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ADDENDUM TO FEASIBILITY STUDY AND INTERIM ACTION WORK PLAN

8801 E Marginal Way South

TUKWILA, WASHINGTON

Agreed Order No. 6069

SHANNON & WILSON

December 11, 2020

Shannon & Wilson No: 21-1-12567-023

Submitted To: PACCAR Inc

Subject: ADDENDUM TO FEASIBILITY STUDY AND INTERIM ACTION WORK PLAN, 8801 E MARGINAL WAY SOUTH, TUKWILA, WASHINGTON

Shannon & Wilson prepared this report and participated in this project as a consultant to PACCAR Inc. This report presents the Addendum to the Feasibility Study and Interim Action Work Plan specific to the shoreline area of the property at 8801 East Marginal Way South, Tukwila, Washington. The report was prepared by the undersigned.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or we may be of further service, please contact us.

Sincerely,

SHANNON & WILSON

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EXECUTIVE SUMMARY

This report presents the Addendum to the Feasibility Study (FS) and the Interim Action Work Plan (IAWP) (Addendum) requested by the Washington State Department of Ecology (Ecology) in its letter dated July 20, 2020. The FS and IAWP pertain to the property located at 8801 East Marginal Way South in Tukwila, Washington (8801 property). The 8801 property constitutes the upland portion of the 8801 site. The 8801 site also includes the sediments in the Lower Duwamish Waterway (LDW) that adjoin the 8801 property. The FS, IAWP, and this Addendum were prepared under and in accordance with Agreed Order No. 6069, which applies to the 8801 property. A separate agreed order applies to the adjoining LDW sediments.

This Addendum relates to the western portion of the 8801 property immediately adjacent to the LDW (shoreline area). The remedial action proposed in the shoreline area of the IAWP included excavation of discrete areas where chemicals of concern (COCs) exceed the soil remediation levels (RELs) and retention of the existing paved surface throughout the shoreline area to reduce stormwater infiltration into subsurface soil where COCs would remain at concentrations greater than the soil cleanup levels (CULs). This Addendum presents an evaluation of technically feasible remedial alternatives and the selection of a preferred remedial action for the shoreline area that differs from the remedial action proposed in the IAWP.

The shoreline area of the 8801 property is subject to the requirements of the Washington State Shoreline Management Act (SMA), Chapter 90.58 Revised Code of Washington (RCW), and the City of Tukwila's Shoreline Master Program (SMP), Chapter 18.44 Tukwila Municipal Code (TMC). The portion of the 8801 property subject to the SMA and the SMP consists of all land within 200 feet of the ordinary high water mark of the LDW. The SMP designates the land within 100 feet of the ordinary high water mark as a river buffer, subject to special vegetation and landscaping requirements.

The purpose of this Addendum is to identify the requirements of the SMA, SMP, and the Model Toxics Control Act (MTCA) that apply to any remedial action conducted in the shoreline area of the 8801 property, evaluate remedial alternatives for the shoreline area that are consistent with those requirements, and select a preferred remedial alternative for the shoreline area.

Three remedial alternatives were identified for the shoreline area that are consistent with the SMA, City of Tukwila's SMP, and MTCA:

- Alternative 1 - Excavate unsaturated and saturated soil that contains COCs above the CULs, backfill the excavation, plant vegetation within the 100-foot river buffer consistent with the City of Tukwila's SMP requirements, and maintain pavement in the shoreline area outside the river buffer.
- Alternative 2 - Excavate unsaturated soil that contains COCs above the CULs, excavate saturated soil in hotspot areas that contains COCs above the RELs, install an impermeable clay cap over soil in the 100-foot river buffer that contains COCs above the CULs, place a drainage blanket over the clay cap, plant vegetation within the river buffer consistent with the City of Tukwila's SMP requirements, and maintain pavement in the shoreline area outside the river buffer. An institutional control would be required to provide notice of the contaminated soil that remains beneath the clay cap and pavement and to prohibit actions that could disturb or damage the clay cap or pavement.
- Alternative 3 - Excavate hotspot areas of soil (saturated and unsaturated) that contains COCs above the RELs, install an impermeable clay cap over soil in the 100-foot river buffer that contains COCs above the CULs, place a drainage blanket over the clay cap, plant vegetation within the river buffer consistent with the City of Tukwila's SMP requirements, and maintain pavement in the shoreline area outside the river buffer. An institutional control would be required to provide notice of the contaminated soil that remains beneath the clay cap and pavement and to prohibit actions that could disturb or damage the clay cap or pavement.

Alternative 1 would be the most protective remedial alternative. However, due to the subsurface infrastructure, large volume of soil that would need to be excavated, shoring requirements, and close proximity to the LDW, implementation of this alternative would be impracticable and expensive. A disproportionate cost analysis (DCA) shows that the cost of this alternative would be disproportionately high when compared to its benefit. Accordingly, this alternative was not selected as the preferred remedial alternative for the shoreline area.

Alternatives 2 and 3 are similar in nature, in that they would both require excavation of varying amounts of soil, installation of an impermeable clay cap and drainage blanket within the 100-foot river buffer, planting of vegetation within the river buffer, maintaining pavement outside the river buffer, and an institutional control. Alternative 2 would involve the excavation of a significantly higher volume of soil; however, the protectiveness generated by the additional removal would be minimal because the bulk of the contamination in the shoreline area is concentrated in three areas (i.e., hotspots) where COCs exceed RELs. Excavation of the hotspots would remove most of the mass of contamination in the shoreline area due to removal of COCs above the RELs. The additional excavation required under Alternative 2 to remove unsaturated soil containing COCs above the CULs would increase short-term risks, would be complicated and expensive to implement, and would provide no significant environmental benefits greater than those offered by Alternative 3. A DCA shows that the cost of Alternative 2 would be disproportionately high when compared to its benefit, and that Alternative 3 provides the greatest benefits when compared to its cost. Alternative 3 is therefore selected as the preferred remedial alternative.

The selected Alternative 3 differs from the remedial alternative proposed for the shoreline area in the IAWP. To the extent there is any conflict between this Addendum and the FS or IAWP, this Addendum controls.

CONTENTS

CONTENTS

Exhibits

Tables

CONTENTS

Figures

Appendices

ACRONYMS

8801 property	upland portion of the 8801 site
8801 site	8801 East Marginal Way South in Tukwila, Washington
Addendum	Addendum to Feasibility Study and Interim Action Work Plan
AS/SVE	air sparge/soil vapor extraction
bgs	below ground surface
COCs	chemicals of concern
cPAHs	carcinogenic polycyclic aromatic hydrocarbons
CSM	conceptual site model
CUL	cleanup level
DCA	disproportionate cost analysis
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FS	feasibility study
IAWP	interim action work plan
ISCO	in situ chemical oxidation
LDW	Lower Duwamish Waterway
mg/kg	milligrams per kilogram
MTCA	Model Toxics Control Act
NPDES	National Pollution Discharge Elimination System
PCBs	polychlorinated biphenyls
POCs	points of compliance
RAOs	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
REL	remediation level
SMA	Shoreline Management Act
SMP	Shoreline Master Program
TCE	trichloroethene
TEQ	toxicity equivalent quotient
TMC	Tukwila Municipal Code
VOCs	volatile organic compounds
WAC	Washington Administrative Code

1 INTRODUCTION

This report presents the Addendum to the FS and the IAWP (Shannon & Wilson, 2020a and 2020b) requested by Ecology in its letter dated July 20, 2020. The FS and IAWP pertain to the property located at 8801 East Marginal Way South in Tukwila, Washington (8801 site). The 8801 property constitutes the upland portion of the 8801 site (Figure 1). The 8801 site also includes the sediments in the LDW that adjoin the 8801 property. The FS, IAWP, and this Addendum were prepared under and in accordance with Agreed Order No. 6069, which applies to the 8801 property. A separate agreed order applies to the adjoining LDW sediments.

This Addendum relates to the western portion of the 8801 property immediately adjacent to the LDW (shoreline area). The remedial action proposed for the shoreline area in the IAWP included excavation of discrete areas (hotspots) where COCs exceed the soil RELs and retention of the existing paved surface throughout the shoreline area to reduce stormwater infiltration into subsurface soil where COCs would remain at concentrations greater than the soil CULs.

The shoreline area of the 8801 property is subject to the requirements of the SMA, Chapter 90.58 RCW, and the City of Tukwila's SMP, Chapter 18.44 TMC. The portion of the 8801 property subject to the SMA and the SMP consists of all land within 200 feet of the ordinary high water mark of the LDW. The SMP designates the land within 100 feet of the ordinary high water mark as a river buffer, subject to special vegetation and landscaping requirements.

The purpose of this Addendum is to identify the requirements of the SMA, SMP, and the MTCA that apply to any remedial action conducted in the shoreline area of the 8801 property, evaluate technically feasible remedial alternatives for the shoreline area that are consistent with those requirements, and select a preferred remedial alternative for the shoreline area. Groundwater remedial actions are not discussed further except where modifications to the previously proposed remedies may be required to be compatible with the selected shoreline remedial actions.

1.1 Objective

The objective of this Addendum is to present the evaluation of technically feasible remedial alternatives and the selected remedial action for remediation of soil in the shoreline area of the 8801 property and demonstrate that the remedy complies with the SMA, the City of Tukwila's SMP, and MTCA.

1.1 Addendum Organization

This Addendum presents the distribution of COCs in the 100-foot river buffer, a summary of the applicable technologies, evaluation of technically feasible remedial alternatives, the selected remedial alternative, consideration of how previously selected groundwater remedial actions in the shoreline area intersect with any selected soil remedy, and the schedule for implementation of the remedial action. This Addendum comprises the following sections:

- Section 1 introduces the background for the Addendum and lays out the objective.
- Section 2 discusses the shoreline area use, infrastructure, and relevant past remedial actions.
- Section 3 presents a synopsis of the contamination within the river buffer, and discusses the conceptual site model (CSM), a framework for looking at the contamination, and how it might affect various receptors in the shoreline area.
- Section 4 discusses the cleanup standards, which include CULs and points of compliance (POCs). It also addresses RELs that are interim levels used to achieve sufficiently low values to protect an exposure pathway, though greater than concentrations that must be achieved by the final cleanup.
- Section 5 discusses the remedial alternatives for the shoreline area.
- Section 6 discusses the selection rationale for shoreline area remedial actions.
- Section 7 discusses the activities associated with shoreline area compliance monitoring and the schedule for implementing the remedial actions.
- Section 8 provides the Addendum's limitations.
- Section 9 lists references used in the Addendum.

2 OVERVIEW

This section presents a short overview of the 8801 property, with an emphasis on the shoreline area.

2.1 Physical Setting

The 8801 site is in the Green-Duwamish River Watershed, which drains approximately 483 square miles in northwestern Washington. The upland portion of the 8801 property lies adjacent to the LDW, approximately 4 miles upstream from the mouth of the river. The upland portion of the 8801 property is relatively flat, with a ground surface elevation of approximately 20 feet above mean sea level.

2.2 Property Description

The upland portion of the 8801 site occupies 24.30 acres on the east bank of the LDW at 8801 East Marginal Way South (King County parcel no. 5422600060), Tukwila, Washington. The 8801 property is zoned manufacturing industrial center/heavy industry by the City of Tukwila.

The western edge of the 8801 property has a sheet pile wall bulkhead built in approximately 1929 that extends along the northern two-thirds of the western edge of the 8801 property and to a depth of about 30 feet below ground surface (bgs). The sheet pile wall bends into the upland area of the 8801 property and extends approximately 100 feet to the east along the former southern property line. In the southwest corner of the 8801 property, a berm was built in approximately 1969 along the southern one-third of the western property boundary and to the east on the southwestern corner of the 8801 property. After the berm was constructed, approximately 10 feet of fill was placed on the east side of the embankment, bringing the ground surface to roughly its present grade. Riprap armor was placed on the two LDW-facing sides.

The shoreline area currently has several structures, some of which will be demolished when CenterPoint redevelops the 8801 property (Figure 2). In the northwest corner of the shoreline area is a stormwater vault and a large-diameter stormwater pipeline. Running parallel with the LDW south of the northwest corner is the former fiberglass shop that was later used as a warehouse. Most of this building will be demolished prior to remedial work. The southern portion of the building contains a groundwater air sparge/soil vapor extraction (AS/SVE) remediation system that has been in operation since 2004. The southern portion of the building where the controls of the AS/SVE remediation system are situated will remain. Buried piping from the AS/SVE treatment system extends southwards below the building, eastwards beyond the 100-foot river buffer, and branches both to the north and south. South of the building is a second stormwater treatment vault that is connected to the Central Outfall. The stormwater facilities described above will remain after remediation.

The storm systems that drain the 8801 property discharge to the LDW. In the northwest corner is the North Outfall (No. 1) and to the south is the Central Outfall (No. 2). The Central Outfall was previously known as the 8801 South Outfall. A middle outfall was plugged and closed in 2004. Stormwater system upgrades completed in 2007 included installation of large concrete vaults to house filter and cyclone units that remove particulates prior to discharge at both existing outfalls.

During the redevelopment of the 8801 property by CenterPoint, demolition of all the buildings is proposed except a part of the warehouse in the shoreline area.

2.3 Previous Investigation and Remedial Activities

Between 1986 and the present, multiple investigations and remedial activities have been completed throughout the 8801 property, including the shoreline area. These investigations and remedial activities are described in the Remedial Investigation Report and FS for the 8801 property (Amec Earth and Environmental, Inc., 2011; Shannon & Wilson, 2020a). The nature and extent of the COCs in the 100-foot river buffer of the 8801 property are summarized in Section 3.1.

Remedial activities have been undertaken on the 8801 property since 1986. Of note is that five excavations have previously been undertaken in the shoreline area. Three of these excavations were for remedial purposes, and two were to install the stormwater vaults. The location of the excavations is shown in Figure 2.

3 CONCEPTUAL SITE MODEL (CSM)

This section summarizes the nature and extent of the COCs in the shoreline area of the 8801 property and presents a CSM specific to the shoreline area. The CULs and RELs were established in the IAWP (Shannon & Wilson, 2020b).

3.1 Area of Concern - Shoreline Area

The COCs are widely dispersed throughout the 8801 property and the shoreline area. The figures in Appendix A depict the distribution of each individual COC in soil and groundwater across the 8801 property, as screened against the CUL established for the COC in the IAWP. The CULs for many of the COCs have been established based on partition of chemicals out of soil into groundwater, which results in very stringent CULs. As Figure 3 shows, nearly all soil within the 100-foot river buffer contains one or more COCs at concentrations exceeding these stringent CULs.

3.1.1 Unsaturated Soil Above Cleanup Levels (CULs) Within the Shoreline Area

The depth to groundwater is approximately 8 feet bgs on the 8801 property, although in the southwest corner of the shoreline area, tidal effects reduce that depth twice daily. With allowance for future sea level rise, 3 feet bgs of unsaturated soil was used for future consideration post remediation. This is because soil within the top 3 feet bgs is not expected to be saturated by groundwater or tidal fluctuation in the future as sea level rises. Several of the CULs for the 8801 property are values above which COCs may have the potential to leach from the soil to groundwater.

The shoreline area has historically been paved, which has protected the COCs in the underlying soil from partitioning to groundwater. Within the shoreline area, many COCs have been detected in soil at concentrations exceeding the CULs established on partition of chemicals out of soil into groundwater, but most of these COCs have not been detected in groundwater. This absence demonstrates that the soil and groundwater are in equilibrium. If pavement is removed and surface water can infiltrate, COCs above the CULs in soil may have the potential to migrate into groundwater and then to the LDW.

The COCs above the CUL in unsaturated soil within the 100-foot river buffer include gasoline-range hydrocarbons, oil-range hydrocarbons, copper, lead, arsenic, bis(2-ethylhexyl) phthalate, total polychlorinated biphenyl (PCB) aroclors, total carcinogenic polycyclic aromatic hydrocarbon (cPAH) toxicity equivalent quotient (TEQ), and trichloroethene (TCE). Unsaturated soil with COCs above the CUL are located:

- Within the Northwest Area (oil-range hydrocarbons, total PCB aroclors, and TCE)
- Within the former Southwest Storage Area (oil-range hydrocarbons, copper, arsenic, lead, cadmium, chromium, bis(2-ethylhexyl) phthalate, total PCB aroclors, and TCE)
- Within the footprint of the former fiberglass building (TCE and lead)
- South of the former fiberglass building footprint (TCE)
- In the southwest corner of the 8801 property (arsenic)
- In the E7 and Vicinity (copper, gasoline and oil-range hydrocarbons, total cPAHs TEQ, and total PCB aroclors)

Gasoline-range hydrocarbons in groundwater are being remediated by injection within the Northwest Area. The selected remedy will aid in the reduction of gasoline-range hydrocarbons in unsaturated soil. That remedial action is detailed in the IAWP (Shannon & Wilson, 2020).

3.1.2 Saturated Soil Above CUL Within the Shoreline Area

Saturated soil is considered to be deeper than 3 feet bgs. Saturated soil are areas that are or may be saturated by groundwater in the future as sea level rises. Currently, saturated soils have been demonstrated to be at equilibrium with most soil COCs, as demonstrated by groundwater monitoring. Once pavement is removed, the current equilibrium that exists between the soil and groundwater may be disrupted by infiltration of stormwater. This change of the groundwater conditions may cause COCs from saturated soil to leach from soil into groundwater and migrate to the LDW. The COCs above the CUL in saturated soil within the 100-foot river buffer include oil-range hydrocarbons, copper, lead, arsenic, bis(2-ethylhexyl)phthalate, total PCB aroclors, total cPAH TEQ, TCE, and vinyl chloride. Saturated soil with COCs above the CUL are located:

- Within the Northwest Area (arsenic, bis(2-ethylhexyl)phthalate, total PCB aroclors, TCE, total cPAHs TEQ, and vinyl chloride)
- Within the former Southwest Storage Area (oil-range hydrocarbons, copper, lead, arsenic, bis(2-ethylhexyl)phthalate, total PCB aroclors, total cPAHs TEQ, TCE, vinyl chloride, and total dioxins/furans TEQ)
- Within the footprint of the former fiberglass building (copper, bis(2-ethylhexyl) phthalate, total PCB aroclors, TCE, and total cPAHs TEQ)
- South of the former fiberglass building footprint (bis(2-ethylhexyl)phthalate), TCE, and total PCB aroclors)

3.1.3 Soil Above Remediation Levels (RELs) Within the Shoreline Area

This section describes the COCs above the RELs in soil within the 100-foot river buffer. Soil contamination above the REL exists in four hotspot locations along the shoreline. These four hotspot locations are identified in the FS as E7 and Vicinity (Area 3), DG11-1 and Vicinity (Area 4), the Southwest Storage Area (Area 5), and the Northwest Area (Area 8). Soil contamination above the REL also exists in two samples along the shoreline, but are unsuitable for immediate remediation (Figure 4), including:

- A total PCB aroclors sample at SSBOT-03 is beneath the Central Outfall stormwater vault. This location is not accessible for remediation, nor is it likely to be an exposure route to construction workers since the vault will be permanently left in place during the shoreline area demolition.
- Lead-contaminated soil at B3 is beneath the slab of the former fiberglass building and the AS/SVE remediation treatment system and is not accessible for remediation, nor is lead likely to be an exposure route to construction workers until remediation is complete and the building removed (date unknown).

The four hotspot areas discussed in the FS and IAWP within the 100-foot river buffer that contain soil contamination above the REL include:

- **E7 and Vicinity (Area 3):** Area 3 is along the southern border of the 8801 property and contains sample locations DG11-11 and DG11-12. The shallow soil (2 to 3 feet bgs) in the unsaturated zone is impacted by total PCB aroclors (DG11-11), copper (DG11-11), and gasoline-range hydrocarbons (DG11-12).
- **DG11-1 and Vicinity (Area 4):** The shallow soil (3 to 4 feet bgs) is impacted by total dioxins/furans TEQ (C6 and DG11-1), and total PCBs aroclors (DG11-1) and deeper soil (4.5 to 8 feet bgs) is impacted with copper (SS-SW-04 and -05) to a depth of approximately 8 feet.
- **Southwest Storage Area (Area 5):** Shallow soil (1 to 5 feet bgs) is impacted by lead, cadmium, chromium, and arsenic (BY-3) and deeper soil (6 to 11 feet bgs) is primarily impacted by total PCBs aroclors (SWS-1), copper (BY-3 and MW-43A), and lead.

- **Northwest Area (Area 8):** Gasoline-range hydrocarbons in saturated soil at a depth between 7.5 and 10 feet bgs (A1 and MW-44B). Gasoline-range hydrocarbons and TCE in groundwater is being remediated by injection within the Northwest Area. In advance of injection, excavation of the soil in the area of A1 and MW-44B is proposed. This excavation work will remove much of the gasoline-range hydrocarbons in soil. The excavation work is associated with groundwater remediation and is detailed further in a separate engineering design report.

3.2 Conceptual Site Model (CSM)

This section discusses the potential sources of contaminants to media, the potential receptors, and the transport pathways. The text below specifically addresses the shoreline area.

3.2.1 Contaminant Sources

The potential sources of contaminants to soil and groundwater are (a) leaks from the former underground storage tanks and leaks from equipment within buildings, as well as isolated spills; (b) offsite sources of arsenic from Boeing (via groundwater flow); (c) fill material placed in the northern end of the Southwest Storage Area by Kenworth and on the southern portion of the 8801 property by Monsanto; and (d) surface activities, including the past storage of cars that had been in automobile accidents.

The potential source of contamination to air is vapor generated from soil and groundwater contaminated with halogenated volatile organic compounds (VOCs) and gasoline. The potential source of contamination to surface water is groundwater contaminated with halogenated VOCs. Although near shore soil contamination is present, bank erosion is not anticipated at the 8801 property. Much of the shoreline is protected by a sheet pile wall, and the remaining shoreline is protected by a 12-foot-wide berm of quarried material that is armored on the LDW side.

Other potential sources of contaminants to sediments are stormwater solids sourced from infrastructure materials, the former surface activities that included the storage of cars that had been in automobile accidents, and airborne particulates that settle out of the atmosphere. Much of the stormwater borne materials are removed by on-site stormwater treatment systems. Stormwater treatment is undertaken by the owner of the 8801 property or its representatives.

3.2.2 Potential Receptors

Currently, the 8801 property is vacant and the shoreline area is paved with asphalt or concrete and with a building that has an interior floor slab. As previously discussed, CenterPoint proposes to redevelop the 8801 property, which include removing all existing pavement in the shoreline area and removing the existing building except for the southern part of the former fiberglass shop that will remain. Landscaping will be planted in the 100-foot river buffer after redevelopment has been completed to comply with the SMA and City of Tukwila's SMP, and pavement will be replaced in portions of the shoreline area outside the river buffer.

Despite being vacant, the 8801 property is currently accessible to occupational workers and visitors. Current and future occupational workers and visitors are not and will not be exposed to soil or groundwater because the 8801 property is currently covered with pavement and a building and after development the 8801 property will be covered with a building, pavement, and landscaping in the 100-foot river buffer. The groundwater on the 8801 property is non-potable (Shannon & Wilson, 2020a), as is the water in the LDW, and there are no known water extraction points for either at the 8801 property. Therefore, occupational workers on the 8801 property are not exposed to groundwater or surface water related to extraction activities.

Current occupational workers (when on the 8801 property) could potentially be exposed to vapors from the halogenated VOC groundwater plume on the western side of the 8801 property. The risk is considered low because (a) the majority of the area overlying the plume is open to the air with the exception of an empty structure (the former fiberglass shop), which has permanently open bay doors and large holes in the building side and roof so vapors would not accumulate; (b) occupational workers are rarely on site and do not spend a large amount of time on the western part of the 8801 property; and (c) the vapor concentrations from the halogenated VOC groundwater plume are relatively low (although not all areas are below the CULs). Future users could be exposed to vapors from the halogenated VOC plume in the building that houses the AS/SVE remediation system. However, it is not currently occupied and there is no future plan to occupy the building.

Construction workers will be exposed to soil and potentially groundwater on the 8801 property through direct contact or inhalation during redevelopment activities. Construction workers also may be exposed to vapors within subsurface structures such as the stormwater treatment system. Soil, groundwater, and air exposure to construction workers are a complete pathway.

The landscaping that will be planted in the 100-foot river buffer will provide a routeway for ecological receptors. However, the 8801 property continues to meet the requirement for ending the terrestrial ecological evaluation (Appendix B) because all areas of the 8801 property outside the river buffer will continue to be covered entirely with buildings and pavement.

