equipment Decontamination Procedures.
- Sampling support equipment (e.g., sample coolers, ice, bubble wrap, clear packing tape, heavy resealable plastic bags, razor knives, garbage bags, paper towels, distilled water, nitrile gloves).

## **DECONTAMINATION**

Reusable equipment that will come into contact with soil boring samples or will be used to acquire soil samples is to be decontaminated before arrival at the site, between soil samples collected, upon relocation at the site, and upon demobilization from the site, in accordance with Farallon SOP EQ-01, Equipment Decontamination Procedures.

## **PROCEDURES**

*Prior to drilling, all underground utilities must be located, and cleared with an air-knife or other method approved by the Farallon Health and Safety Coordinator.*

Collect soil samples from areas known or suspected to have the lowest concentrations of constituents of concern first, with areas of higher concentrations of constituents of concern sampled last, unless the Project Manager indicates a different project-specific sampling protocol. The procedures listed below may be modified, with approval from the field team lead and the Project Manager. Any modifications must be identified in the project-specific sampling plans or, at a minimum, details must be noted on the Field Report form.



Soil core collection methods differ for hollow-stem-auger, direct-push, and sonic drilling techniques, each summarized below:

- Hollow-stem-auger: Collect soil core samples using a standard 18-inch-length (6-inch waste barrel) Dames & Moore split-spoon sampler with a 2.5-inch inner diameter that can be used with or without brass or stainless steel liners.
- Direct-push: Collect soil core samples using 5-foot macrocore samplers with acetate sample liners.
- Sonic: Collect soil core samples using a standard 6-inch-diameter stainless steel sampling rod. Use a 2.5-, 5.0-, or 10-foot polyethylene liner inside the sampling rod for soil sample collection.

Record the specific drilling and soil sampling equipment used on the Boring Log form and on the Field Report form.

### **Setup**

The instructions below are to be followed at each boring site:

- Don appropriate PPE as described in the site-specific Health and Safety Plan.
- Ensure that each borehole has been cleared to a minimum depth of 5 feet below ground surface using an air knife, per the Farallon health and safety policy.
- Set up a temporary sampling table adjacent to the drill rig to log and collect soil samples from the soil cores as they are recovered during drilling. During sunny conditions, consider using a portable canopy for protection from the sun. Lay plastic sheeting over the table to keep the surface clean and to prevent potential cross-contamination between borings and soil samples. Designate clean areas for decontaminated sampling equipment and laboratory-provided certified pre-cleaned soil sample containers.
- Set up 5-gallon buckets for decontaminating soil sampling equipment between samples. These decontamination buckets are separate from the buckets provided by the drillers for their split spoons and core barrels. (Refer to Farallon SOP EQ-01, Equipment Decontamination Procedures.)
- Calibrate the PID to monitor headspace for selected soil core samples in accordance with the equipment manual.

### **Sample Collection and Processing**

The instructions listed below are to be followed for collecting samples using lined and unlined split-spoon and tube samplers:

- Don a new pair of nitrile sampling gloves for each individual soil sample collected, and prior to decontaminating sampling equipment to avoid potential cross-contamination.



- Ensure that the drillers have properly decontaminated all drill shoes and caps prior to initiating drilling operations. Drill shoes and caps must be decontaminated between sampling intervals and stations in accordance with Farallon SOP EQ-01, Equipment Decontamination Procedures. Replace dirty or ineffective decontamination water as needed throughout the workday.
- Ensure that the drillers position the sampling rig over the sample station and remove any surface material or debris that would interfere with sampling. Note on the Field Report form any surface material removed.
- Note on the Field Report form and the Boring Log forms any difficulties encountered during drilling operations. Include the number of blow counts (if applicable) or any resistance encountered during drilling operations.
- Place the core tube, core liner, or split spoon on a new piece of aluminum foil on the sample logging/processing table. If necessary, use wood or metal stakes as shims to stabilize the tube, liner, or split spoon on the sample logging/processing table.
- If a core liner is used, split the liner open with a decontaminated utility knife, taking care not to penetrate the soil in the liner with the blade or knife.
- Briefly examine the soil sample visually for obvious signs of contamination, and take PID readings.
- Take care to:
  - **Not** collect soil in contact with the sidewalls of the sampler or liner.
  - **Always** use decontaminated stainless-steel spoons or scoops to handle the soil within a given sample interval.
  - **Always** don a new pair of nitrile gloves before processing each sample interval in each soil core to prevent cross-contamination in the soil core.
- When sampling for VOCs, collect them as soon as possible after opening the core tube, split spoon, or core liner. Use a decontaminated stainless steel spoon to collect the VOC samples with minimal disturbance to soil by placing a representative amount of soil from the length and depth of the desired sample interval directly into the laboratory-provided VOC sample container with no headspace, and seal it tightly. Follow the sample collection guidelines provided by the manufacturer or the analytical laboratory when using a plunger-type sampling device in accordance with EPA Method 5035A.
- Retain approximately 100 grams of the soil sample in a heavy resealable plastic bag or glass sample container, shake the sealed bag to volatilize the contaminants in the soil, and wait approximately 5 minutes before measuring for headspace analysis using the PID (Washington State Department of Ecology 2011). Insert the PID probe tip into a small opening in the top of the bag, and record the PID units on the Boring Log form. Reseal the bag after taking the headspace reading in case further assessment of the sample is needed. Do not puncture the resealable plastic bag to obtain headspace readings.