Surface water impacted by contaminated groundwater is considered a complete pathway to off-property ecological receptors (benthic and aquatic species) via direct contact and ingestion, and to off-property human receptors via ingestion and direct contact with the surface water and via ingestion of the benthic and aquatic species that live in the LDW.

Sediments impacted by contaminated groundwater are also considered a complete pathway to off-property ecological receptors (benthic and aquatic species) via direct contact and ingestion, and to off-property human receptors via ingestion and direct contact with the sediments and via ingestion of benthic and aquatic species that live in the LDW.

3.2.3 Transport Mechanisms and Pathways

To control sources to the LDW, actions may be taken to control the contaminant release, the media, or the pathway. Contaminated media can affect LDW sediments through eight potential pathways, as discussed in the LDW Source Control Strategy (direct discharges; surface runoff; groundwater discharges; erosion/leaching; spills, dumping, leaks, and inappropriate management practices; waterway operations and traffic; atmospheric deposition; and transport of contaminated sediments) (Ecology, 2016). This section discusses the transport mechanisms and pathways specific to the 8801 property.

Contaminated soil and groundwater are not currently exposed on the surface of the 8801 property. After removal of the pavement in the shoreline area, contaminants in the unsaturated soil may be able to leach to the groundwater and from the groundwater to the surface water.

Currently, chemicals in the saturated soil are likely in equilibrium with the groundwater on the 8801 property. This is supported by the data, since many chemicals have been identified above the soil CUL that have been established based on partition of the chemicals out of soil into groundwater, and yet those chemicals are below the CULs in groundwater. The removal of the pavement in the shoreline area may affect this equilibrium if water infiltrates through the exposed landscaped area.

Soil and groundwater can also enter the stormwater system, which then discharges to the LDW. However, the portion of the stormwater system that is submerged below the water table was slip-lined in 2012, and it is unlikely that groundwater is now entering the stormwater system. Particles of soil could be entering the stormwater system through cracks in the pipe. This contribution is likely to be low since most of the system does not intersect with areas of contamination and a treatment system would remove them prior to discharge to the river.

Solid materials from the surface activities, degraded infrastructure, and deposition of atmospheric particles will be transported through the stormwater system. Since 2007, stormwater treatment systems have been present on the 8801 property and surface sweeping is undertaken to remove surface materials before they enter the stormwater system. These actions have likely reduced but not eliminated this pathway. Future redevelopment will result in a new building, removal of the old surface structures, and a new stormwater infrastructure system with new catch basins that will have more integrity, which will prevent the potential entry of soil particulates.

4 CLEANUP STANDARD

This section reiterates the IAWP CULs that are protective of human health and the environment, the RELs used for soil and halogenated VOCs in groundwater, and the POCs where those CULs apply.

4.1 Cleanup Levels (CULs)

The CULs for soil, groundwater, and air at the 8801 property are based on unrestricted land use and are shown in Table 1.

4.1.1 Soil Cleanup Levels (CULs)

A CUL was selected for each COC in soil. The selected CUL was the most stringent one applicable to the COC based either on the protection of non-potable groundwater, direct contact, bank erosion, or natural background (if applicable). For many COCs, the most stringent CUL is based on the potential for the COC to partition from soil to groundwater.

Some COCs with very low CULs are widespread in the shoreline area and sporadically elsewhere on the 8801 property. The COCs with very low CULs are arsenic, copper, bis(2-ethylhexyl)phthalate, total PCB aroclors, total cPAHs TEQ, TCE and vinyl chloride. For these COCs a REL, which is higher than the CUL, was generated. The selected values were calculated by comparing the percentage mass of COCs that would be removed at different RELs and completing a cost benefit analysis of the various masses. Soil RELs were developed in accordance with Washington Administrative Code (WAC) 173-340-355 and their selection is discussed in more detail in the IAWP (Shannon & Wilson, 2020b).

4.1.2 Soil Remediation Levels (RELs)

Soil REL selection for the COCs is discussed in this section. Due to the stringent values required to ensure that soil is protective of the leaching to groundwater pathway, RELs may be used to delineate excavation areas. Excavation may occur throughout the shoreline area or in selected parts of the shoreline area. There are areas where multiple COCs are co-located (known as hotspots where excavation will remove the overall mass of COCs in the shoreline area) or additional areas where COCs may leach into groundwater and the concentration can be reduced (for example, in an area where TCE concentrations are elevated).

The selected soil REL for the COCs are shown in Table 2 and for those COCs driving shoreline remediation are:

- Total PCB aroclors value of 0.5 milligram per kilogram (mg/kg).
- Total cPAHs TEQ value of 0.6 mg/kg.
- Arsenic value of 14.6 mg/kg.
- Copper value of 250 mg/kg.
- TCE value of 5 mg/kg.
- Vinyl chloride value of 5 mg/kg.

4.1.3 Groundwater

Groundwater CULs are discussed to evaluate the effects of impermeable surfaces, such as retention of existing pavement or placement of a clay cap and drainage system in the shoreline area to impede the mobilization of COCs from the soil. COCs in groundwater include cPAHs, PCBs, copper, arsenic, and halogenated VOCs and the CULs previously established for these chemicals are shown in Table 1.

4.1.4 Groundwater Restoration Timeline

RELs are not CULs. The groundwater CULs will be achieved at the boundary of the 8801 property with the LDW within a reasonable restoration timeline. The halogenated VOC RELs that are protective of indoor air exposure in the western part of the 8801 property are estimated to be achieved in approximately three years (with bioaugmentation).

The restoration timeline for the remediated halogenated VOCs to meet the CULs at the POC is modeled to be approximately ten years. However, the CULs for total cPAHs TEQ and total PCB aroclors in groundwater are extremely stringent (parts per trillion) and are at the practical quantitation limit for each chemical. Since laboratory detection limits improve with time, the restoration timeline associated with achieving the CULs for these COCs in groundwater is in the order of decades even with remedial action.

4.2 Point of Compliance (POC)

MTCA defines the POC as the point or points at which CULs must be attained. The POC applies to all soil, groundwater, or air at or adjacent to any location where releases of hazardous substances have occurred or that has been impacted by releases from the location. The primary affected media at the 8801 property are soil and groundwater. The inhalation pathway is also significant for the 8801 property due to the presence of halogenated VOCs in soil and groundwater.

4.2.1 Soil

POCs demonstrating compliance for pathways protective of human health, namely potential direct contact, inhalation, or ingestion of impacted soil, will be established in the soil throughout the 8801 property from the ground surface to 15 feet bgs (WAC 173-340-740(6)(d)).

The POC demonstrating protection of groundwater will be established in soil throughout the 8801 property (WAC 173-340-740(6)(b)).

POCs demonstrating compliance for pathways protective of human health and the environment by migration of chemicals from soil to air will be established in the soil from the ground surface to the top of the uppermost saturated zone throughout the 8801 property (i.e., the vadose zone) (WAC 173-340- 740(6)(c)).

As discussed earlier, the 8801 property is excluded from the requirement for a terrestrial ecological evaluation, because the presence of existing buildings, pavement, or capping will prevent plants and wildlife from exposure to contaminated substrate provided an institutional control is implemented in accordance with WAC 173-340-7491(1)(b).

4.2.2 Air

The POC demonstrating compliance for pathways protective of air will be ambient air throughout the 8801 property (WAC 173-340-750(6)). Per WAC 173-340-750(1)(a), the cleanup standard applies to ambient outdoor air and air within a building, manhole, utility vault, or any structure large enough for a person to fit into.

4.2.3 Groundwater

Groundwater CULs are based on indoor air protection or protection of discharge to surface water of the LDW. MTCA regulations favor permanent cleanup of groundwater contamination at the standard POC (throughout the site). However, a conditional POC at the western property boundary is being used due to the inability to achieve the total cPAH

TEQ and total PCB aroclor CULs in groundwater throughout the 8801 property within a reasonable restoration timeline (Shannon & Wilson, 2020a).

5 IDENTIFICATION AND DEVELOPMENT OF REMEDIAL ALTERNATIVES

This section discusses the requirements for evaluating and developing the shoreline area soil remedial alternatives.

5.1 Remedial Action Objectives (RAOs)

RAOs are medium-specific goals for the protection of human health and the environment. RAOs form the basis for developing and evaluating remedial actions. The RAOs are:

- Protect current and future worker exposure to soil contaminants.
- Protect current and future beneficial use of surface water and sediments in the LDW by attaining groundwater CULs before groundwater migrates to the LDW.
- Achieve the groundwater remediation CULs for the halogenated VOC plume within a reasonable timeframe.
- Allow for landscaping to be established within the 100-foot river buffer.

5.2 General Response Actions

General response actions are those actions that satisfy RAOs. General response actions consist of engineering and/or institutional controls, treatment, soil excavation, and offsite disposal without treatment, monitored natural attenuation, and combinations of these. Combinations of general response actions were assembled into groups called remedial alternatives for evaluation against other remedial alternatives.

As discussed in the IAWP, remedial alternatives considered include compliance monitoring.

5.3 Remedial Alternatives

This section discusses the initial requirements that the selected remedial alternatives must meet and presents three remedial alternatives for the shoreline area soil that were selected for further evaluation as summarized in Exhibit 5.1 below.

Exhibit 5-1: Remedies Selected for Further Evaluation

	Unsaturated Soil	Saturated Soil	Cap Required
Alternative 1	Excavation to CULs	Excavation to CULs	No
Alternative 2	Excavation to CULs	Excavation to RELs	Yes
Alternative 3	Excavation to RELs	Excavation to RELs	Yes

5.3.1 Shoreline Management Act (SMA) and Shoreline Master Program (SMP) Requirements

Pursuant to RCW 70A.105D.090(1), remedial actions conducted under an agreed order are exempt from the procedural requirements of the SMA and any laws requiring local government permits or approvals. However, the remedial actions must comply with the substantive requirements of such permit and approvals.

The shoreline area of the 8801 property is subject to the requirements of the SMA, Chapter 90.58 RCW, and the City of Tukwila's SMP, Chapter 18.44 TMC. The portion of the 8801 property subject to the SMA and the SMP consists of all land within 200 feet of the ordinary high water mark of the LDW.

The City of Tukwila has designated the shoreline area of the 8801 property as a High Intensity Environment, which means the portion of the 8801 property within 100 feet of the ordinary high water mark constitutes a river buffer, TMC 18.44.060(A). The High Intensity Environment is subject to the development standards set forth in TMC 18.44.070 and the vegetation protection and landscaping standards set forth in TMC 18.440.080. The 100-foot river buffer along the shoreline of the 8801 property is subject to the landscaping requirements set forth in TMC 18.44.080(C)(1) and (2).

The evaluated and selected remedial actions in the shoreline area of the 8801 property must be consistent with the SMA and SMP.

5.3.2 Model Toxics Control Act (MTCA) Threshold Requirements

The remedial alternatives were screened against these four minimum/threshold requirements. Alternatives that did not satisfy one or more of these requirements were not considered further.

- Protect human health and the environment.
- Comply with cleanup standards.
- Comply with applicable federal and state laws.
- Provide for compliance monitoring.

Six remedial alternatives were considered for the shoreline area soil and evaluated for compliance with the four threshold/minimum requirements (Table D-1). Three remedial alternatives that satisfied the four threshold/minimum requirements are discussed in more detail below. The alternatives evaluation and summary are presented in Section 6.3. The three remedial alternatives for the shoreline area are consistent with the SMA, SMP, and MTCA.

5.3.3 General Conditions

For each of the three remedial alternatives in the shoreline area, the following general conditions are applicable:

- The warehouse building parallel to the western boundary and associated structures will be demolished, except for the portion housing the AS/SVE system.
- Pavement, subbase, and soil to a depth of 2 feet bgs will be excavated and removed, except for areas within the AS/SVE system building footprint and stormwater facilities footprint.
- The northern stormwater vault and stormwater lift station will be upgraded and will remain intact. The vault and lift station must remain accessible from the ground surface for maintenance, so they will not be covered with landscaping.
- The southern stormwater vault walls will be upgraded and will remain intact. The vault must remain accessible from the ground surface for maintenance, so it will not be covered with landscaping.
- Catch basins will be removed and associated stormwater lines will be either crushed or filled in-place.
- The portion of the existing AS/SVE system lines (33 AS and potentially the 6 SVE) in the shoreline area will be excavated at the eastern edge of the area, replumbed, and run above ground to the control system in the building. If maintenance is required, running the lines on the surface precludes the need to disturb the landscaping in the 100-foot river buffer.
- For Alternatives 2 and 3, any penetration points through the clay cap (such as existing or new monitoring wells or AS points) will be sealed at the time of construction of the clay cap or during installation using a grout collar. The AS/SVE extension vertical pipes will be completed at ground level without vaults but will be protected with polyvinyl chloride or similar collars. The lines will be run above ground to the control system in the building. Excluding vaults means that there is a larger area for landscaping and limited maintenance requirements associated with probable settlement. Running the lines on the surface precludes the need to disturb the landscaping in the 100-foot river buffer if maintenance is required and during decommissioning. The existing AS/SVE system has not required any subsurface maintenance in the last 16 years and the AS/SVE extension is estimated to only be required to be active for 10 years. Therefore, no

disturbance of the landscaping in the river buffer to maintain AS/SVE subsurface elements is expected. In addition, the subsurface SVE lines can be decommissioned using pumpable grout, which will mean that the landscaping in the river buffer will be not be impacted during decommissioning of the lines.

- For Alternatives 2 and 3, the line for the new stormwater system that will be installed in the northern portion of the 8081 property will extend under the clay cap, drainage blanket, and landscaping in the 100-foot river buffer. The line will be accessible from outside the river buffer, precluding the need to disturb the cap, drainage blanket, or landscaping. The design life of the new stormwater system is approximately 40 years.
- For Alternatives 2 and 3, the gasoline-range hydrocarbon soil in Area 8 will be excavated to a depth of approximately 10 feet bgs, disposed offsite and injection to remediate the groundwater will occur to the east of the river buffer. Removal of the soil will accelerate the groundwater remedy action in this area because the previously proposed injection of chemicals cannot occur in Area 8 once the clay cap is placed.

5.3.4 Alternative 1: Excavation/Disposal to Cleanup Levels (CULs) and Landscape

Unsaturated and saturated soil that contains COCs above the CULs in the river buffer portion of the shoreline area will be excavated and removed from the 8801 property. The lateral extent of such soil encompasses nearly the entire river buffer portion of the shoreline area, as shown in Figure 3. It is estimated that 67,813 tons of soil would be excavated from within the river buffer portion of the shoreline area up to 15 feet bgs in areas where there is insufficient information to estimate the depth to the excavation base. The depth of 15 feet bgs was selected because it is the human health direct contact POC. However, in many locations, the COCs do not extend to 15 feet bgs and the depth of the excavation was based on the known concentrations of COCs. Shoring and dewatering will be required to excavate to 15 feet bgs. Excavations will encounter existing subsurface structures that will need to be worked around and the western sheet pile wall and the North Outfall piping will need to be protected. The portion of the shoreline area outside the river buffer would remain paved.

Alternative 1 is expected to require extensive and lengthy excavation and movement of contaminated materials through the adjacent neighborhood (approximately 2,260 truck trips). The excavated soil will be classified as non-hazardous waste based on past analytical results. The excavated soil will be loaded directly, if feasible, into a dump truck for transport to a permitted disposal facility. Excavated saturated soil may require stabilization or dewatering prior to loading for offsite disposal.

After excavation, soil samples will be collected around the excavation sidewalls. Confirmation soil samples will also be collected across the bottom of the excavations where the excavation does not contact groundwater. The excavations will be backfilled with compacted inert fill and soil near the surface. Once back at grade, landscaping similar to that laid out in Appendix C (without the clay cap) will be planted within the 100-foot river buffer consistent with the City of Tukwila's SMP requirements. Pavement will remain in the portion of the shoreline area outside the river buffer.

The clay cap and drainage blanket depicted in Appendix C and included in Alternatives 2 and 3 are not included in Alternative 1 because all the COCs above the CULs will have been removed and infiltration of stormwater will not impact the quality of the groundwater. Alternative 1 will require that the existing shoreline monitoring wells be either removed and reinstalled or be protected and resealed after completion of the excavation.

5.3.5 Alternative 2: Excavation/Disposal of Unsaturated Soil to CULs, Excavation/Disposal of Saturated Soil to Remediation Levels (RELs), Place a Clay Cap, Landscape, and Institutional Controls

Unsaturated soil within the 100-foot river buffer containing COCs above the CULs will be excavated and disposed of offsite. Such soil encompasses nearly the entire river buffer portion of the shoreline area, as shown in Figure 3. In addition, saturated soil in three hotspot areas within the river buffer portion of the shoreline area that have COCs in soil exceeding RELs will be excavated and disposed of offsite, as shown in Figure 4. We estimate that soil will be excavated up to 8 feet bgs (the current depth of the unsaturated soil) in areas where there is insufficient information to estimate the depth to the excavation base and into the saturated soil to 12 feet bgs in Area 5. Excavations will encounter existing subsurface structures that will need to be worked around and the western sheet pile wall and the North Outfall piping will need to be protected.

We estimate that, at minimum, 36,700 tons of impacted soil will be excavated (approximately 1,223 truck trips). The excavated soil from each area will be classified as non-hazardous waste based on previous analytical results. Complete delineation of soil in some of the excavation areas and COCs has not been undertaken to date; field sampling will be completed during excavation work to verify CULs and RELs are achieved as discussed below.

The three hotspot areas in the 100-foot river buffer are described below.

- **E7 and Vicinity (Area 3):** The shallow soil (2 to 3 feet bgs) in the unsaturated zone is impacted by PCBs, copper, and gasoline-range hydrocarbons. Approximately 1,809 tons of shallow soil will be excavated to a depth of 6 feet bgs. We assume that the material will be disposed of as non-hazardous waste. Sampling will be undertaken to determine when the PCB, copper, and gasoline-range hydrocarbon RELs are achieved.
- **DG11-1 and Vicinity (Area 4):** The shallow soil (3 to 4 feet bgs) is impacted by PCBs and dioxin/furan and the deeper soil is impacted by copper. Approximately 802 tons of shallow soil will be excavated to a depth of 8 feet bgs. We assume that the material will

be disposed of as non-hazardous waste. Sampling will be undertaken to determine when the REL and CUL values are achieved for the PCBs and dioxin/furans, respectively. The west side of the excavation is part of the former stormwater vault excavation and may not be sampled as it is imported backfill. Dewatering may be required.

- **Southwest Storage Area (Area 5):** Shallow soil (1 to 5 feet bgs) is primarily impacted by lead and arsenic and deeper soil (6 to 11 feet bgs) is impacted by PCBs and lead. Approximately 4,836 tons of soil will be excavated to an average depth of 12 feet bgs. We assume that the material will be disposed of as non-hazardous waste. The excavation base, west boundary, and south boundary are delineated. Sampling will be undertaken on the north and east sidewalls.to determine when the RELs are achieved. The south side of the excavation is part of the former stormwater vault excavation and may not be sampled as it is imported backfill. Shoreline and dewatering may be required.

The excavated soil will be loaded directly, if feasible, into a dump truck for transport to a permitted disposal facility. Excavated saturated soil may require stabilization or dewatering prior to loading for offsite disposal. As described above, after excavation, samples will be collected around the excavation sidewalls where previously not delineated. Confirmation samples as detailed above will be collected across the bottom of the excavations where the excavation limit had not been previously delineated, and where the base does not contact groundwater. The excavations will be backfilled with compacted inert fill.

After backfill has been placed within the 100-foot river buffer, a clay cap and overlying drainage blanket will be placed over the entire river buffer, except for the remaining building footprint, which will remain as a concrete floor slab and the areas where the north and south stormwater facilities will be left in place. The clay cap will consist of a geosynthetic clay liner that provides a minimum permeability of 1×10^{-6} in accordance with U.S. Environmental Protection Agency (EPA) specifications for a Resource Conservation and Recovery Act (RCRA) Subtitle C landfill cap (Appendix C). A drainage blanket will be placed on top of the clay cap that will be a 6- to 8-inch quarry spalls covered with a filter fabric at a 2% slope away from the LDW. A drainpipe along the length of the eastern side of the drainage blanket will capture irrigation water and stormwater. The drainage pipe will connect with the 8801 property stormwater system and be handled under the National Pollution Discharge Elimination System (NPDES) permit requirements. Above the clay cap and drainage blanket, 60 inches minimum of topsoil will be placed to support landscaping designed to meet the SMA and City of Tukwila's SMP requirements (Figure 5 and Appendix C).

In the portion of the shoreline area outside the 100-foot river buffer, pavement will remain at over the ground surface. The pavement reduces stormwater infiltration from potentially mobilizing COCs above CULs in the underlying soil.

Institutional controls by means of a deed restriction would be implemented to prevent uncontrolled disturbance of the clay cap, drainage blanket, and pavement, and maintenance of those features.

Installing a clay cap and drainage blanket within the 100-foot river buffer and maintaining pavement outside the river buffer would reduce infiltration of stormwater into the underlying soil. This is important because COCs above the CULs will remain in the underlying soil after excavation work is complete. The infiltration of stormwater could potentially result in those COCs migrating into groundwater. This pathway is removed by using the clay cap, drainage blanket, and pavement. Removal of soil above the RELs will eliminate the potential for worker exposure to COCs above the RELs and remove the need for management of exposure during future construction or excavation work.

Alternative 2 would require that an alternative approach is considered for the remediation of the TCE and gasoline-range hydrocarbons in groundwater in the Northwest Area. The proposed remedy in the IAWP was to undertake in situ chemical oxidation (ISCO) in this area. The ISCO design requires injections to occur on more than one occasion over a period of a couple of years to achieve the remedial objectives. For this reason, the ISCO work cannot be completed in advance of placing the clay cap and drainage blanket. And injection through the clay cap and drainage blanket may be technically difficult and affect their performance. For these reasons, the groundwater remedy in northwest corner of the 100-foot river buffer is amended to replace injection with excavation in Area 8 and introduction of the remedial compound through permanent injection points installed immediately to the east of the 100-foot river buffer as shown in Figure 4. Because the chemical will be delivered east of and below the clay cap, this design change will also ensure that the injected chemicals will not come in contact with landscaping planted in the 100-foot river buffer during injection. The injected chemicals are not expected to affect the ability of landscaping in the river buffer to grow or thrive.

5.3.6 Alternative 3: Excavation/Disposal of Soil to RELs, Place a Clay Cap, Landscape, and Institutional Controls

The three hotspot areas where COCs exceed the soil RELs in the 100-foot river buffer portion of the shoreline area will be removed. The hotspots to be excavated include the same three hotspots identified in Alternative 2 (Figure 4).

We estimate that a minimum of 7,653 tons of impacted soil will be excavated from the hotspots (approximately 355 truck trips). Based on the analytical results, the excavated soil from each area will be classified as non-hazardous waste. Complete delineation of the COCs in the soil in the hotspot areas has not been completed; field samples will be collected from the excavations to verify that soil with COCs above the RELs is removed as detailed in Alternative 2.

The excavated soil will be loaded directly, if feasible, into a dump truck for transport to a permitted disposal facility. Excavated saturated soil may require stabilization or dewatering prior to loading for offsite disposal. Shoring and dewatering may be required, as detailed in Alternative 2. After excavation, soil samples will be collected from the excavation sidewalls. Confirmation soil samples as detailed above will be collected across the bottom of the excavations where the base does not contact groundwater. The excavations will be backfilled with compacted inert fill.

After backfill has been placed within the 100-foot river buffer, a clay cap and overlying drainage blanket will be placed over the entire river buffer, except for the remaining building footprint, which will remain as a concrete floor slab and the areas where the north and south stormwater facilities will be left in place. The clay cap will consist of a geosynthetic clay liner that provides a minimum permeability of 1×10^{-6} in accordance with EPA specifications for a RCRA Subtitle C landfill cap (Appendix C). A drainage blanket will be placed on top of the clay cap that will be a 6- to 8-inch quarry spalls covered with a filter fabric at a 2% slope away from the LDW. A drainpipe will be installed along the length of the eastern side of the drainage blanket to capture irrigation water and stormwater. The drainage pipe will connect with the 8801 property stormwater system and be handled under the NPDES permit requirements. Above the clay cap and drainage blanket, 60 inches minimum of soil will be placed to support landscaping designed to meet the SMA and City of Tukwila's SMP requirements (Figure 5 and Appendix C).

In the portion of the shoreline area outside the 100-foot river buffer, pavement will remain at the ground surface. The pavement reduces stormwater infiltration from potentially mobilizing COCs above CULs in the underlying soil.

Institutional controls by means of a deed restriction would be implemented to prevent uncontrolled disturbance of the clay cap, drainage blanket, or pavement, and maintenance of those features.

As discussed in Alternative 2, installing a clay cap and drainage blanket in the 100-foot river buffer and maintaining pavement outside the river buffer would reduce infiltration of stormwater into the underlying soil. This is important because COCs above the CULs will remain in the underlying soil after excavation work is complete. The infiltration of stormwater could potentially result in those COCs migrating into groundwater. This pathway is removed by using the clay cap, drainage blanket, and pavement. Removal of soil above the RELs will eliminate the potential for worker exposure of COCs above the RELs and remove the need for management of exposure during future construction or excavation work.

Alternative 3 would require that an alternative approach is considered for the remediation of the TCE and gasoline-range hydrocarbons in groundwater in the Northwest Area. The proposed remedy in the IAWP was to undertake ISCO in this area. The ISCO design requires injections to occur on more than one occasion over a period of a couple of years to achieve the remedial objectives. For this reason, the ISCO work cannot be completed in advance of placing the clay cap and drainage blanket. And injection through the clay cap and drainage blanket may be technically difficult and affect their performance. For these reasons, the groundwater remedy in northwest corner of the 100-foot river buffer is amended to replace injection with excavation in Area 8 and introduction of the a remedial compound from permanent injection points installed immediately to the east of the 100-foot river buffer as shown in Figure 4. Because the chemical will be delivered east of and below the clay cap, this design change will also ensure that the injected chemicals will not come in contact with landscaping planted in the 100-foot river buffer during injection. The injected chemicals are not expected to affect the ability of landscaping in the river buffer to grow or thrive.

6 EVALUATION OF REMEDIAL ALTERNATIVES

In this section, criteria specified by MTCA are used to qualitatively evaluate the remedial alternatives described in Section 5 and select the preferred alternative. The selection process is provided in detail in Appendix D (Tables D-1, D-2, and D-3).

6.1 Model Toxics Control Act (MTCA) Evaluation Criteria

The MTCA evaluation criteria consist of MTCA minimum/threshold requirements (WAC 173-340-360(2)(a)) and other MTCA requirements (WAC 173-340-360(2)(b)). Threshold requirements are discussed in Section 5.3.1.

After meeting the threshold requirements, MTCA requires that remedial alternatives be evaluated for three other requirements:

- Consider public concerns. Public concerns should be eliminated or mitigated, if possible, by selection of technologies or methods.

- Provide for a reasonable restoration timeframe. The requirements and procedures for determining whether a remedial alternative provides for a reasonable restoration timeframe as discussed in WAC 173-340-360(4).
- Use permanent solutions to the maximum extent practicable. To evaluate practicability, MTCA considers cost effectiveness using a DCA, as specified in WAC 173-340-360(3)(e) and discussed in Section 6.2.

6.2 Model Toxics Control Act (MTCA) Disproportionate Cost Analysis (DCA)

The DCA uses seven criteria to compare, contrast, and rank each remedial alternative:

- **Overall protectiveness**. An alternative's ability to achieve protectiveness is a key factor. Overall protectiveness includes the degree of overall risk reduction, the time required to reduce risk and attain cleanup standards, and the improved overall quality of the environment at a site.
- **Permanence.** The long-term success of an alternative can be measured by the degree to which an alternative permanently reduces the toxicity, mobility, or volume of hazardous substances on the property. Typically, permanence considers the whole life cycle of the chemical; however, removal of the COC from the proximity to the LDW and disposal in a managed landfill is considered to increase the permanence of the remedy for this project.
- **Effectiveness over the long-term.** An alternative's long-term effectiveness is based on the reliability of treatment technologies to meet and maintain CULs, and if using engineering or institutional controls, on their reliability to manage residual risks. Long-term reliability is also influenced by uncertainties associated with potential long-term risk management.
- **Management of short-term risks.** Short-term risk evaluates the risk posed by the cleanup action during its implementation (including construction and operation), based on potential impacts to the community, workers, and the environment, and the effectiveness and reliability of protective or mitigative measures.
- **Technical and administrative implementability.** An alternative's implementability is evaluated based on whether it is easy or difficult to implement depending on practical, technical, or legal difficulties that may be associated with construction and implementation, including schedule delays. Implementability also depends on the ability to measure the remedy's effectiveness and its consistency with MTCA and other regulatory requirements.
- **Consideration of public concerns.** Potential public concerns, whether from individuals, community groups, local governments, tribes, or federal and state agencies about a proposed cleanup alternative, are addressed by means of MTCA's public involvement process during Ecology's remedy selection process.

- **Cost.** Cost considerations include design, construction, and installation costs; the net present value of long-term costs; and agency oversight costs. Long-term costs include the cost of operation and maintenance, monitoring, equipment replacement, and maintaining institutional controls.

For each remedial alternative, a score of 0 to 10 is assigned to each criteria (except cost). According to WAC 173-340-360(3)(e)(i), costs are considered disproportionate to benefits when the incremental costs of the alternative exceed the incremental benefits achieved by the alternative compared to that achieved by other lower-cost alternatives. The selected remedy or "preferred alternative" is the alternative with the greatest benefit for the most reasonable cost.

The weighted overall benefit score is calculated for each remedial alternative using weighting factors and the raw benefit score for each of the six DCA criteria (all except cost) (Exhibit 6-1). A higher weighted overall benefit score indicates a larger benefit if the associated remedial alternative was implemented, when compared to a remedial alternative with a lower weighted overall benefit score.

Exhibit 6-1: Formulate for Weighted Overall Benefit Score

Formula	MTCA Criteria	Weight Factor	Raw Benefit Score
$\text{Weighted Overall Benefit Score} = \sum_{\text{Criteria}} \left(\text{weight factor} * \text{raw benefit score} \right)$	Protectiveness	20%	(0-10)
	Permanence	20%	(0-10)
	Cost	0%	(0-10)
	Long-term Effectiveness	20%	(0-10)
	Short-term Effectiveness	10%	(0-10)
	Implementability	20%	(0-10)
	Consideration of Public Concerns	10%	(0-10)

NOTE:
A Raw Benefit Score between 0 to 10 was estimated for each remedial alternative based on the projected outcomes.

The total cost over the lifetime of the remedial alternative is estimated. An alternative's costs are considered disproportionate to benefits if the incremental costs of a more permanent alternative are greater than the incremental benefits achieved by that alternative over those of the lower cost alternatives (WAC 173-340-360(3)(e)(i)). This is evaluated using a Benefit/Cost Ratio, where a lower Benefit/Cost Ratio may indicate that the incremental cost is disproportionately large for the incremental benefit (Exhibit 6-2).

Exhibit 6-2: Formulate for Benefit/Cost Ratio

$$\text{Benefit/Cost Ratio} = \frac{\text{Weighted Overall Benefit Score}}{\text{Cost}}$$

The estimations, calculations, and rankings of remedial alternatives are summarized in the DCA (Appendix D). In Appendix D, graphs for each area visually show the cost versus the weighted benefit of each alternative. The selected remedy is the alternative with the greatest benefit for the least cost and shows to the bottom (least cost) on the right-hand side (greatest benefit) of the graphs.

6.3 Selection of Preferred Remedial Alternative

This section discusses and compares the three remedial alternatives for the shoreline area.

All three remedial alternatives for soil address all saturated and unsaturated soil within the shoreline area that contain COCs above the CULs and/or RELs.

Table D-1 in the DCA indicates that Alternative 3, which consists of excavation/disposal of soil with concentrations of COCs above the RELs in three hotspot areas, placing a clay cap, laying a drainage blanket, installing landscaping within the 100-foot river buffer, maintaining pavement outside the river buffer, and establishing institutional controls, has the greatest benefit for the least cost and is the preferred remedial alternative for soil. This alternative is preferred because the contaminated soil with the greatest COC concentrations would be removed and any remaining contaminated soil within the river buffer would be capped with an impermeable clay cap and drainage blanket and contaminated soil outside the river buffer would remain capped with pavement. The clay cap, drainage blanket, and pavement would prevent stormwater from infiltrating the soil that could disrupt the existing equilibrium between the soil and the groundwater. Institutional controls would ensure the continued integrity of the clay cap, drainage blanket, and pavement for the duration of the restoration timeline of ten years.

Although Alternative 3 does not actively promote in situ remediation of residual soil contamination, some degree of remediation has already occurred (for example, total petroleum hydrocarbons and cPAHs) and more may occur over time via natural attenuation, including biodegradation, volatilization, and dispersion.

Alternative 1 (full excavation/disposal to CULs) is more permanent than the preferred alternative for the criteria of overall protectiveness since all contamination exceeding CULs within the shoreline area would be removed. However, Alternative 1 requires a much larger extent of excavation including required protection of structures than the preferred alternative. This results in about four and a half times the cost due to the large quantity of material excavated and disposed offsite, lower implementability due to the larger excavation area and working around existing infrastructure, lower consideration of public concerns since large quantities of contaminated material would be transported through the surrounding area, and lower management of short-term risks since construction workers are more likely to be exposed during a more lengthy and large excavation. In summary, Alternative 1 has a higher overall weighted benefit score than the preferred alternative; however, the increase in benefit is disproportionate to the increase in cost.

Alternative 2, which involves excavation/disposal to CUL in unsaturated soil, excavation/disposal to REL in saturated soil (three hotspot areas), placing an impermeable clay cap, laying a drainage blanket, installing landscaping within the 100-foot river buffer, replacing pavement outside the river buffer, and establishing institutional controls, is similar to the preferred alternative, with the additional excavation of unsaturated soil to CULs, resulting in a much larger excavation to an estimated averaged depth of 8 feet along most of the shoreline. The removal of contaminated soil with the greatest COC concentrations is protective; however, the additional excavation results in a decrease in management of short-term risks and implementability with no significant increase in other benefit criteria, since the percent of total contaminant mass removed is only slightly higher than Alternative 3. This results in the cost being higher, and the overall weighted benefit score being lower when Alternative 2 is compared to the preferred alternative.

Since Alternative 3 is the selected remedy for the shoreline area, the engineering design report for the Northwest Area groundwater treatment will reflect the revisions to the ISCO delivery system. The engineering design report will also include an evaluation of the nature of the injected fluids to meet the objectives of the groundwater remedy in the Northwest Area.

6.4 Contingencies

This section discusses the decision points to determine if additional soil and/or groundwater remedial actions are required after the proposed remedy has been put in place. Groundwater monitoring will be undertaken both to assess the performance of the remedial actions and establish whether the RAOs are being met. The RAOs are to protect current and future worker exposure to soil contaminants, occupants of future buildings, and the surface water and sediments of the LDW, achieve remediation of the halogenated VOC groundwater plume in a reasonable timeframe and allow for landscaping to be established per the SMA and City of Tukwila's SMP. The groundwater data will be used to establish whether additional remedial actions are required and to assess the restoration timeline.

As previously discussed, soil confirmation samples will be collected to evaluate the effectiveness of soil excavations in meeting the RELs and removing most of the COC mass in soil. Three of the excavations (Excavations 3, 4, and 5) are close to the 8801 property boundary with the LDW. Groundwater for some of the COC concentrations from monitoring wells adjacent to these locations have exceeded their respective CULs. Excavation work is expected to disturb the soil and groundwater equilibrium resulting in temporary impacts to groundwater. Contaminants adsorbed to the finer soil particles may temporarily increase contaminant concentrations in total groundwater samples immediately after the excavation activities. Because it may take up to a year before this disturbance effect diminishes and the soil/groundwater equilibrium is restored, contingency actions will not be evaluated until after a minimum of four groundwater monitoring events associated with the excavation activities. Therefore, the timeline for consideration of actions associated with the excavation areas will be over a greater time-period than for groundwater remedial actions. Detection of chemicals associated with the laboratory's ability to achieve lower detection limits and consequently result in a detection where previous samples were non-detect are not considered applicable to the triggers discussed below. Triggers and potential actions that will be considered for soil commencing one year after excavation work are:

- If total PCB aroclors are detected in the POC wells for more than three consecutive sampling events at concentrations greater than cleanup criteria and do not show a declining trend in concentration, a discussion with Ecology regarding additional alternatives such as excavation will be undertaken.

6.5 Institutional Controls

After remedial alternatives for the shoreline area have been implemented, institutional controls will be required as follows:

1. Protect the clay cap within the 100-foot river buffer from being punctured without means of repair;
2. Maintain drainage away from the clay cap underneath the landscaping; and
3. Allow for inspection and repair of the pavement outside the river buffer.

The institutional controls will comply with the Uniform Environmental Covenants Act, Chapter 64.70 of the RCW.

7 COMPLIANCE MONITORING AND SCHEDULE

The compliance monitoring for the 8801 property is provided in the IAWP. The compliance monitoring specific to the shoreline area is discussed below.

7.1 Placement of Cap and Drainage Blanket

The impermeable clay cap and drainage blanket will be placed only in the 100-foot river buffer. This section discusses the requirements for placing the clay cap and drainage blanket.

In advance of placement of the cap, the surface will be graded to allow for a 2% grade falling to the east (away from the LDW). This will be under the control of the Contractor and will be visually assessed before placement of the clay cap.

The clay cap will be provided in rolls that will be placed on the ground, unrolled, and then hydrated. The rolls will be spaced at a set distance from each other and after hydration will be inspected to ensure that no gaps exist between the rolls. After the clay is fully hydrated and inspected, drainage rock of 6- to 8-inch quarry spalls will be placed.

7.2 Schedule of Deliverables and Implementation

The cleanup actions described in this Addendum will be completed after review by Ecology. In accordance with the schedule specified in Agreed Order No. 6069, a draft engineering design report will be provided for review by Ecology 90 days after this Addendum is finalized.

The cleanup task will identify contingencies and contain the following technical specifications:

- Detailed construction documentation, including specifics on the excavations and placement of the clay cap and drainage blanket.
- Protection and performance monitoring plan/compliance monitoring plan (can reference the integrated compliance monitoring plan). This document includes the soil testing protocols to establish the limit of the excavations and the groundwater monitoring after the completion of remedial actions.
- Permit requirements and schedules.
- Operations and maintenance plan. This document will include information on monitoring of the drainage blanket, and the AS/SVE system operations. A planting maintenance plan will not be included in this document but will be part of a submittal for permit requirements.

- Proposed construction schedule and sequence.
- Contractor staging areas and other work plans.

Following Ecology's approval of the final engineering design report, it is proposed to implement the excavation within one year. Compliance monitoring will then commence.

8 LIMITATIONS

This Addendum was prepared exclusively for PACCAR by Shannon & Wilson. The quality of information, conclusions, and estimates contained herein are consistent with the level of effort involved in our services and based on (a) information available at the time of preparation; (b) data supplied by outside sources; and (c) the assumptions, conditions, and qualifications set forth in this Addendum and our proposal. This Addendum is intended to be used for the 8801 property only, subject to the terms and conditions of the contract. Any other use of, or reliance on, this Addendum by any third party is at the sole risk of that party.

9 REFERENCES

Amec Earth & Environmental, Inc., 2011, Remedial investigation report, 8801 East Marginal Way South, Tukwila, Washington, agreed order number 6069: Report prepared by Amec Earth & Environmental, Inc., Bothell, Wash., 9-915-14995-L, for PACCAR Inc., Bellevue, Wash., March 18.

Shannon & Wilson, 2020a, Final feasibility study for 8801 East Marginal Way S, Tukwila, Wash.: Report prepared by Shannon & Wilson, Inc., 21-1-12567-021, for PACCAR Inc, July.

Shannon & Wilson, 2020b, Final interim action work plan for 8801 East Marginal Way S, Tukwila, Wash.: Report prepared by Shannon & Wilson, Inc., 21-1-12567-021, for PACCAR Inc, July.

Washington State Department of Ecology (Ecology), 2016, Lower Duwamish Waterway source control strategy: Olympia, Wash., Washington State Department of Ecology publication no. 16-09-339, June, available: https://fortress.wa.gov/ecy/publications/SummaryPages/1609339.html.

Table 1 - Cleanup Levels

Analyte	Soil – Protection of Sediment or Surface Water[a] (mg/kg)	Soil - Background (mg/kg)	Human Health – MTCA Method A or B[b] (mg/kg)	Practical Quantitation Limit (mg/kg)	Soil – Protective of Vapor[c] (mg/kg)	Groundwater[a] (µg/L)	Groundwater – Protective of Indoor Air[b] (µg/L)	Practical Quantitation Limit (µg/L)	MTCA Method B Indoor Air[b] (µg/m³)
Arsenic	—	7.3	—	—	—	8	—	—	—
Bis(2-ethylhexyl)phthalate	0.005/0.1	—	—	0.12	—	0.046	—	0.2	—
Cadmium	5.1	—	—	—	—	—	—	—	—
Chromium	2,600	—	—	—	—	—	—	—	—
Copper	—	36	—	—	—	8	—	—	—
Dichloroethane, 1,1-	—	—	—	—	—	—	11	—	1.56
Diesel-range hydrocarbons	—	—	—	—	—	500[d]	—	—	—
Dioxin/furan TEQ	—	0.0000052	—	—	—	—	—	—	—
Gasoline-range hydrocarbons	—	—	100	—	250	1,000[d]	—	—	1,400
Lead	—	—	250	—	—	—	—	—	—
Oil-range hydrocarbons	—	—	2,000	—	—	500[d]	—	—	—
Tetrachloroethene	0.0016	—	—	—	—	2.9	—	—	9.62
Total cPAHs TEQ	0.0000022	—	—	0.005	—	0.000016	—	0.01	—
Total PCB aroclors	0.0000022	—	—	0.002	—	0.000007	—	0.01	—
Trichloroethene	0.00027/0.0044	—	—	0.001	—	0.7	—	—	0.37
Vinyl chloride (chloroethylene)	0.000055 /0.001	—	—	0.001	—	0.18	—	—	0.28

NOTES:

a. Washington State Department of Ecology's (Ecology's) Lower Duwamish Waterway (LDW) Preliminary Cleanup Levels (PCUL) Work Book (Ecology, 2018). Soil values are based on protection of sediment or surface water via leaching from saturated/unsaturated soil into non-potable groundwater or from bank spall at locations close to water (cadmium and chromium). The first value is saturated soil and the second value is unsaturated soil.

b. Model Toxics Control Act (MTCA) Method A or B levels from the CLARC database (March 2019).

c. Ecology Implementation Memo 14: Updated process for initially assessing the potential for petroleum vapor intrusion. March 2016.

d. A1 boring area is the one area with gasoline impacted groundwater and the adjacent well MW-44A is the only location with diesel and oil impacted groundwater in 2019.

Bold = Selected proposed cleanup level for chemical in the media.

— = Not a selected cleanup level and/or chemical of concern for this media; cPAHs = carcinogenic polycyclic aromatic hydrocarbons; mg/kg = milligrams per kilogram; PCB = polychlorinated biphenyl; TEQ = toxicity equivalency quotient; µg/L = micrograms per liter; µg/m^3 = micrograms per meter cubed

Table 2 - Soil Remediation Levels

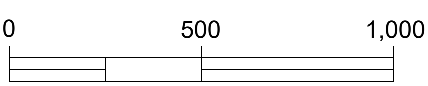
Analyte	Human Health Method B Carcinogen[a] (mg/kg)	Human Health Method B Non-Carcinogen[a] (mg/kg)	Proposed Remediation Level[b] (mg/kg)
Arsenic	—	—	14.6
Bis(2-ethylhexyl)phthalate	71.4	1,600	71.4
Copper	—	3,200	250
Oil-range hydrocarbons	—	—	4,000
Tetrachloroethene	476	480	5
Total cPAHs TEQ	—	—	0.6
Total PCB aroclors	—	—	0.5
Trichloroethene	12	40	5
Vinyl chloride	0.67	—	5

NOTES:

a. Model Toxics Control Act (MTCA) Method B direct contact levels from the CLARC database (March 2019).

b. See text for discussion on selection procedure for remediation levels.

— = Not a criteria selected for this media; cPAHs = carcinogenic polycyclic aromatic hydrocarbons; mg/kg = milligrams per kilogram; PCB = polychlorinated biphenyl; TEQ = toxicity equivalency quotient



8801 East Marginal Way South
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VICINITY MAP

December 2020 21-1-12567-023

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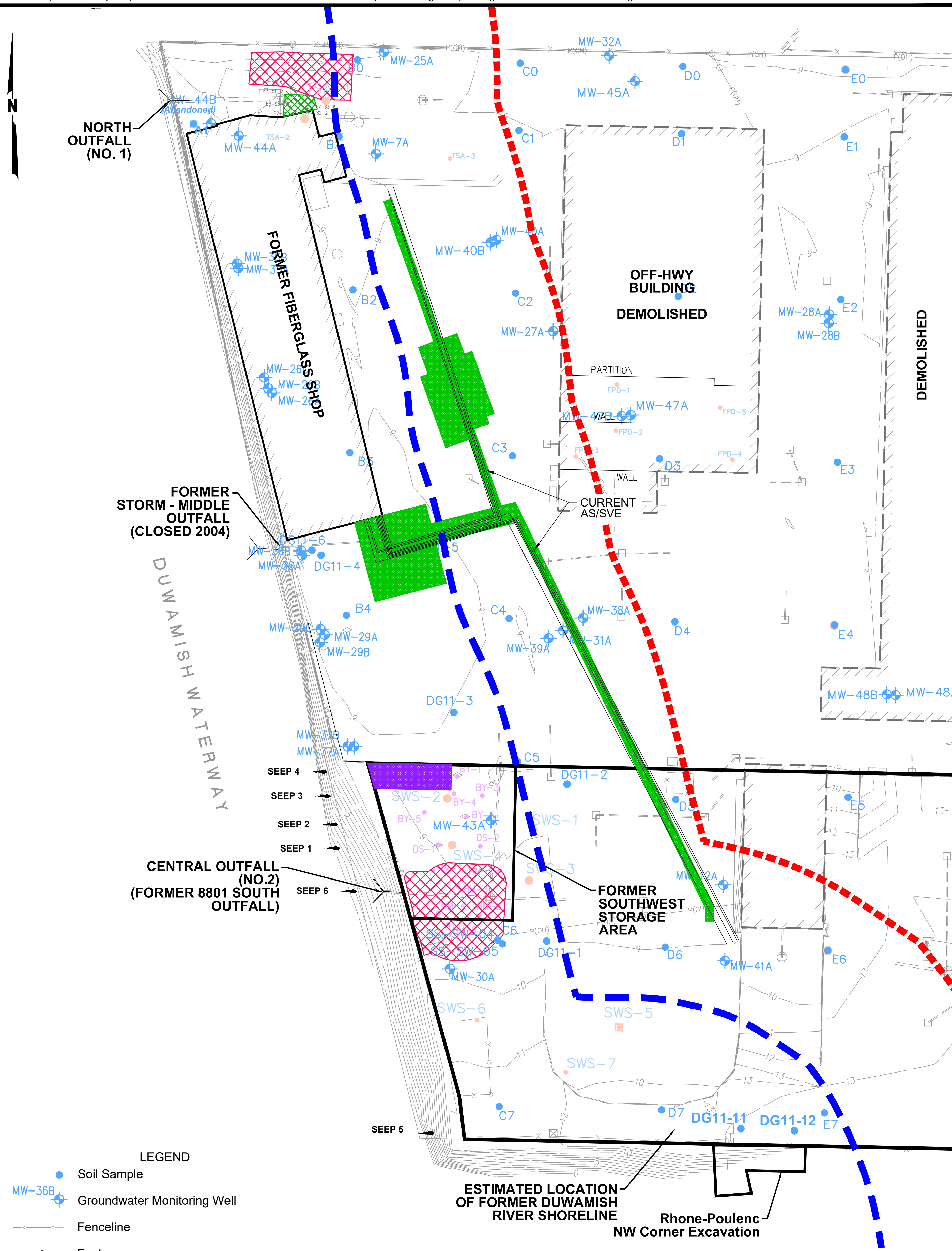
FIG. 1

Filename: C:\Users\jrs\CAD Group Dropbox\JDrive\211\12567\023\21-1-12567-023 Vicinity Map.dwg Date: 12-01-2020 Login: JRS

Filename: C:\Users\jrs\CAD Group Dropbox\JDrive\211\12567\023\21-1-12567-023 Shoreline Key Feature.dwg Layout: Figure 2 Date: 12-01-2020 Login: JRS



LEGEND

- Soil Sample
- MW-36B Groundwater Monitoring Well
- Fenceline
- Feet
- 100' River Buffer
- 200' Shoreline Buffer
- Existing Buildings
- Former Buildings
- Southwest Storage Area Approximate Excavation Area (1995)
- Approximate Acetone UST Soil Excavation Area (2003)
- Approximate AS/SVE Soil Excavation Area (2004)
- Approximate Stormwater Soil Excavation Areas (2007)

0 60 120

Scale in Feet

NOTES

1. Exploration locations are approximate.
2. Base map and historic exploration points are from Kennedy-Jenks Figures 2 and 3, 046001.00/Report/Po4SK003.
3. Figure adapted from AMEC *14995-L-32.dwg* and AMEC *14995-L-37.dwg* dated 05/2013, and *14995-L-16.dwg* dated November 2010.