- If specified in the project-specific plans, photograph each section of the boring, including in the photograph notations on a white board documenting sample location identifier, date, orientation, depth, and site markers.
- Describe the soil samples in accordance with ASTM International Standard D-2488-00, *Standard Practice for Description and Identification of Soils*.
- Record on the Field Report form any deviations from the project-specified sampling procedures or from this SOP, or any obstacle encountered.
- Examine the remaining soil core sample for lithology using the Unified Soil Classification System, and record the lithology on the Boring Log form.
- Discard excess soil cuttings in a labeled waste drum or a soil bin in accordance with Farallon SOP WM-01, Field Handling of Investigation-Derived Waste. Do not add soil to a liquid waste drum.
- Backfill the borehole, as appropriate.
- Upon completion of sampling at a boring, measure the boring's location to an on-site permanent datum, collect the location using the differential global positioning system, or have the sample location surveyed by a licensed surveyor.
- Decontaminate the soil sampling equipment, and don a new pair of sampling gloves before collecting each new soil sample.

## DOCUMENTATION

Document the soil sampling activities on the Boring Log form, the Chain of Custody form, and the Field Report form.

## REFERENCE

American Society for Testing Materials. 1989. *Standard Method for Penetration Test and Split-Barrel Sampling of Soils*. Method D-1586-11.

U.S. Environmental Protection Agency. 1987. *A Compendium of Superfund Field Operation Methods*. EPA Document No. 540-P-87-001. December 1.

Washington State Department of Ecology. 2011. *Guidance for Remediation of Petroleum Contaminated Sites*. Ecology Publication No. 10-09-057. Toxics Cleanup Program. September.

**APPENDIX B**  
**FARALLON FIELD FORMS AND RECORDS**

SAMPLING AND ANALYSIS PLAN  
MONITORING WELL INSTALLATION  
Block 38 West Property  
500 through 536 Westlake Avenue North  
Seattle, Washington

Farallon PN: 397-019









# MONITORING WELL CONSTRUCTION DATA

WELL/BORING NO: \_\_\_\_\_

PROJECT NO: \_\_\_\_\_

PROJECT NAME: \_\_\_\_\_

PERMIT NO: \_\_\_\_\_

DATE: \_\_\_\_\_

SITE ADDRESS: \_\_\_\_\_

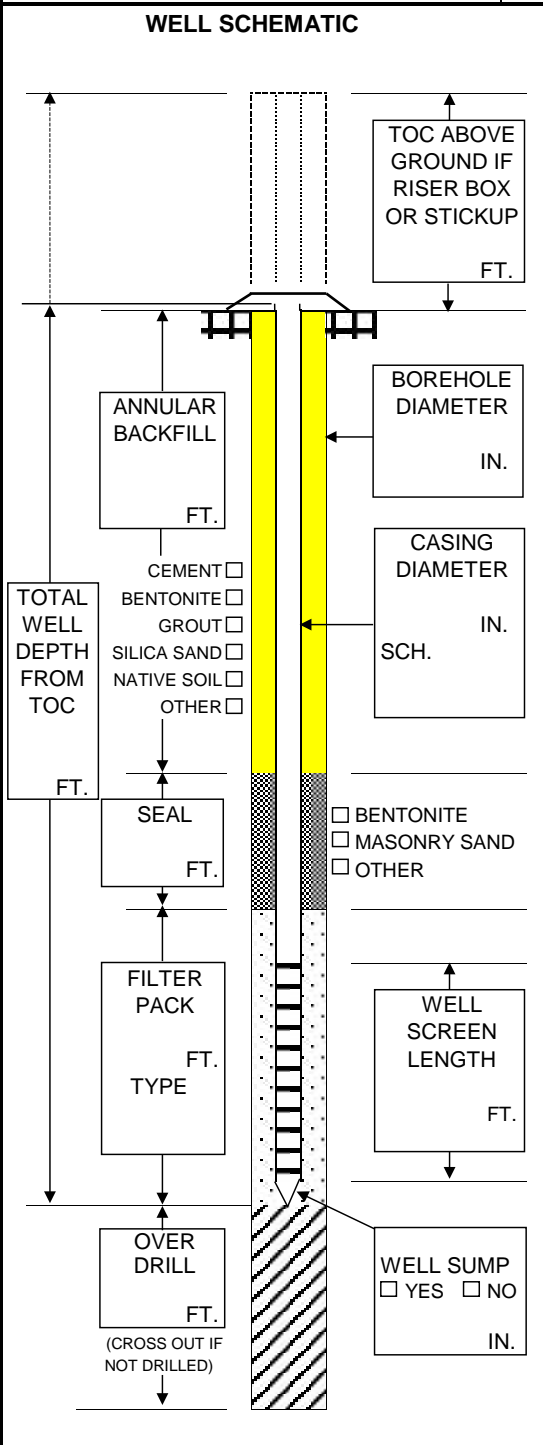
WELL SITE LOCATION PLAN:

SEC: \_\_\_\_\_ TWN: \_\_\_\_\_ RGE: \_\_\_\_\_ LAT: \_\_\_\_\_ LONG: \_\_\_\_\_

DRILLING CO: \_\_\_\_\_

DRILL CREW: \_\_\_\_\_

WELL TYPE:  SHALLOW  SINGLE CASED  MONITORING  
 PERMANENT  INTERMEDIATE  DOUBLE CASED  RECOVERY  
 TEMPORARY  DEEP  OTHER  OTHER



**INSTALLATION DATA**

DECON.  STEAM CLEAN  HIGH PRESSURE WASH  
 SOAP WASH  OTHER \_\_\_\_\_

CASING TYPE:  PVC  STAINLESS  TEFLON  OTHER  
 JOINTS:  THREADED  WELDED  COUPLED  
 SCREWED  OTHER \_\_\_\_\_

PIT CASING:  YES  NO  DESCRIBE \_\_\_\_\_

WELL SCREEN:  PVC  STAINLESS  TEFLON  OTHER  
 DIAMETER:  2"  4"  6"  OTHER \_\_\_\_\_ IN  
 SLOT:  0.010  0.020  OTHER \_\_\_\_\_ IN

DRILLING METHOD:  SOLID STEM  HOLLOW STEM  MUD ROTARY  
 AIR ROTARY  DIRECT PUSH  HAND AUGER  
 OTHER \_\_\_\_\_

BIT SIZE:  2"  4"  6"  8"  12"  OTHER \_\_\_\_\_ IN

DRILLING MUD:  NONE  WATER  BENTONITE  
 OTHER \_\_\_\_\_

CENTRALIZER:  YES  NO

COMPLETION:  FLUSH MOUNT  STICKUP  RISER BOX  
 LOCK TYPE:  DOLPHIN  MASTER KEY NO. \_\_\_\_\_  
 OTHER \_\_\_\_\_

PAD:  2'X2'  4'X4'  OTHER \_\_\_\_\_

CUTTINGS:  DRUMMED NUMBER OF DRUMS \_\_\_\_\_  
 SPREAD  OTHER \_\_\_\_\_

DEVELOPMENT METHOD:  NONE  BAILING  PUMPING  AIR LIFT  
 SURGE & BLOCK  OTHER \_\_\_\_\_

TIME:  10 MIN  20 MIN  OTHER \_\_\_\_\_ MIN  
 AMOUNT:  5 GAL  10 GAL  OTHER \_\_\_\_\_ GAL

WATER BEFORE:  SILTY  TURBID  OPAQUE  CLEAR  
 WATER AFTER:  SILTY  TURBID  OPAQUE  CLEAR  
 EVIDENT ODOR:  YES  NO TYPE \_\_\_\_\_

DEVELOPMENT WATER:  DRUMMED NUMBER OF DRUMS \_\_\_\_\_  
 SPREAD  TREATED  POTW  OTHER \_\_\_\_\_

WATER LEVEL: INITIAL \_\_\_\_\_ FT.  BTOC  BLS

DATE: \_\_\_\_\_ FT BELOW TOC  
 DATE: \_\_\_\_\_ FT BELOW TOC

NOTES: (DESCRIBE ALL NON-STANDARD METHODS & MATERIALS)

PREPARED BY: \_\_\_\_\_