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KEY SHORELINE AREA FEATURES

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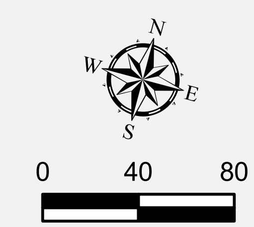
FIG. 2

FIG. 2

NOTE:
All locations and features are approximate.



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Distribution of Chemicals of Concern

21-1-12567-023 December 2020

FIG. 3 Sheet 1 of 3

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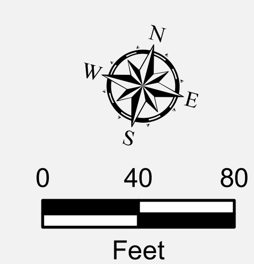
NOTE:
All locations and features are approximate.



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Distribution of Chemicals of Concern

21-1-12567-023 December 2020

FIG. 3 Sheet 2 of 3

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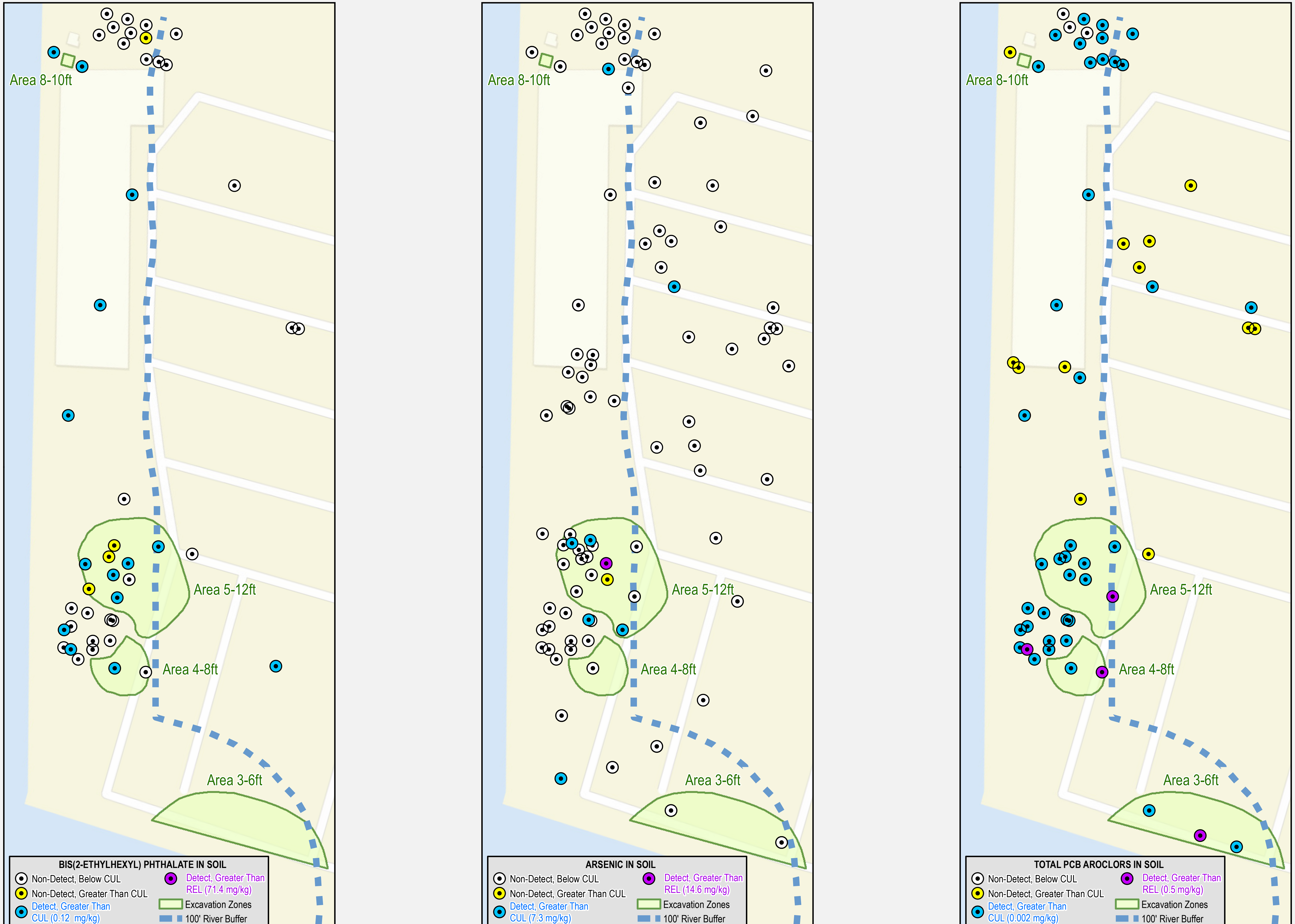
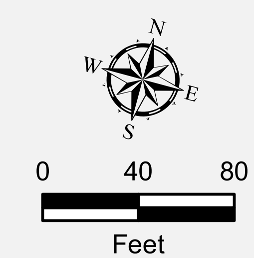


NOTE:
All locations and features are approximate.



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Distribution of Chemicals of Concern

21-1-12567-023 December 2020

FIG. 3 Sheet 3 of 3

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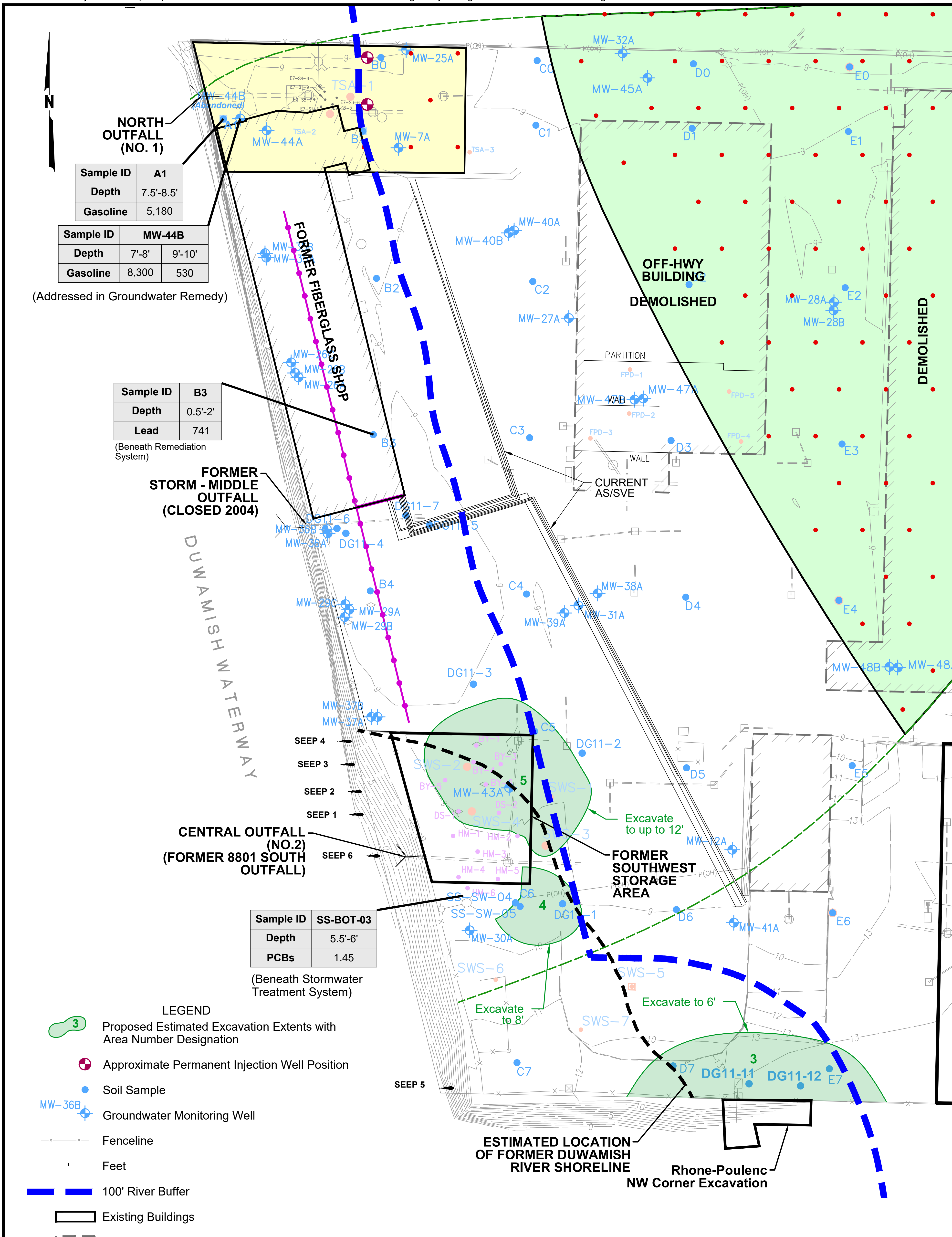
Filename: C:\Users\jrs\CAD Group Dropbox\JDrive\211\12567\023\21-1-12567-023 Remediation.dwg   Layout: Figure 4   Date: 12-14-2020   Login: JRS



Sample ID	A1
Depth	7.5'-8.5'
Gasoline	5,180

Sample ID	MW-44B	
Depth	7'-8'	9'-10'
Gasoline	8,300	530

Sample ID	B3
Depth	0.5'-2'
Lead	741

Sample ID	SS-BOT-03
Depth	5.5'-6'
PCBs	1.45

NOTES

1. Exploration locations are approximate.
2. Base map and historic exploration points are from Kennedy-Jenks Figures 2 and 3, 046001.00/Report/Po4SK003.
3. Concentrations are expressed in milligrams per kilograms (mg/kg).
4. Figure adapted from AMEC *14995-L-32.dwg* and AMEC *14995-L-37.dwg* dated 05/2013, and *14995-L-16.dwg* dated November 2010.

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PROPOSED REMEDIATION AREAS

December 2020   21-1-12567-023

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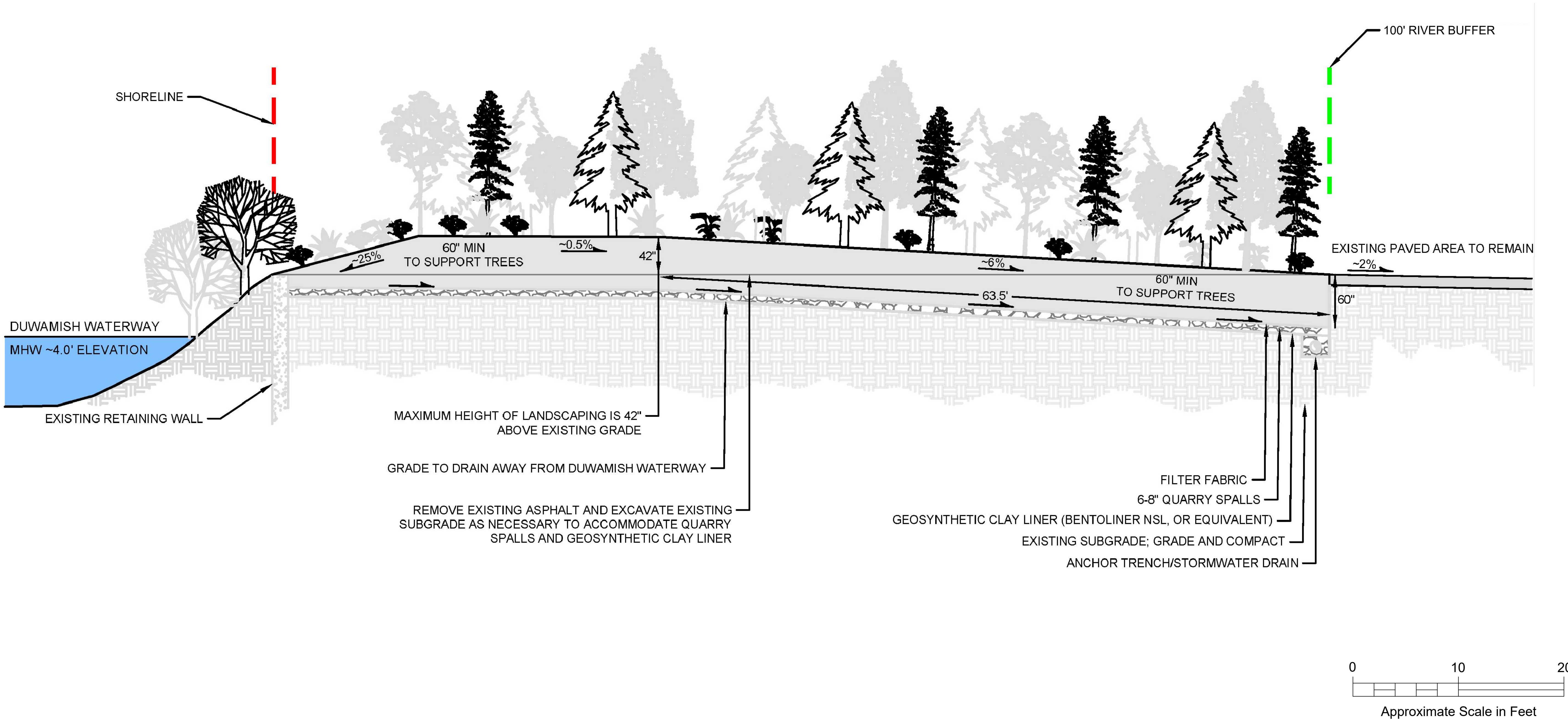
FIG. 4



NOTES

1. Landscaping is Consistent with the Planting Plan prepared by Soundview Consultants, Dated 02/12/2020.

2. Figure adapted from "Centerpoint Tukwila - Proposed Shoreline Cross-Section" of *Centerpoint Tukwila* dated 10/29/2020 by Soundview Consultants, Inc.

Farallon Consulting
Washington
Issaquah | Bellingham | Seattle
Oregon
Portland | Baker City
California
Oakland | Folsom | Irvine
Quality Service for Environmental Solutions | farallonconsulting.com

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CROSS SECTION OF CAP, DRAINAGE AND LANDSCAPING

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FIG. 5

Filename: C:\Users\jrs\CAD Group Dropbox\UDrive\21\12567\023\21-1-12567-023 Shoreline Cross Setion.dwg Layout: Figure 5 Date: 12-01-2020 Login: JRS

Appendix A

Chemical of Concern Distribution Figures

APPENDIX A: CHEMICAL OF CONCERN DISTRIBUTION FIGURES

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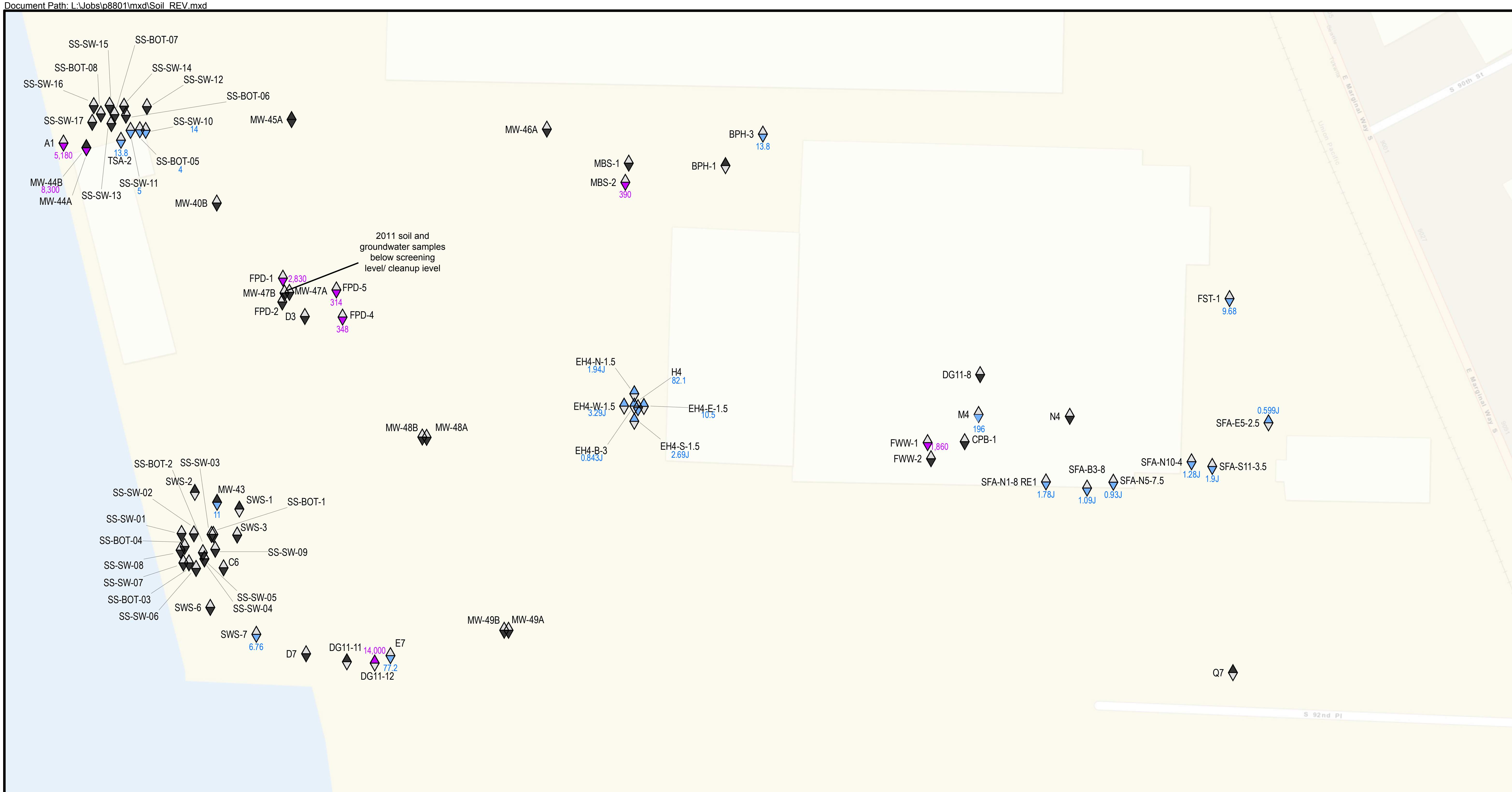

LEGEND

Sample Location

Unsaturated — Surface to 3 feet

Saturated

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

EXAMPLE

FPD-5 314

Sample Location is FPD-5.
Sample analyzed and detected greater than screening level.
Sample result is 314 mg/kg for Unsaturated.

NOTE
Screening against project proposed cleanup level.
Gasoline-Range Hydrocarbons cleanup level in soil is 250 mg/kg.

N W E S

0 50 100
Feet

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GASOLINE RANGE HYDROCARBONS IN SOIL

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FIG. A-1

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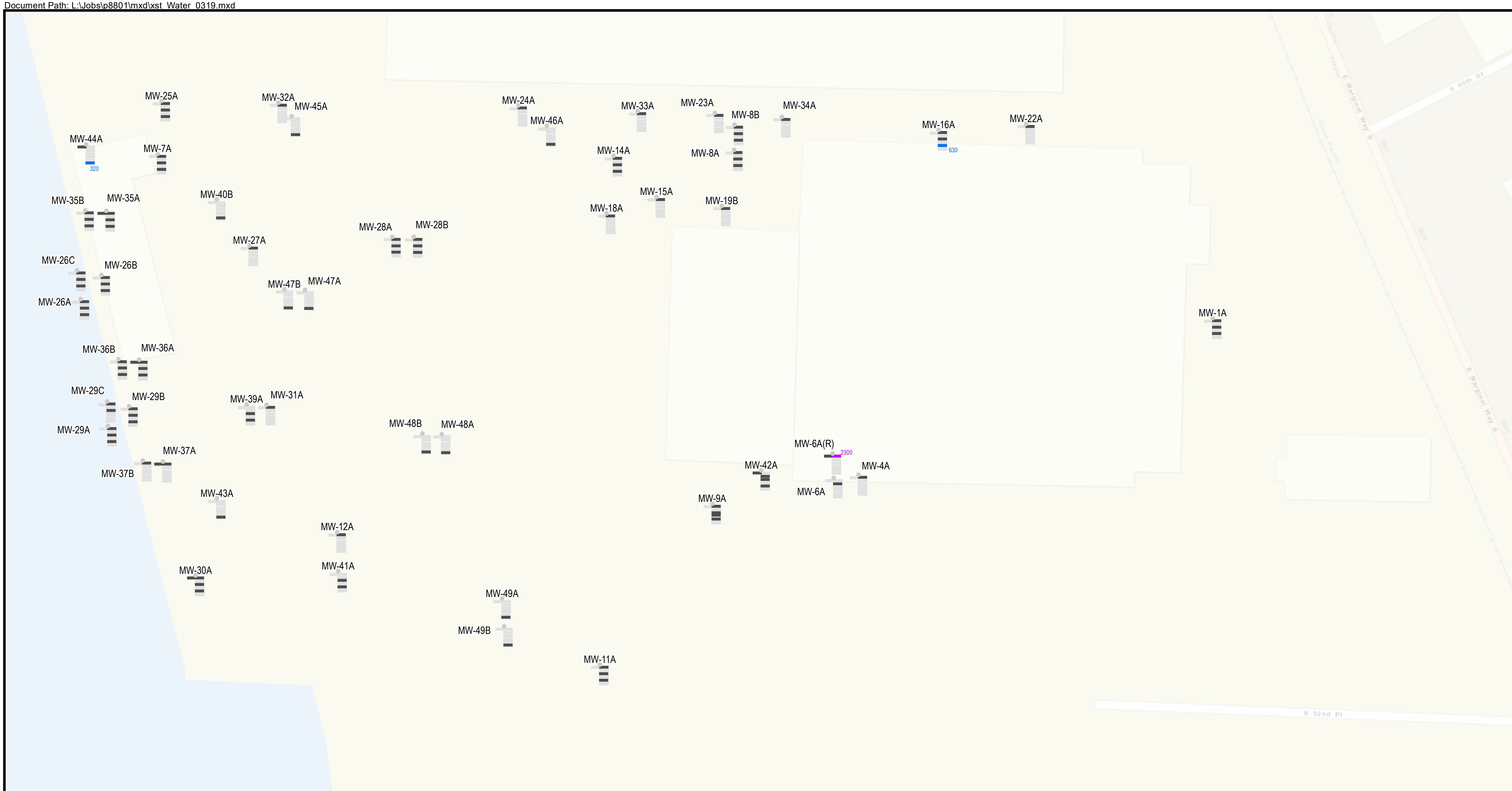

LEGEND

Sample Location

2019- Winter 2002 - Spring
2004 - Spring
2006- Spring
2006- Spring *
2006- Fall
2011- Fall

Sample - Date

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

NOTE
Screening against project proposed cleanup level.
Gasoline range hydrocarbons cleanup level in groundwater is 1,000 ug/L.

N
W E
S

0 50 100
Feet

8801 East Marginal Way South
Tukwila, Washington

GASOLINE RANGE HYDROCARBONS IN GROUNDWATER

December 2020 21-1-12567-023

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FIG. A-2

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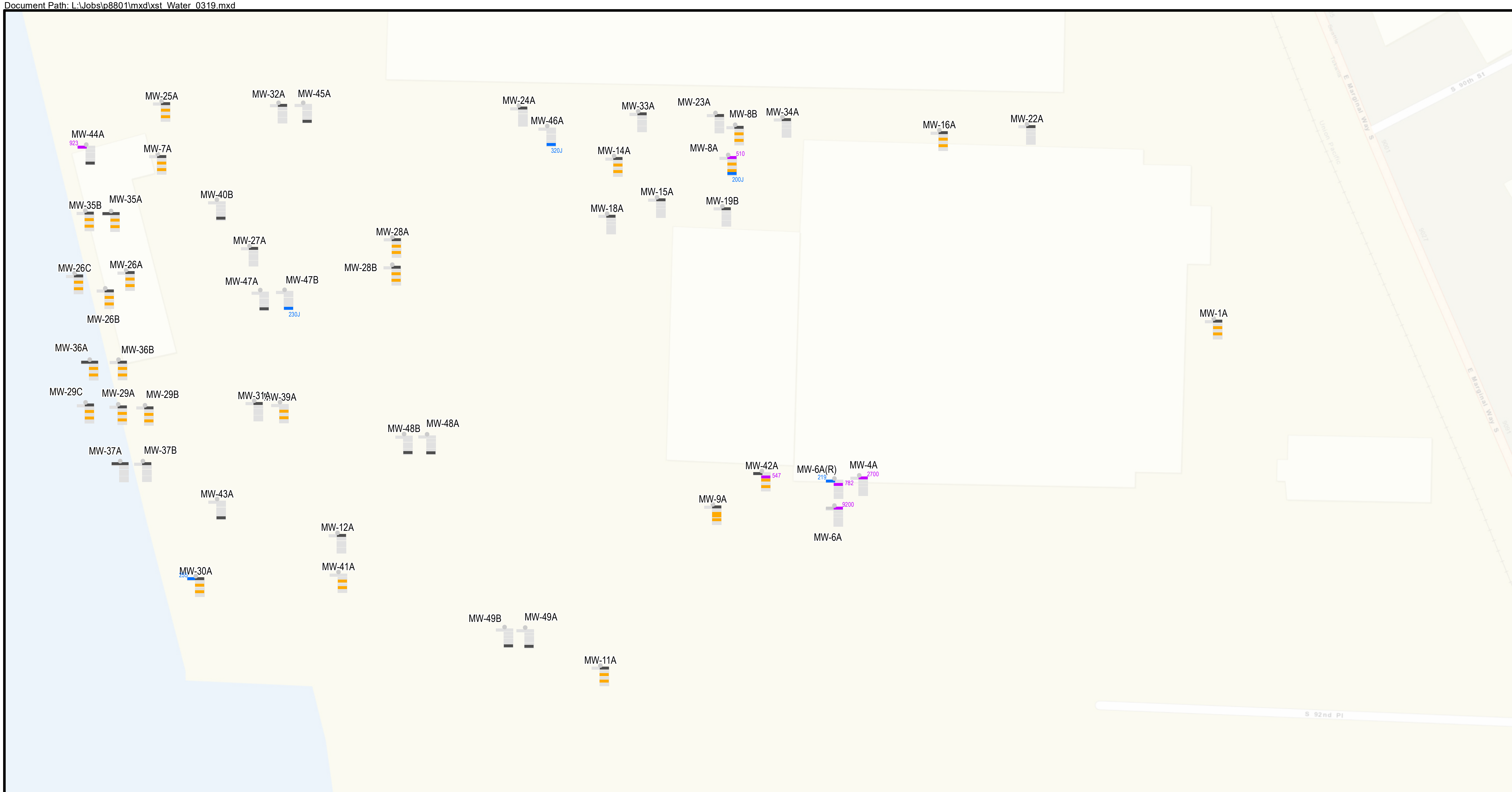

LEGEND

Sample Location

2019- Winter 2002 - Spring
2004 - Spring
2006- Spring
2006- Spring *
2006- Fall
2011- Fall

Sample - Date

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

NOTE
Screening against project proposed cleanup level. Diesel range hydrocarbons cleanup level in groundwater is 500 ug/L.

N E S W

0 50 100
Feet

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Tukwila, Washington

DIESEL RANGE HYDROCARBONS IN GROUNDWATER

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FIG. A-3

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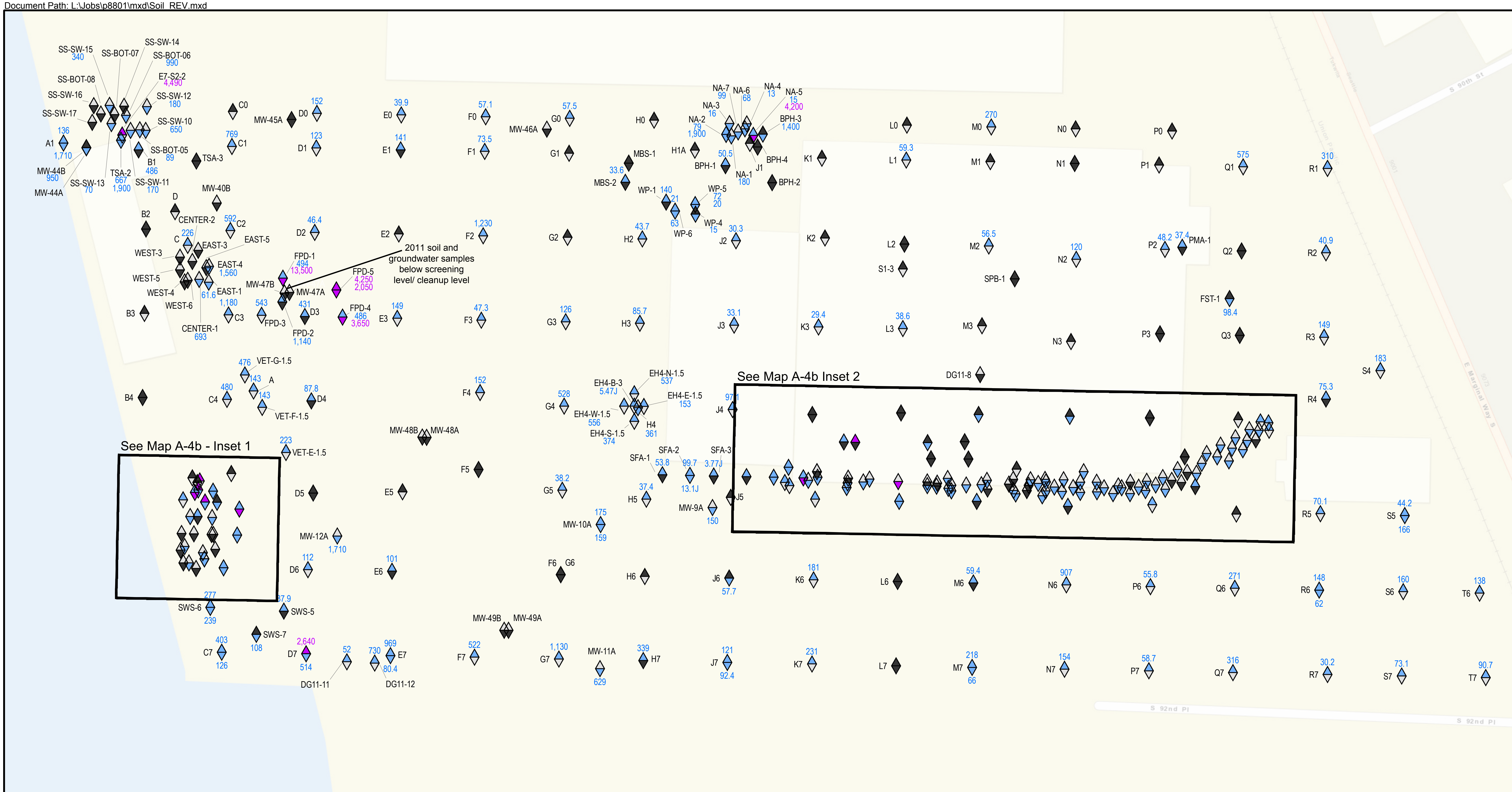

LEGEND

Sample Location

Unsaturated — Surface to 3 feet

Saturated

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

EXAMPLE

E7-S2-2

4,490

Sample Location is E7-S2-2. Sample analyzed and detected greater than screening level. Sample result is 4,490 mg/kg for Unsaturated.

NOTE

Screening against project proposed cleanup level. Oil-Range Hydrocarbons cleanup level in soil is 2,000 mg/kg.

N E S W

0 50 100

Feet

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OIL RANGE HYDROCARBONS IN SOIL

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FIG. A-4a

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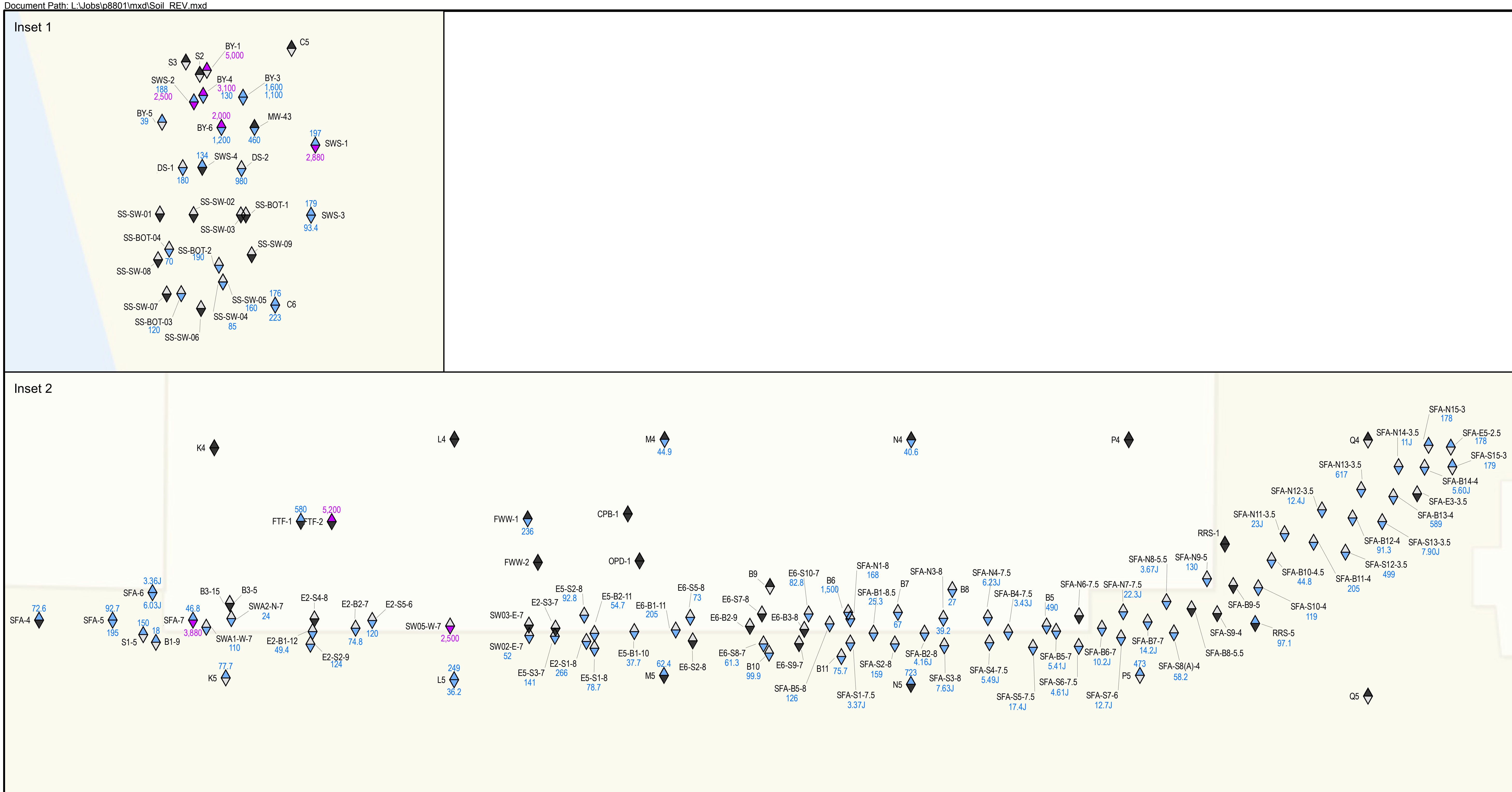

LEGEND

Sample Location

Unsaturated — Surface to 3 feet

Saturated

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

EXAMPLE

BY-1
5,000

Sample Location is BY-1.
Sample analyzed and detected greater than screening level.
Sample result is 5,000 mg/kg for Unsaturated.

NOTE
Screening against project proposed cleanup level. Oil-Range Hydrocarbons cleanup level in soil is 2,000 mg/kg.

N W E S

0 30 60
Feet

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Tukwila, Washington

OIL RANGE HYDROCARBON IN SOIL

December 2020 | 21-1-12567-023

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FIG. A-4b

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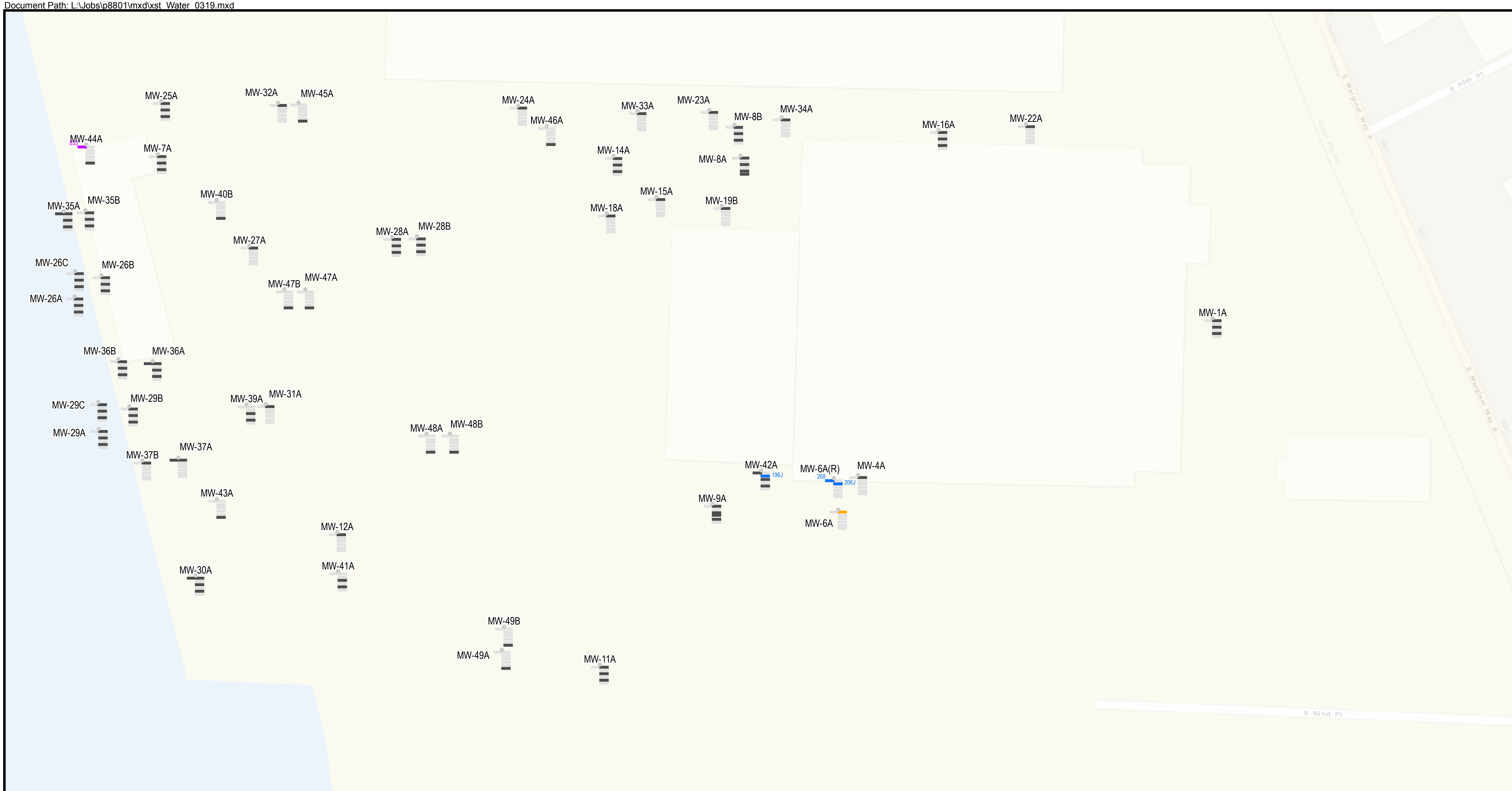

LEGEND

Sample Location

2019- Winter 2002 - Spring
2004 - Spring
2006- Spring
2006- Spring *
2006- Fall
2011- Fall

Sample - Date

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

NOTE
Screening against project proposed cleanup level. Oil range hydrocarbons cleanup level in groundwater is 500 ug/L.

N W E S

0 50 100
Feet

8801 East Marginal Way South
Tukwila, Washington

OIL RANGE HYDROCARBONS IN GROUNDWATER

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FIG. A-5

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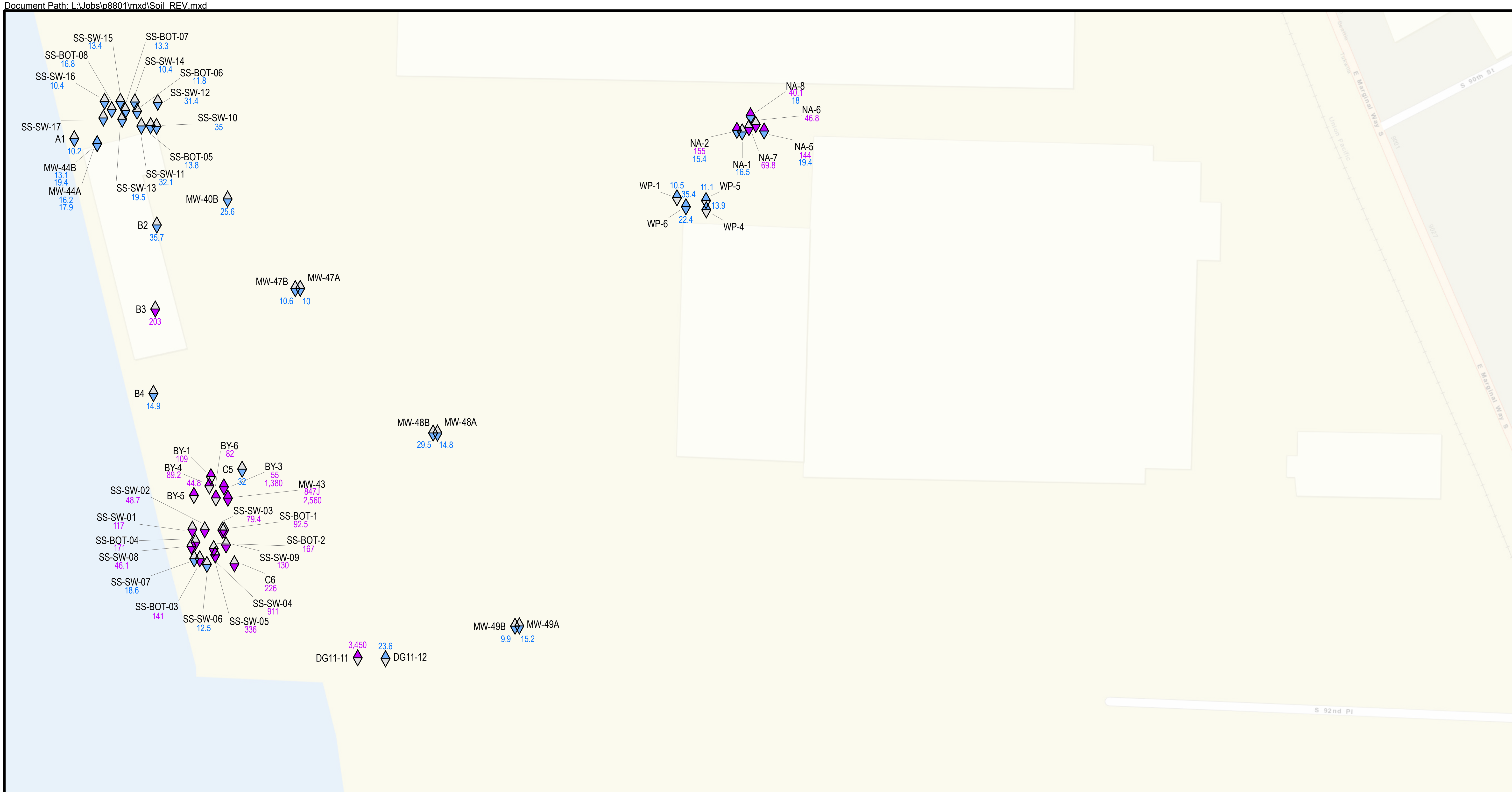

LEGEND

Sample Location

Unsaturated — Surface to 3 feet

Saturated

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

EXAMPLE

B3

203

Sample Location is B3.
Sample analyzed and detected greater than screening level.
Sample result is 203 mg/kg for Saturated.

NOTE
Screening against project proposed cleanup level.
Copper cleanup level in soil is 36 mg/kg.

N W E S

0 50 100
Feet

8801 East Marginal Way South
Tukwila, Washington

COPPER IN SOIL

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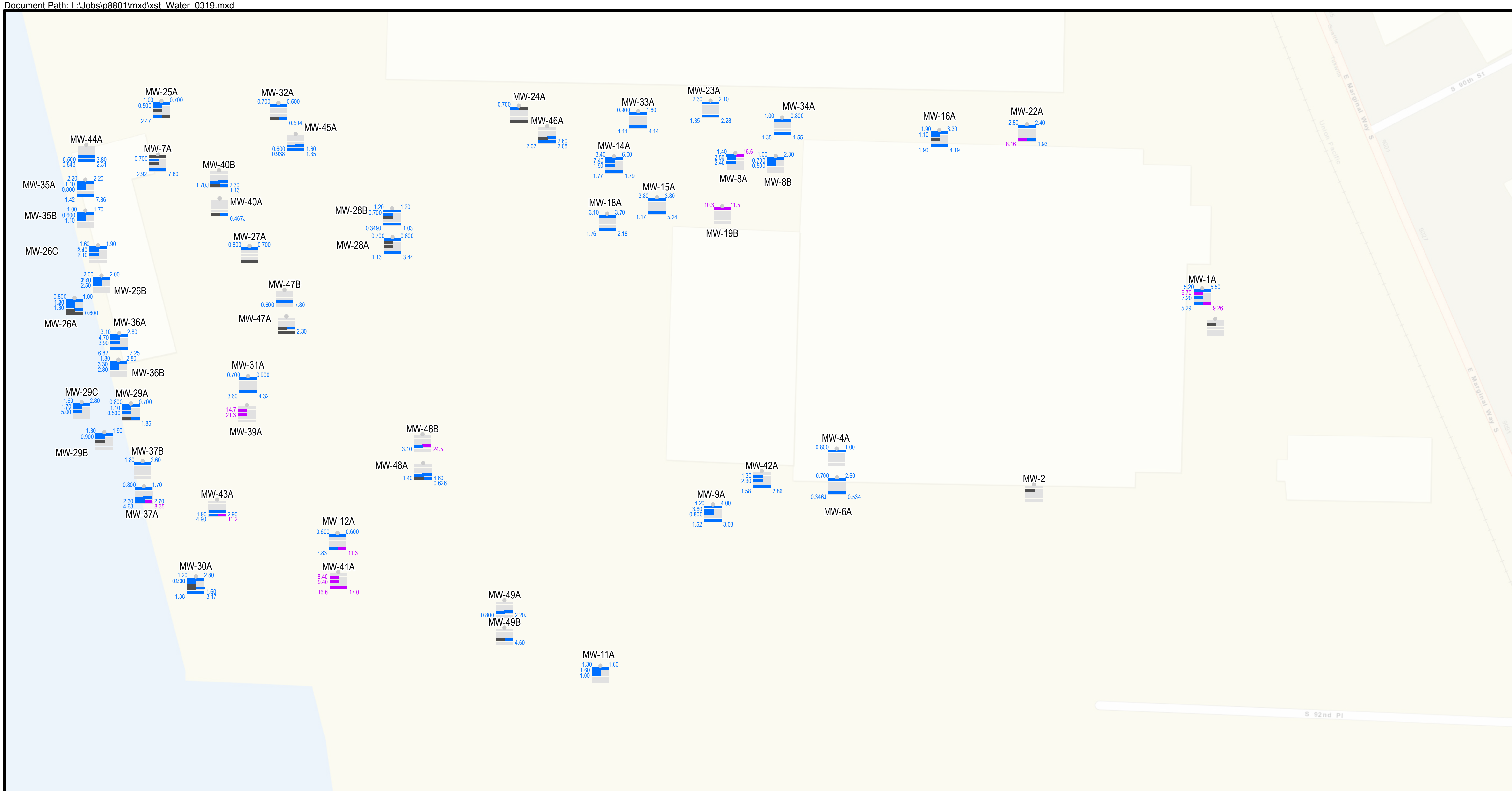
FIG. A-6



LEGEND

Sample Location

Dissolved	2002 - Spring 2006- Spring 2006- Fall 2011- Fall 2019- Winter	Total

Sample - Date

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

NOTE
Screening against project proposed cleanup level. Copper cleanup level in groundwater is 8 ug/L.

N E S W

0 50 100
Feet

8801 East Marginal Way South
Tukwila, Washington

COPPER IN GROUNDWATER

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FIG. A-7

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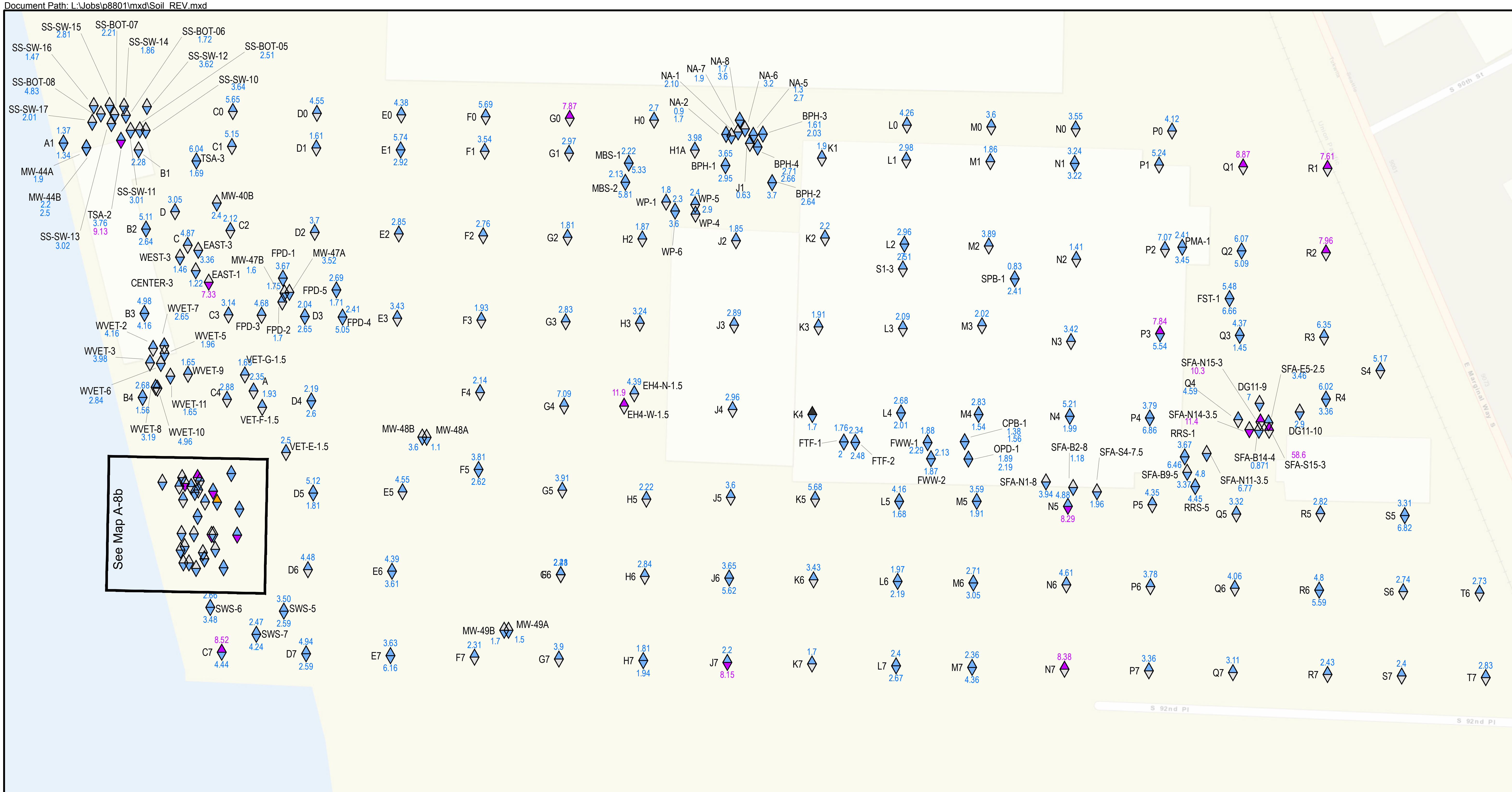

LEGEND

Sample Location

Unsaturated — Surface to 3 feet

Saturated

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

EXAMPLE

G0 7.87

Sample Location is G0. Sample analyzed and detected greater than screening level. Sample result is 7.87 mg/kg for Unsaturated.

NOTE
Screening against project proposed cleanup level.
Arsenic cleanup level in soil is 7.3 mg/kg.

N W E S

0 50 100
Feet

8801 East Marginal Way South
Tukwila, Washington

ARSENIC IN SOIL

December 2020 | 21-1-12567-023

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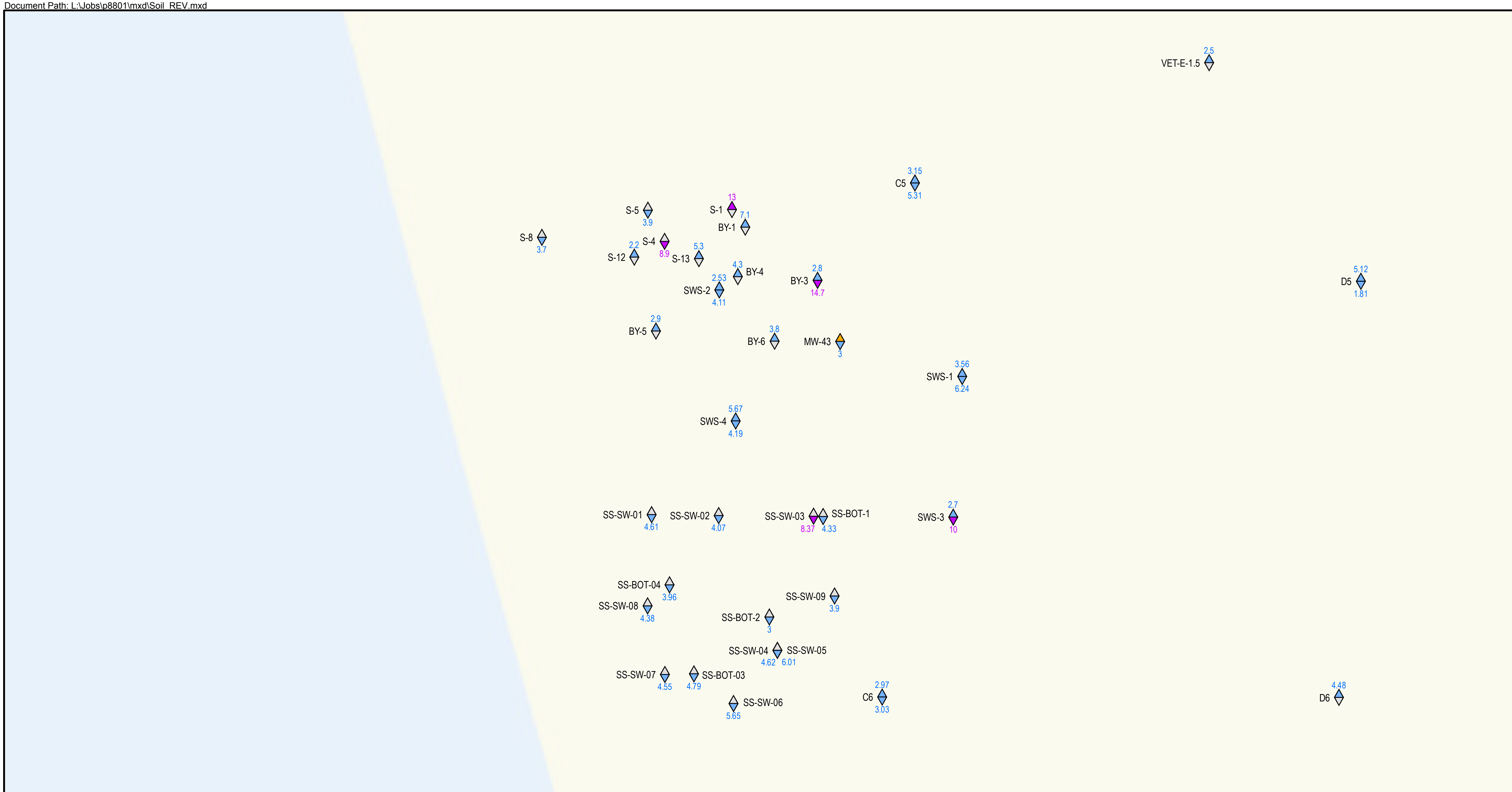
FIG. A-8a

Document Path: L:\Jobs\p8801\mxd\Soil_REV.mxd



LEGEND

Sample Location

Unsaturated / Saturated — Surface to 3 feet

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

EXAMPLE

S-1 13

Sample Location is S-1.
Sample analyzed and detected greater than screening level.
Sample result is 13 mg/kg for Unsaturated.

NOTE
Screening against project proposed cleanup level.
Arsenic cleanup level in soil is 7.3 mg/kg.

N W E S

0 15 30
Feet

8801 East Marginal Way South
Tukwila, Washington

ARSENIC IN SOIL

December 2020 21-1-12567-023

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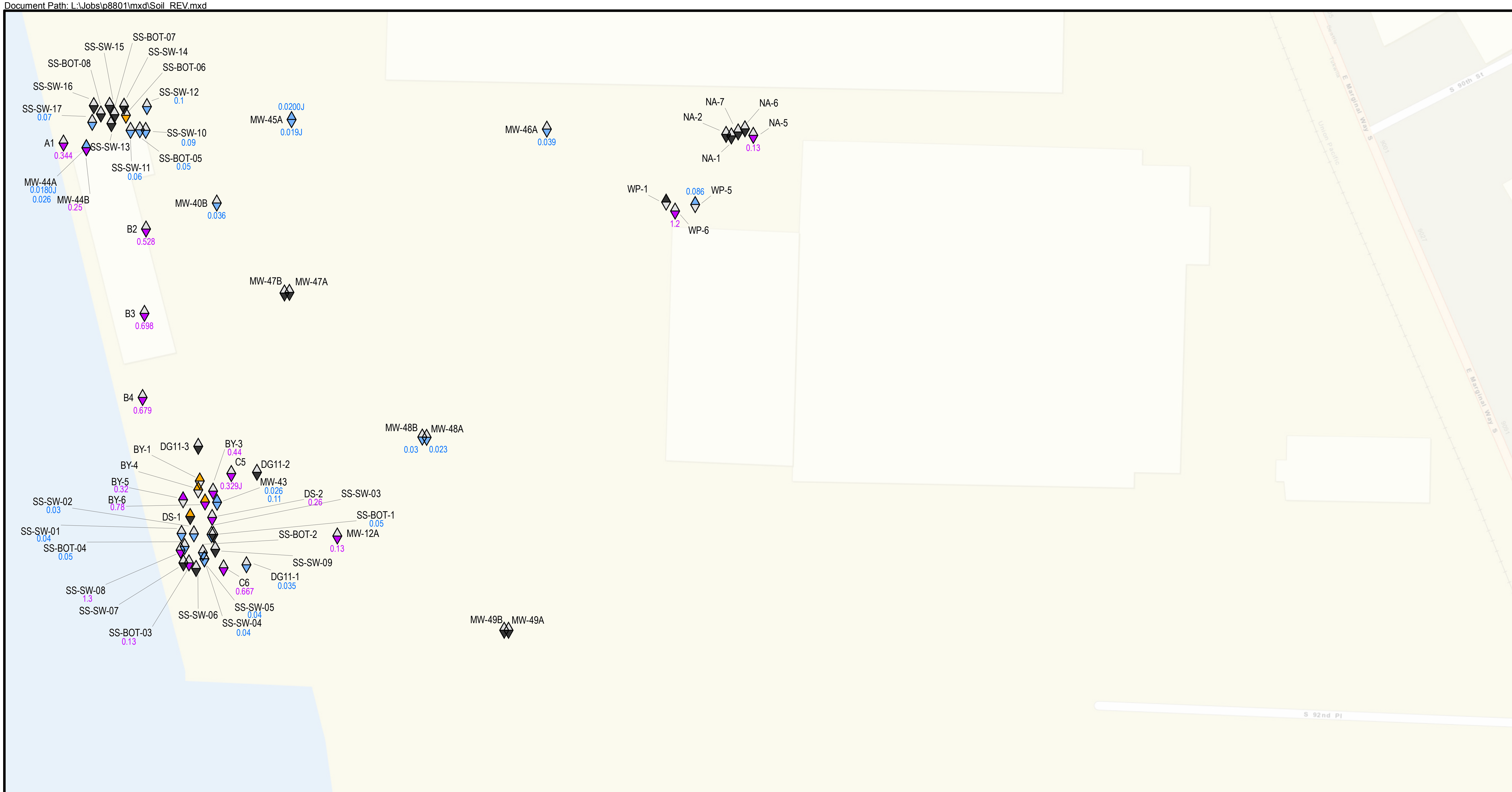
FIG. A-8b

Document Path: L:\Jobs\p8801\mxd\Soil_REV.mxd



LEGEND

Sample Location

Unsaturated — Surface to 3 feet

Saturated

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

EXAMPLE

BY-5 0.32

Sample Location is BY-5.
Sample analyzed and detected greater than screening level.
Sample result is 0.32 mg/kg for Unsaturated.

NOTE
Screening against project proposed cleanup level.
Bis(2-ethylhexyl)phthalate cleanup level in soil is 0.12 mg/kg.

N W E S

0 50 100
Feet

8801 East Marginal Way South
Tukwila, Washington

BIS(2-ETHYLHEXYL) PHTHALATE IN SOIL

December 2020 21-1-12567-023

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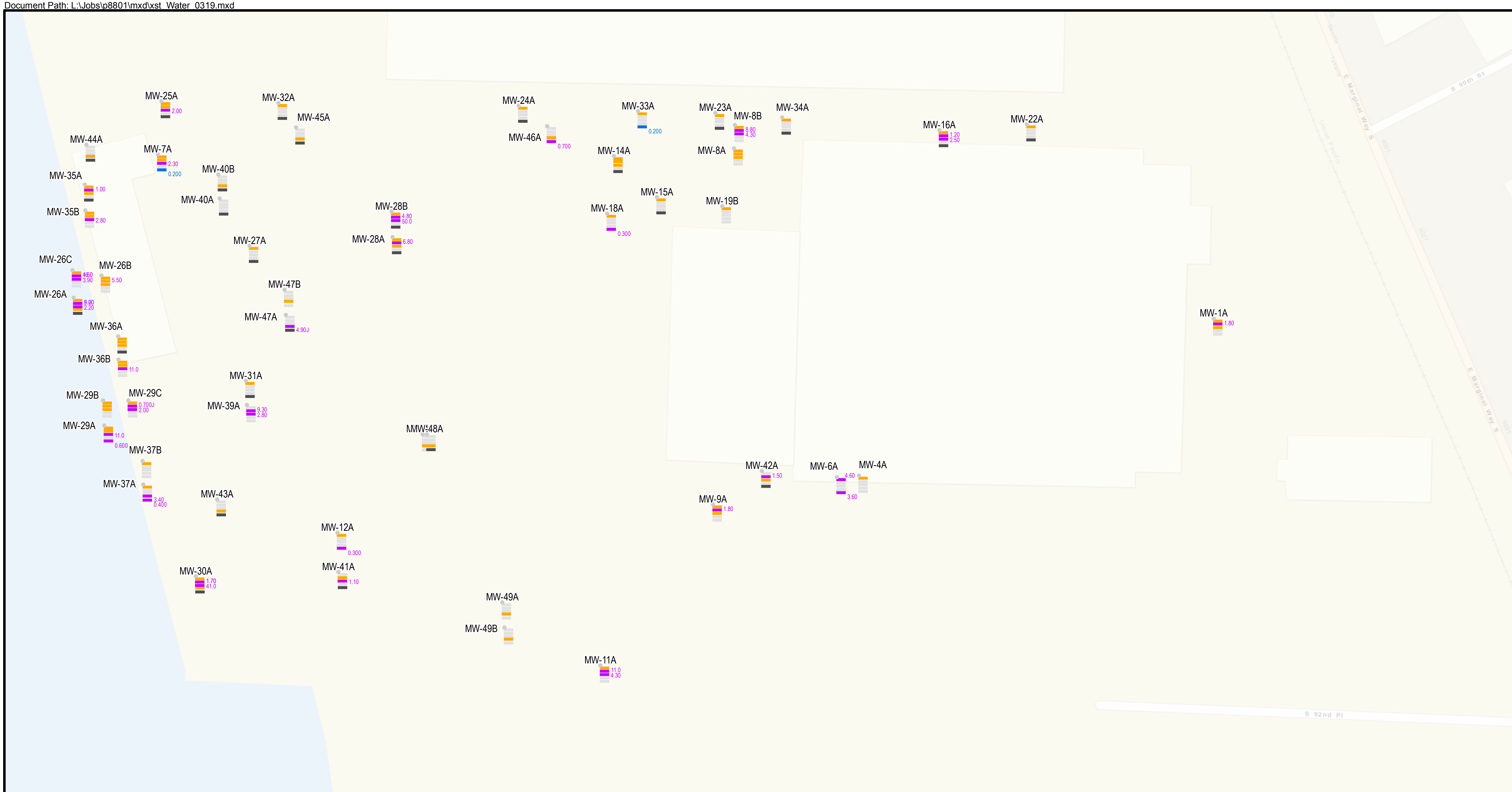
FIG. A-9

Document Path: L:\Jobs\p8801\mxd\xst_Water_0319.mxd



LEGEND

Sample Location

2002 - Spring
2004 - Spring
2006- Spring
2006- Fall
2011- Fall
2019- Winter

Sample - Date

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

NOTE
Screening against project proposed cleanup level.
Bis(2-ethylhexyl) Phthalate cleanup level in groundwater is 0.2 ug/L.

N E S W

0 50 100
Feet

8801 East Marginal Way South
Tukwila, Washington

BIS(2-ETHYLHEXYL) PHTHALATE IN GROUNDWATER

December 2020 21-1-12567-023

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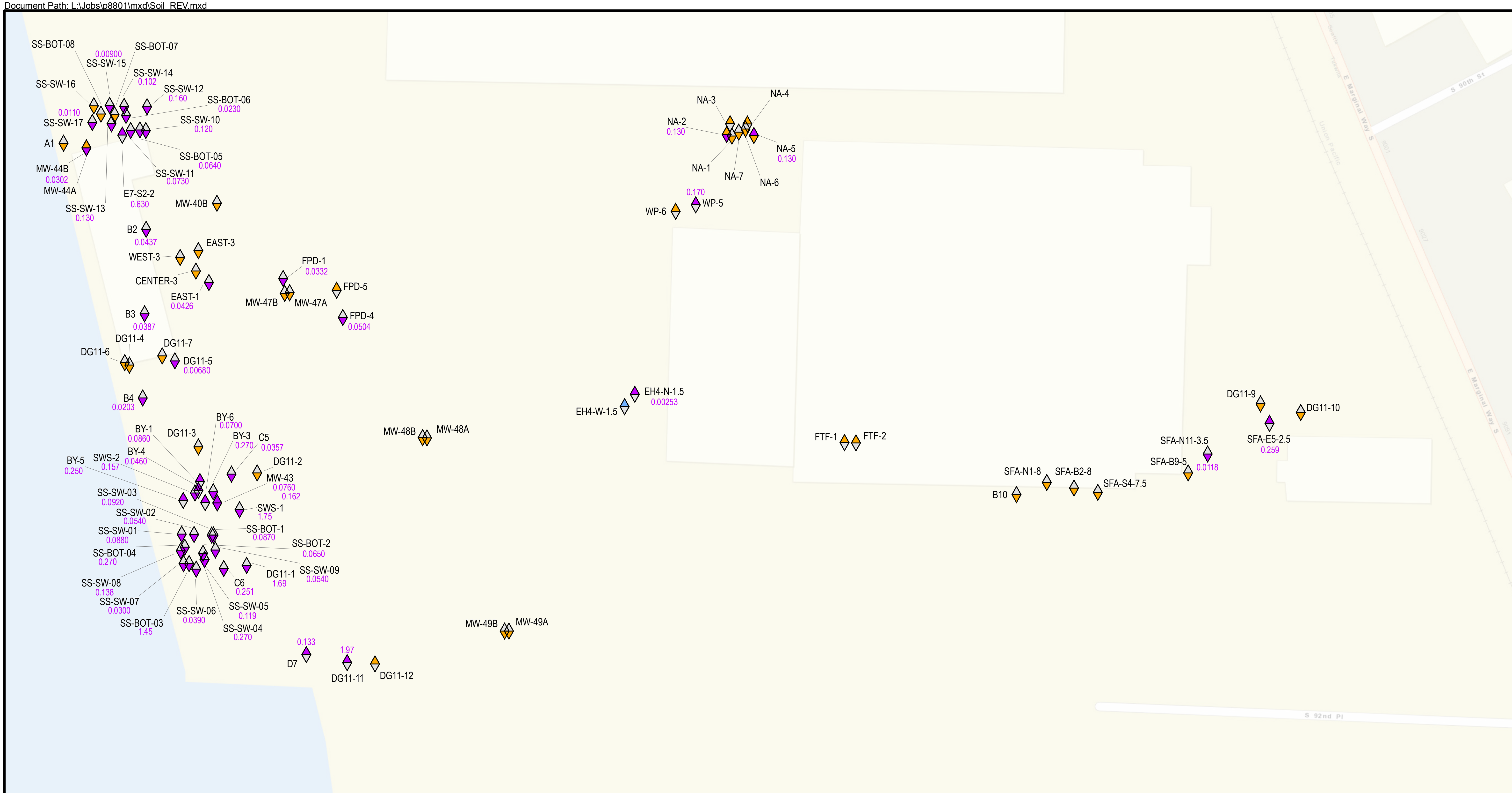
FIG. A-10

Document Path: L:\Jobs\p8801\mxd\Soil_REV.mxd



LEGEND

Sample Location

Unsaturated / Saturated — Surface to 3 feet

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

EXAMPLE

EH4-N-1.5 0.00253

Sample Location is EH4-N-1.5. Sample analyzed and detected greater than screening level. Sample result is 0.00253 mg/kg for Unsaturated.

NOTE
Screening against project proposed cleanup level.
Total PCB aroclors cleanup level in soil is 0.002 mg/kg.

N S E W

0 50 100
Feet

8801 East Marginal Way South
Tukwila, Washington

TOTAL PCB AROCLORS IN SOIL

December 2020

21-1-12567-023

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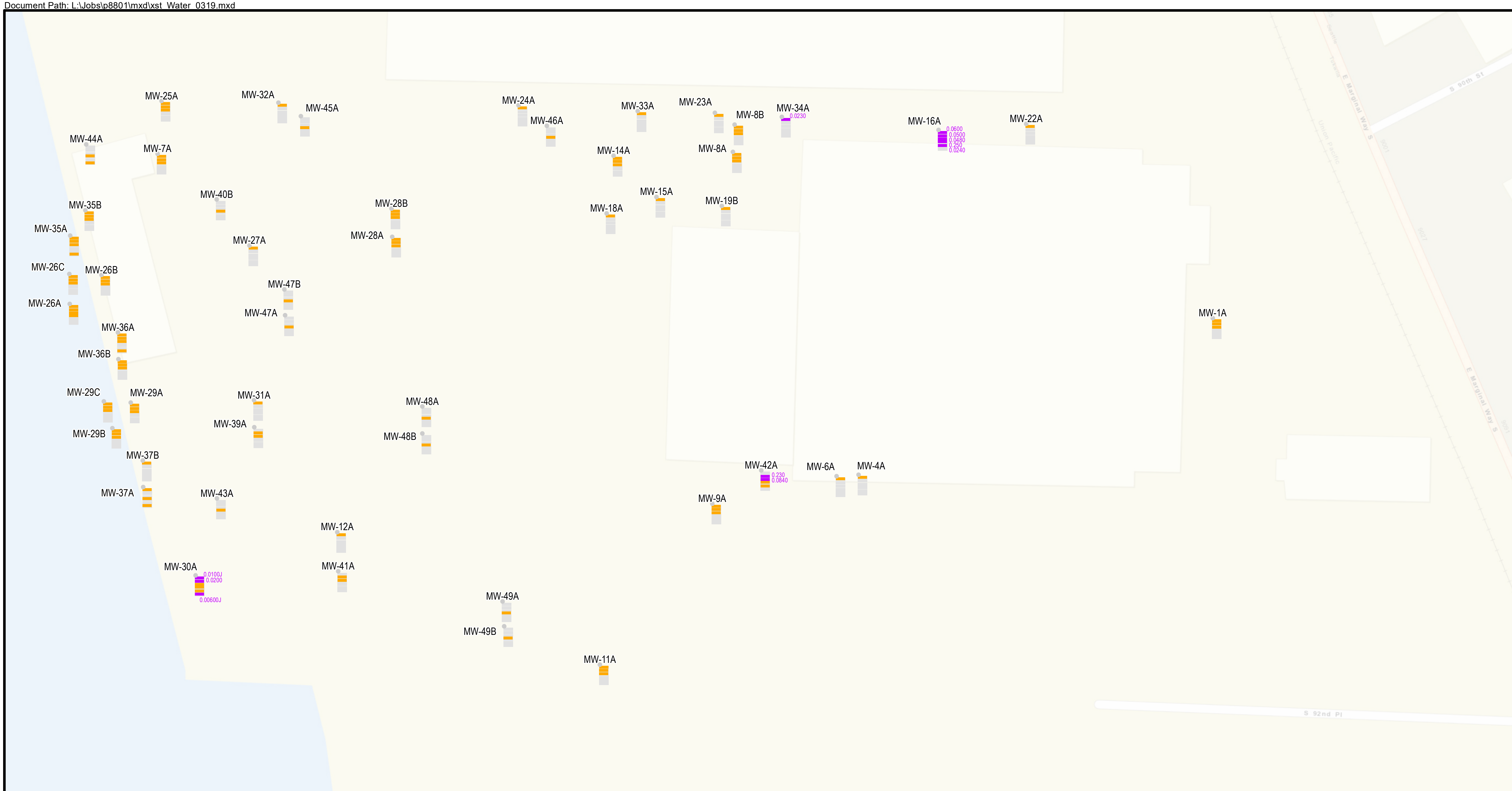
FIG. A-11



LEGEND

Sample Location

2002 - Spring
2004 - Spring
2006- Spring
2006- Fall
2011- Fall
2019- Winter

Sample - Date

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

NOTE

Screening against project proposed cleanup level. Total PCB aroclors in groundwater is 0.01 ug/L.

N E S W

0 50 100

Feet

8801 East Marginal Way South
Tukwila, Washington

TOTAL PCB AROCLORS IN GROUNDWATER

December 2020 21-1-12567-023

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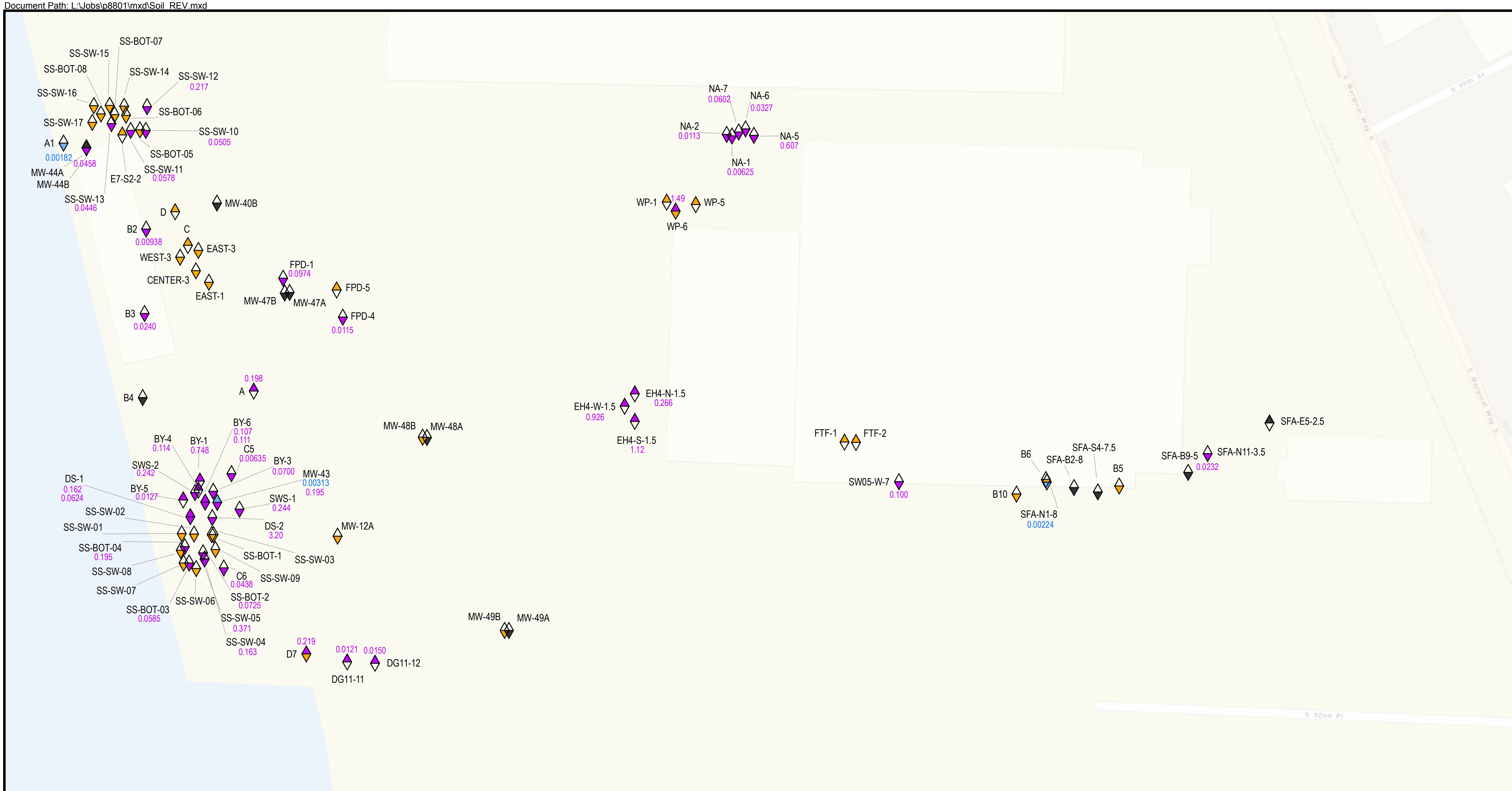
FIG. A-12

Document Path: L:\Jobs\p8801\mxd\Soil_REV.mxd



LEGEND

Sample Location

Unsaturated — Surface to 3 feet

Saturated

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

EXAMPLE

MW-43

0.00313

Sample Location is MW-43.
Sample analyzed and detected greater than screening level.
Sample result is 0.00313 mg/kg for Unsaturated.

NOTE
Screening against project proposed cleanup level.
Total CPAH TEQ cleanup level in soil is 0.005 mg/kg.

N
W E
S

0 30 60
Feet

8801 East Marginal Way South
Tukwila, Washington

TOTAL CPAH TEQ IN SOIL

December 2020 21-1-12567-023

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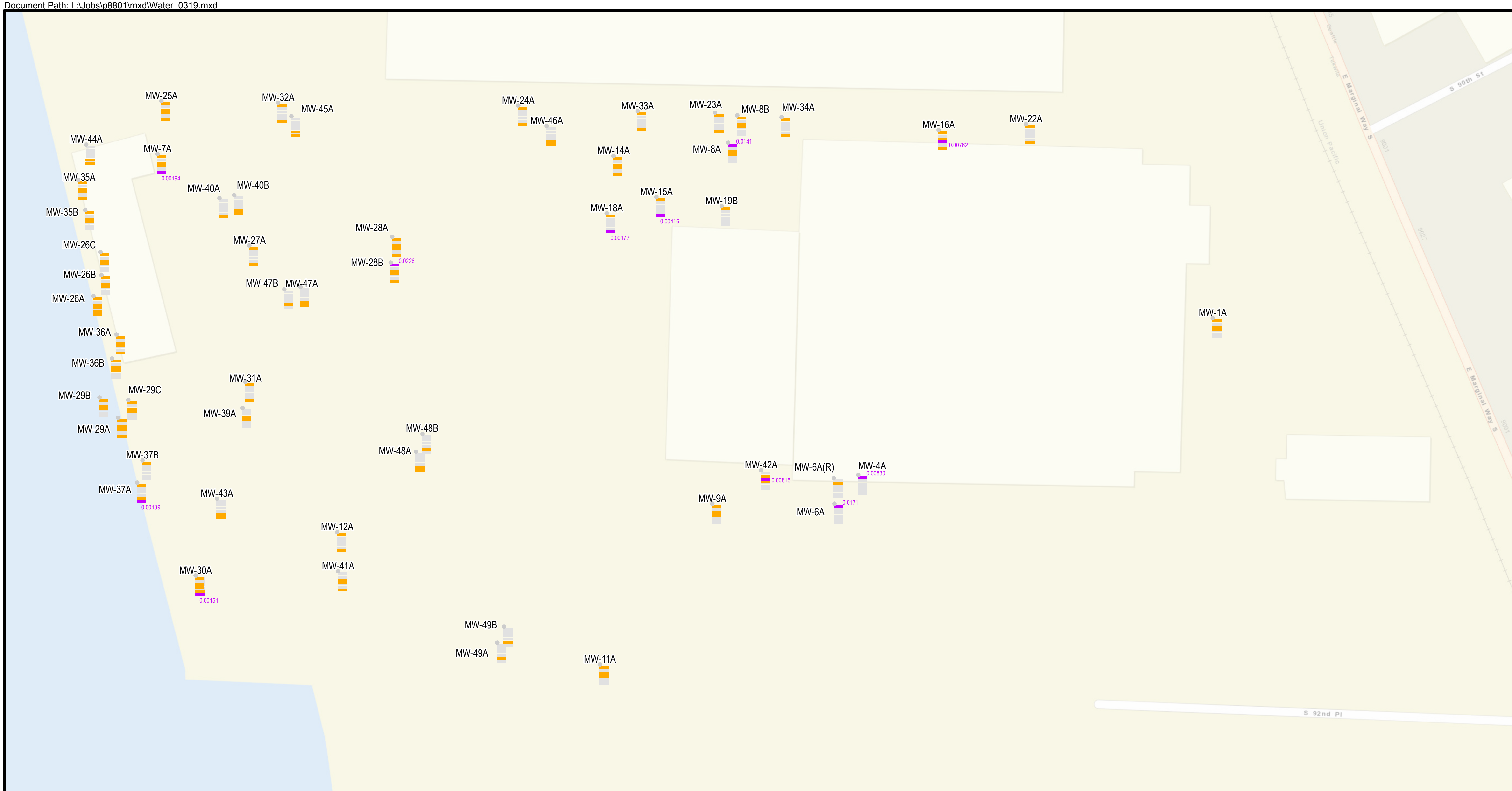
FIG. A-13

Document Path: L:\Jobs\p8801\mxd\Water_0319.mxd



LEGEND

Sample Location

2002 - Spring
2004 - Spring
2006- Spring
2006- Fall
2011- Fall
2019- Winter

Sample - Date

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

NOTE
Screening against project proposed cleanup level.
Total cPAH TEQ cleanup level in groundwater is 0.01 ug/L

N
W E
S

0 50 100
Feet

8801 East Marginal Way South
Tukwila, Washington

TOTAL CPAH TEQ IN GROUNDWATER

December 2020

21-1-12567-023

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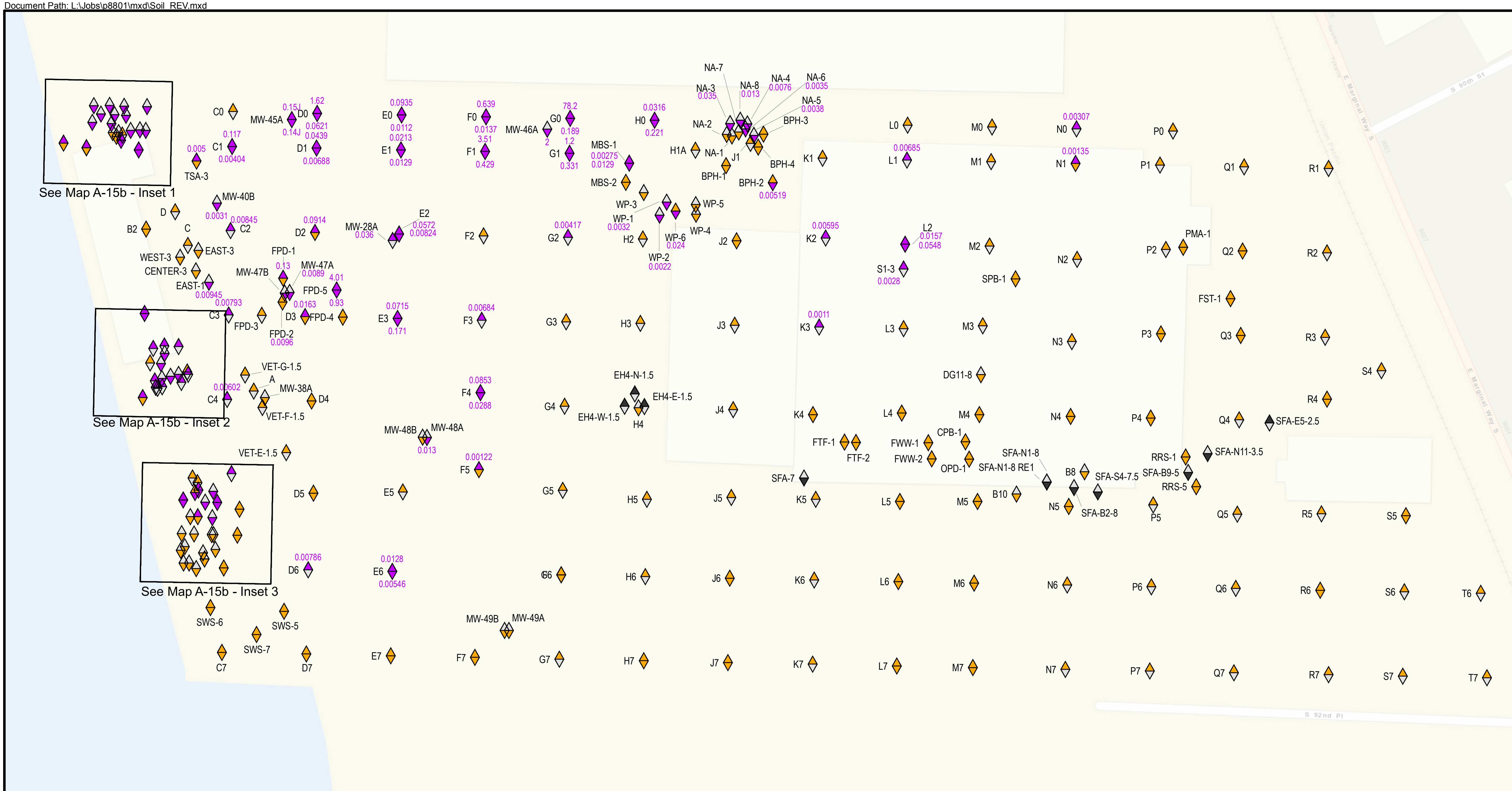
FIG. A-14

Document Path: L:\Jobs\p8801\mxd\Soil_REV.mxd



LEGEND

Sample Location

Surface to 3 feet

Unsaturated

Saturated

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

EXAMPLE

F3

0.00684

Sample Location is F3. Sample analyzed and detected greater than screening level. Sample result is 0.00684 mg/kg for Unsaturated.

NOTE
Screening against project proposed cleanup level. Trichloroethylene cleanup level in soil is 0.001 mg/kg.

N W E S

0 50 100
Feet

8801 East Marginal Way South
Tukwila, Washington

TRICHLOROETHYLENE (TCE) IN SOIL

December 2020 21-1-12567-023

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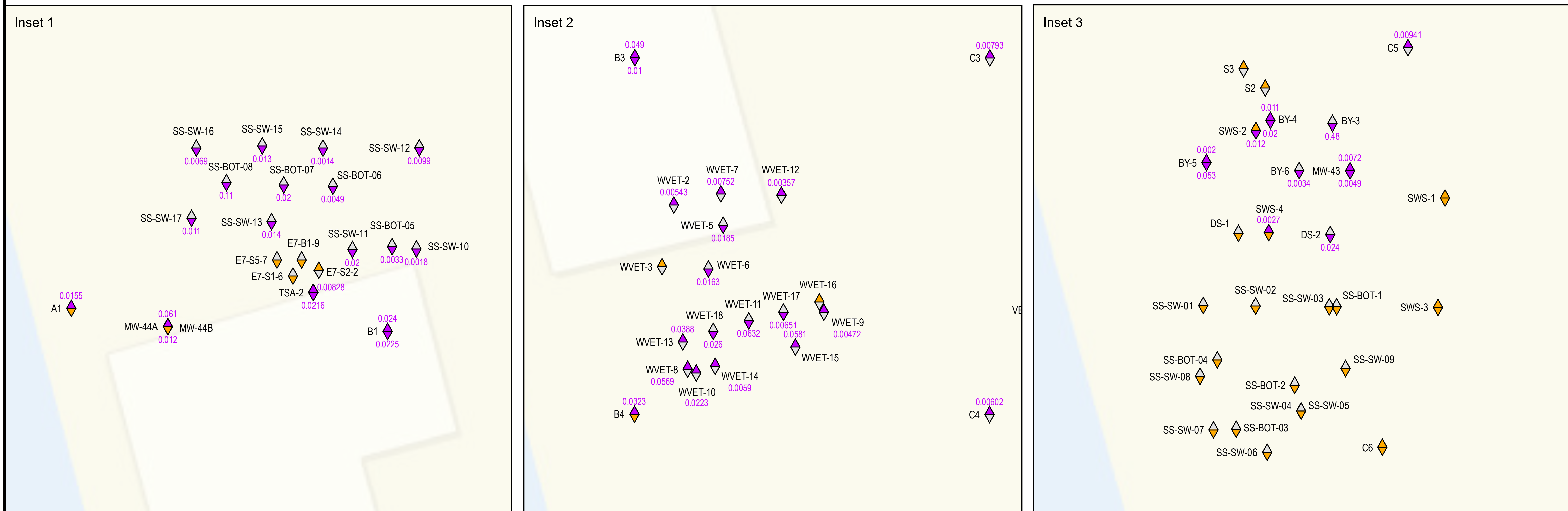
FIG. A-15a

Document Path: L:\Jobs\p8801\mxd\Soil_REV.mxd



LEGEND

Sample Location

Unsaturated / Saturated — Surface to 3 feet

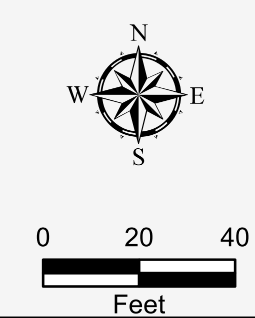
- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

EXAMPLE

WVET-2 0.00543

Sample Location is WVET-2. Sample analyzed and detected greater than screening level. Sample result is 0.00543 mg/kg for Unsaturated.

NOTE
Screening against project proposed cleanup level.
Trichloroethylene cleanup level in soil is 0.001 mg/kg.



8801 East Marginal Way South
Tukwila, Washington

TRICHLOROETHYLENE (TCE) IN SOIL

December 2020 | 21-1-12567-023

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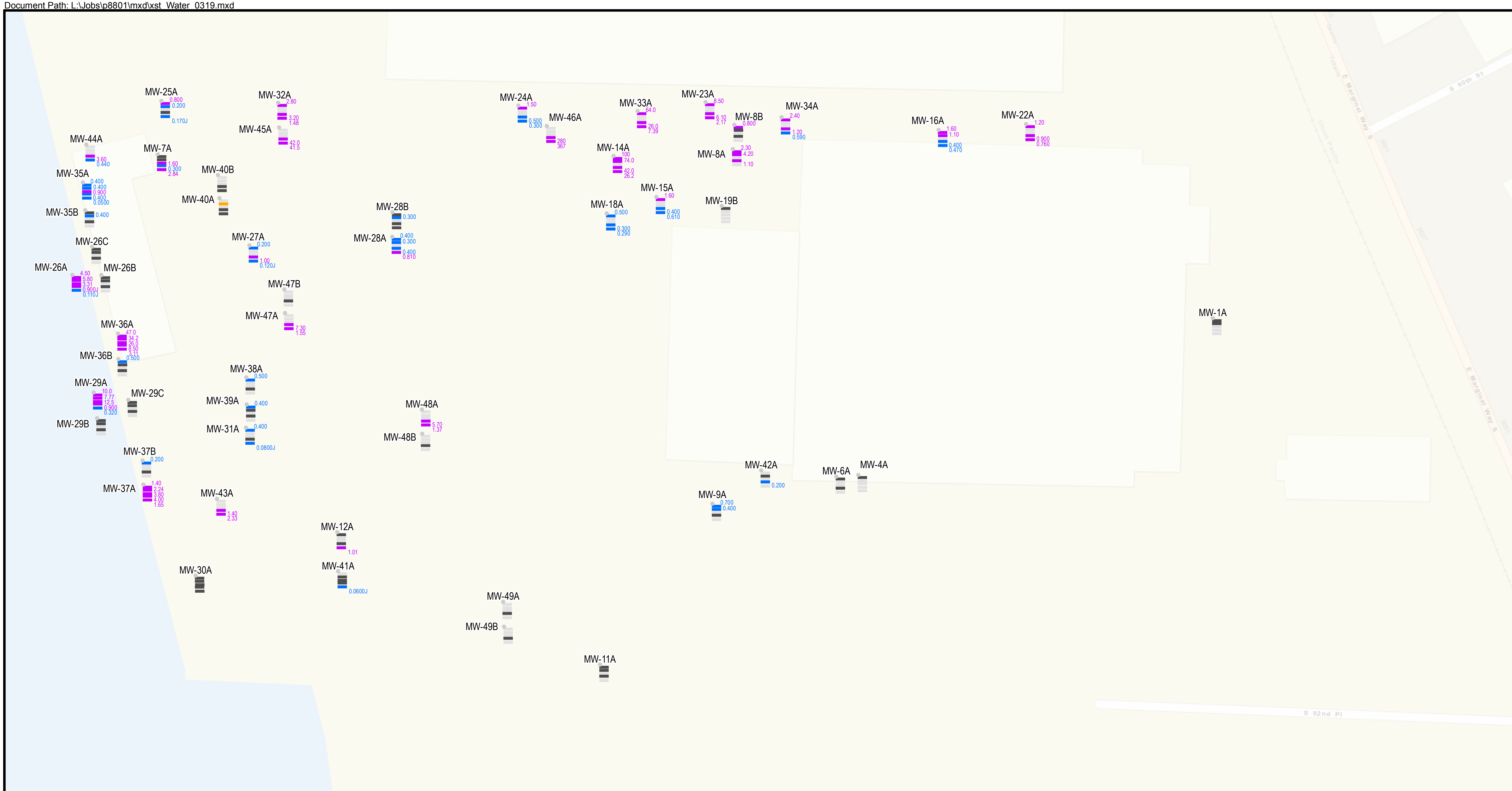
FIG. A-15b

Document Path: L:\Jobs\p8801\mxd\xst_Water_0319.mxd



LEGEND

Sample Location

2001-2003
2004-2006
2007-2009
2011-Fall
2019-Winter

Sample - Date

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

NOTE
Screening against project proposed cleanup level.
Trichloroethylene (TCE) celanup level in groundwater is 0.7 ug/L

N E S W

0 50 100
Feet

8801 East Marginal Way South
Tukwila, Washington

TRICHLOROETHYLENE (TCE) IN GROUNDWATER

December 2020 21-1-12567-023

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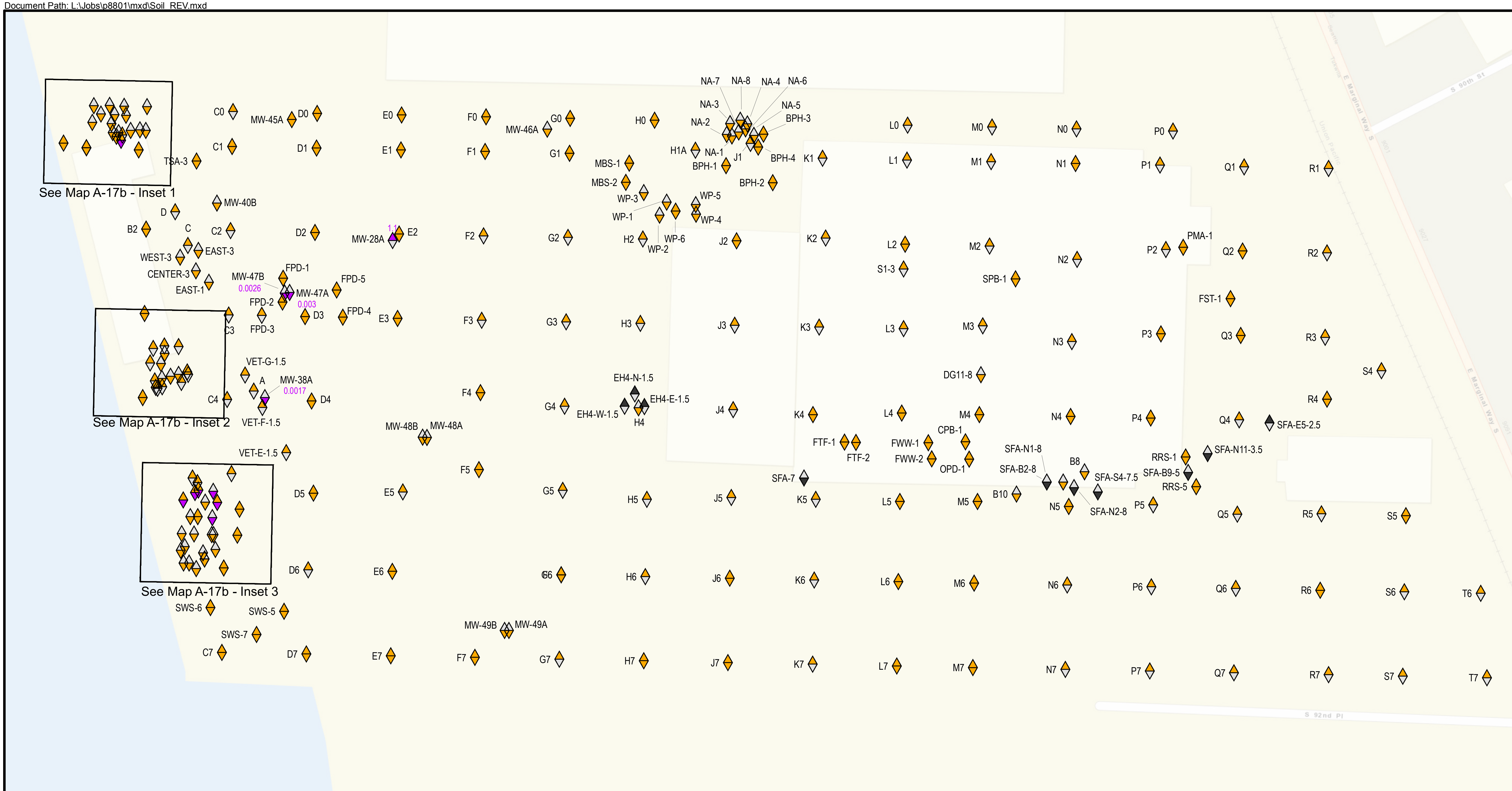
FIG. A-16

Document Path: L:\Jobs\p8801\mxd\Soil_REV.mxd



LEGEND

Sample Location

Unsaturated — Surface to 3 feet

Saturated

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

EXAMPLE

MW-28A 1.1

Sample Location is MW-28A.
Sample analyzed and detected greater than screening level.
Sample result is 1.1 mg/kg for Unsaturated.

NOTE
Screening against project proposed cleanup level.
Vinyl chloride cleanup level in soil is 0.001 mg/kg.

N E S W

0 50 100
Feet

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Tukwila, Washington

VINYL CHLORIDE IN SOIL

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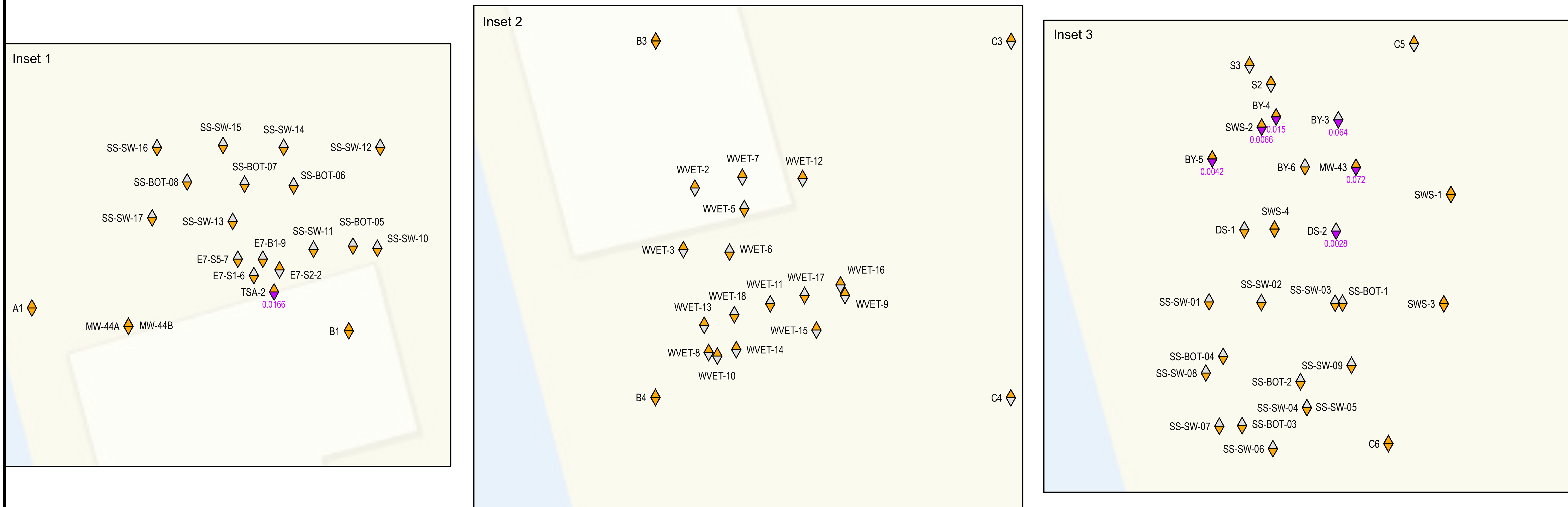
FIG. A-17a

Document Path: L:\Jobs\p8801\mxd\Soil_REV.mxd



LEGEND

Sample Location

Unsaturated | Surface to 3 feet
Saturated

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

EXAMPLE

BY-3

0.064

Sample Location is BY-3. Sample analyzed and detected greater than screening level. Sample result is 0.064 mg/kg for Saturated.

NOTE
Screening against project proposed cleanup level. Vinyl chloride cleanup level in soil is 0.001 mg/kg.

N W E S

0 20 40
Feet

8801 East Marginal Way South
Tukwila, Washington

VINYL CHLORIDE IN SOIL

December 2020 21-1-12567-023

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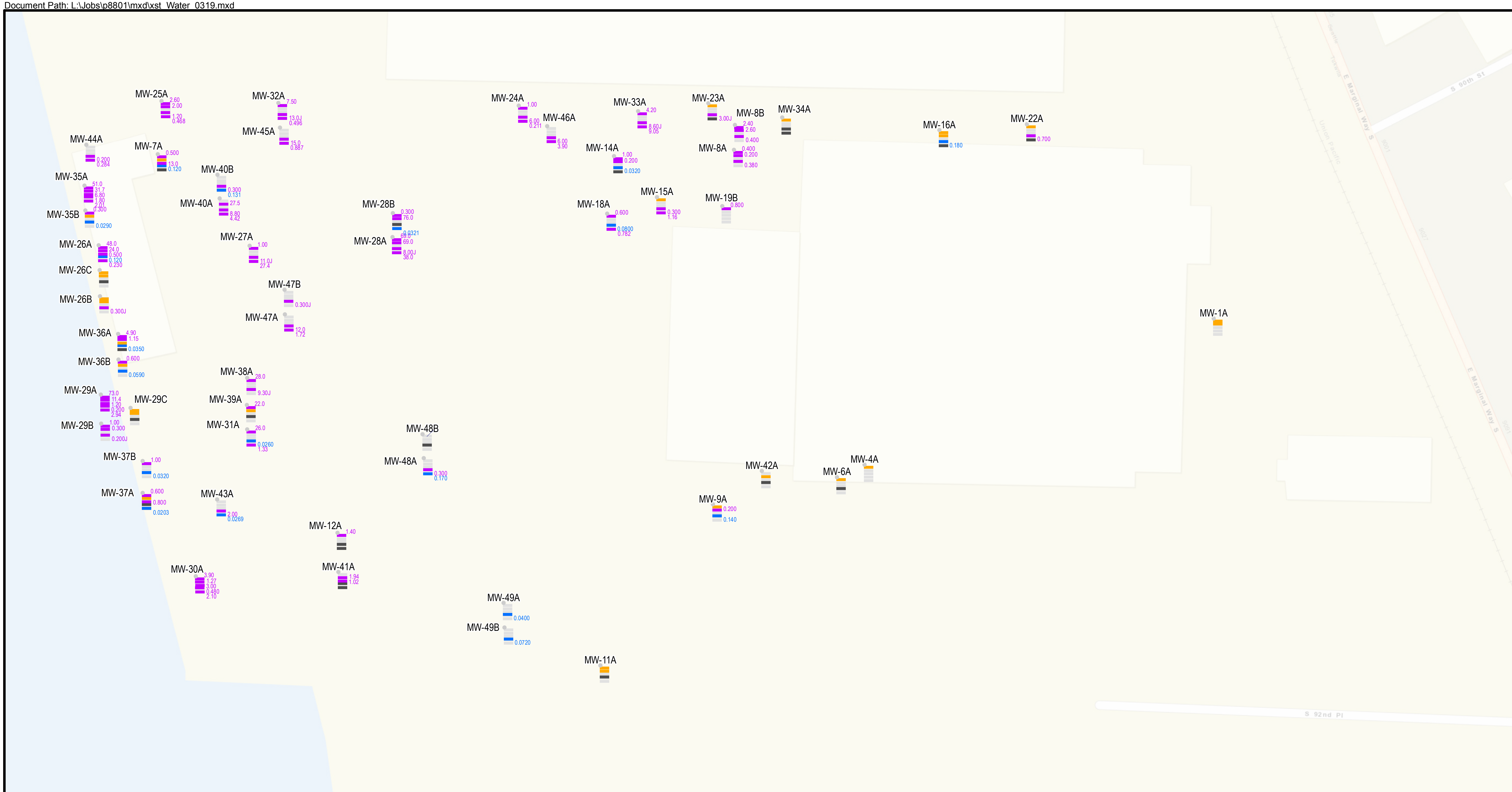
FIG. A-17b

Document Path: L:\Jobs\p8801\mxd\xst_Water_0319.mxd



LEGEND

Sample Location

2001-2003
2004-2006
2007-2009
2011-Fall
2019-Winter

Sample - Date

- Not Analyzed
- Analyzed - Not Detected
- Analyzed - Detected At or Below Screening Level
- Analyzed - Not Detected and Detection Limit Greater Than Screening Level
- Analyzed - Detected Greater Than Screening Level

NOTE
Screening against project proposed cleanup level.
Vinyl chloride cleanup level in groundwater is 0.18 ug/L.

N W E S

0 50 100
Feet

8801 East Marginal Way South
Tukwila, Washington

VINYL CHLORIDE IN GROUNDWATER

December 2020 21-1-12567-023

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FIG. A-18

APPENDIX B: TERRESTRIAL ECOLOGICAL EXPOSURE EVALUATION

Appendix B

Terrestrial Ecological Exposure Evaluation

8801 Shoreline Addendum - Post Remediation

Table 749-1
Simplified Terrestrial Ecological Evaluation – Exposure Analysis Procedure under WAC 173-340-7492(2)(a)(ii).[a]

Estimate the area of contiguous (connected) undeveloped land on the site or within 500 feet of any area of the site to the nearest 1/2 acre (1/4 acre if the area is less than 0.5 acre). "Undeveloped land" means land that is not covered by existing buildings, roads, paved areas or other barriers that will prevent wildlife from feeding on plants, earthworms, insects or other food in or on the soil.	
1) From the table below, find the number of points corresponding to the area and enter this number in the box to the right.	
Area (acres) — Points 0.25 or less — 4 0.5 — 5 1.0 — 6 1.5 — 7 2.0 — 8 2.5 — 9 3.0 — 10 3.5 — 11 4.0 or more — 12	8
2) Is this an industrial or commercial property? See WAC 173-340-7490(3)(c). If yes, enter a score of 3 in the box to the right. If no, enter a score of 1.	3
3) Enter a score in the box to the right for the habitat quality of the site, using the rating system shown below[b]. (High = 1, Intermediate = 2, Low = 3)	3
4) Is the undeveloped land likely to attract wildlife? If yes, enter a score of 1 in the box to the right. If no, enter a score of 2. See footnote c.	2
5) Are there any of the following soil contaminants present: Chlorinated dioxins/furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, pentachlorobenzene? If yes, enter a score of 1 in the box to the right. If no, enter a score of 4.	1
6) Add the numbers in the boxes on lines 2 through 5 and enter this number in the box to the right. If this number is larger than the number in the box on line 1, the simplified terrestrial ecological evaluation may be ended under WAC 173-340-7492 (2)(a)(ii).	9

Footnotes:

a It is expected that this habitat evaluation will be undertaken by an experienced field biologist. If this is not the case, enter a conservative score (1) for questions 3 and 4.

b **Habitat rating system.** Rate the quality of the habitat as high, intermediate or low based on your professional judgment as a field biologist. The following are suggested factors to consider in making this evaluation:
Low: Early successional vegetative stands; vegetation predominantly noxious, nonnative, exotic plant species or weeds. Areas severely disturbed by human activity, including intensively cultivated croplands. Areas isolated from other habitat used by wildlife.
High: Area is ecologically significant for one or more of the following reasons: Late-successional native plant communities present; relatively high species diversity; used by an uncommon or rare species; priority habitat (as defined by the Washington Department of Fish and Wildlife); part of a larger area of habitat where size or fragmentation may be important for the retention of some species.
Intermediate: Area does not rate as either high or low.

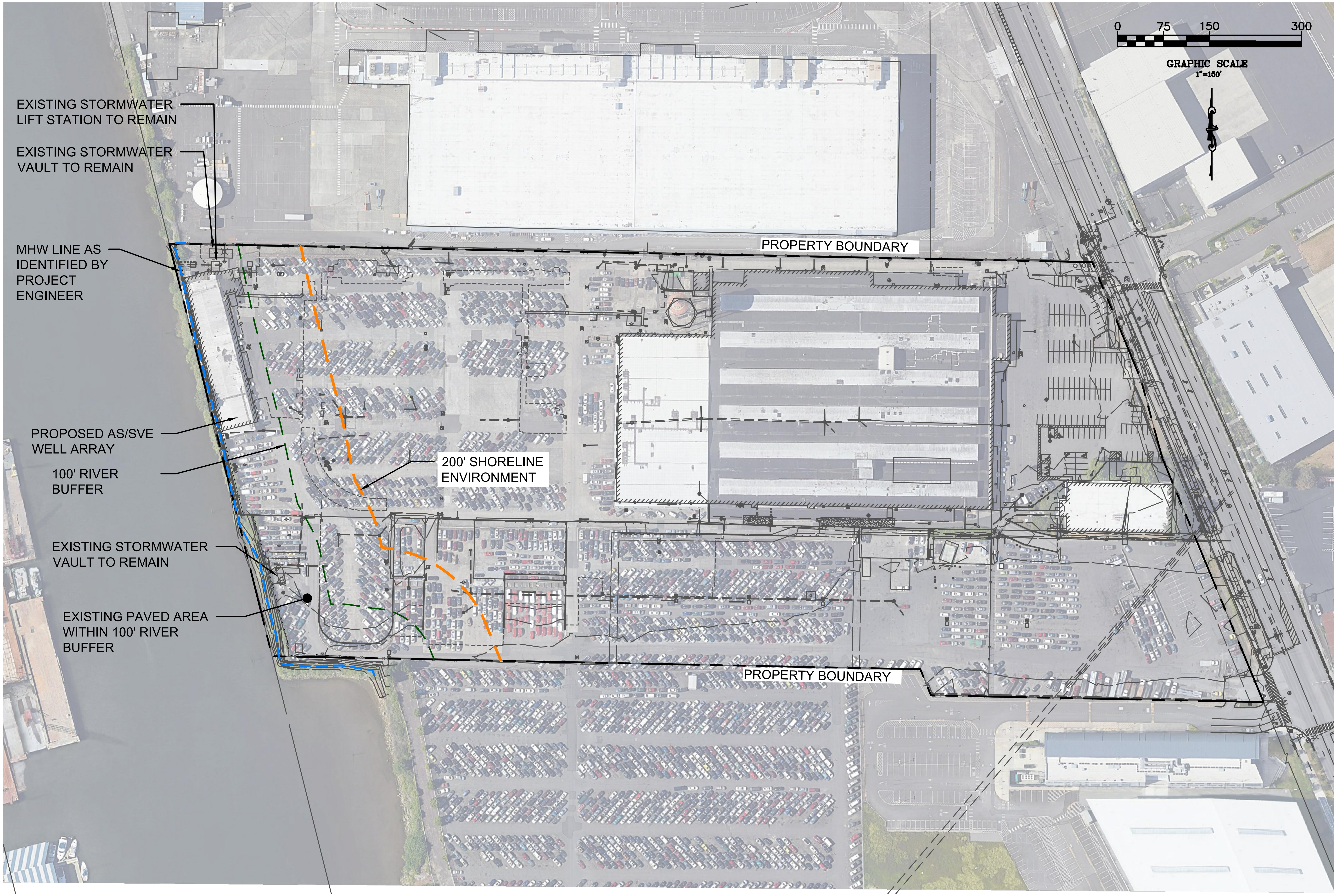
c Indicate "yes" if the area attracts wildlife or is likely to do so. Examples: Birds frequently visit the area to feed; evidence of high use by mammals (tracks, scat, etc.); habitat "island" in an industrial area; unusual features of an area that make it important for feeding animals; heavy use during seasonal migrations.

APPENDIX C: CLAY LINER MATERIAL SPECIFICATIONS AND PROPOSED PLANTING

Appendix C

Clay Cap Material Specifications and Proposed Planting Plan

CENTERPOINT TUKWILA - EXISTING CONDITIONS



SOURCES:

BARGHAUSEN CONSULTING ENGINEERS, INC.
18215 72ND AVENUE SOUTH
KENT, WA 98032
(425)251-6222
(425)251-8782 FAX
CIVIL ENGINEERING, LAND PLANNING, SURVEYING, ENVIRONMENTAL SERVICES

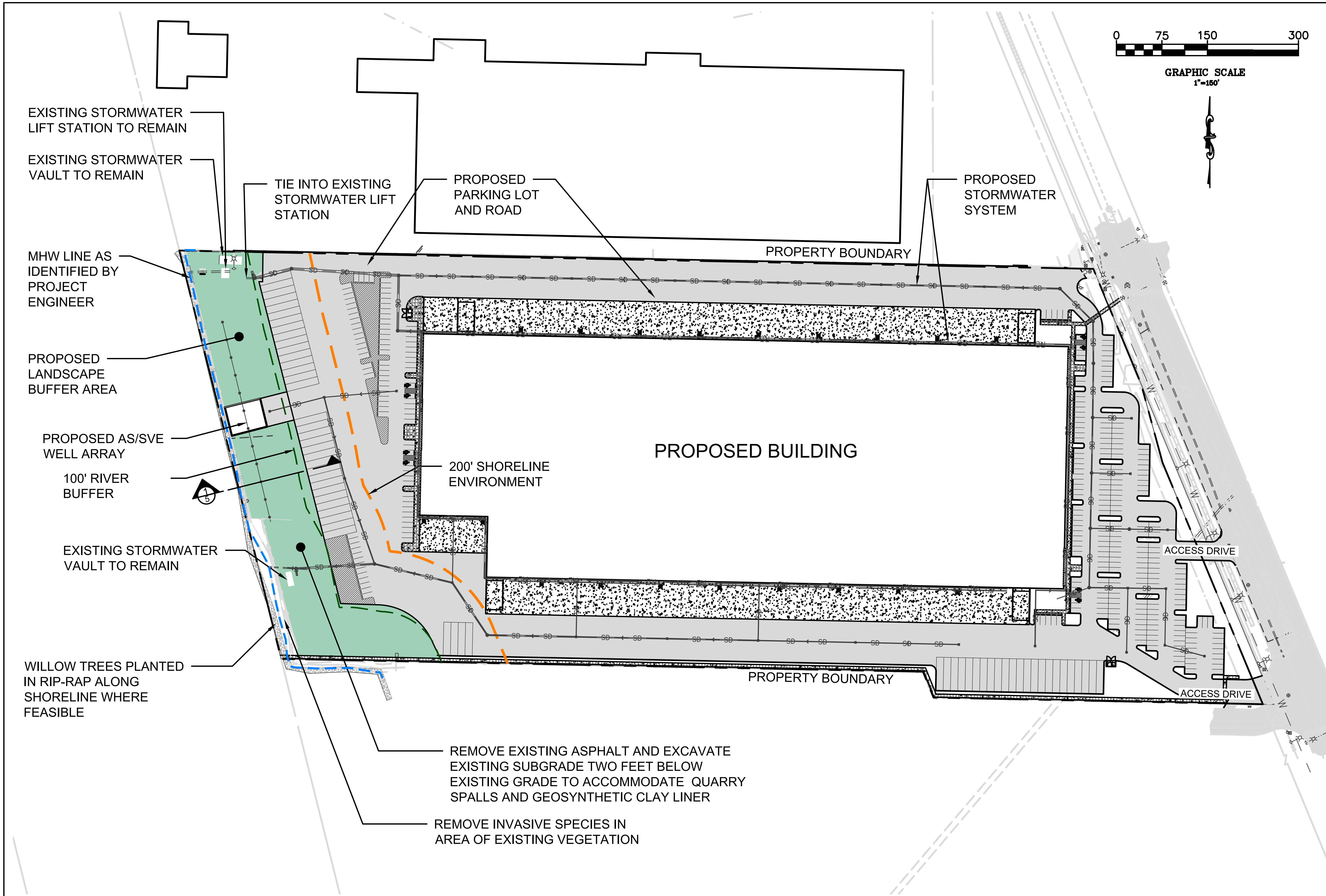
Soundview Consultants LLC
Environmental Assessment • Planning • Land Use Solutions
2907 HARBORVIEW DRIVE, SUITE D
GIG HARBOR, WASHINGTON 98335
P. 253.514.8952
F. 253.514.8954
WWW.SOUNDVIEWCONSULTANTS.COM

CENTERPOINT TUKWILA
8801 EAST MARGINAL WAY SOUTH
SEATTLE, WASHINGTON 98108

THE SE ¼ OF SECTION 33, TOWNSHIP 24N, RANGE 04E, W.M.

DATE: 10/29/2020
JOB: 1853.0001
BY: MW
SCALE: AS SHOWN
SHEET 1 OF 7

CENTERPOINT TUKWILA - PROPOSED PROJECT



SOURCES:

BARGHAUSEN CONSULTING ENGINEERS, INC.
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WWW.SOUNDVIEWCONSULTANTS.COM

CENTERPOINT TUKWILA
8801 EAST MARGINAL WAY SOUTH
SEATTLE, WASHINGTON 98108
THE SE ¼ OF SECTION 33, TOWNSHIP 24N, RANGE 04E, W.M.

DATE:	10/29/2020
JOB:	1853.0001
BY:	MW
SCALE:	AS SHOWN
SHEET	2 OF 7

CENTERPOINT TUKWILA - PLANTING PLAN VIEWPORTS 1 & 2

VIEWPORT 1

0 15 30 60
GRAPHIC SCALE
1"= 30'

VIEWPORT 2

SCALE: 1"=30'

NOTE:
- SEE SHEET 4 FOR PLANT LIST AND SYMBOLS AND SHEET 5 FOR FULL PLANT SCHEDULE WITH QUANTITIES.
- LANDSCAPING WILL INCORPORATE CONTINUED ACCESS FOR AS/SVE SYSTEM.

SOURCES:
BARGHAUSEN CONSULTING ENGINEERS, INC.
18215 72ND AVENUE SOUTH
KENT, WA 98032
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CIVIL ENGINEERING, LAND PLANNING, SURVEYING, ENVIRONMENTAL SERVICES

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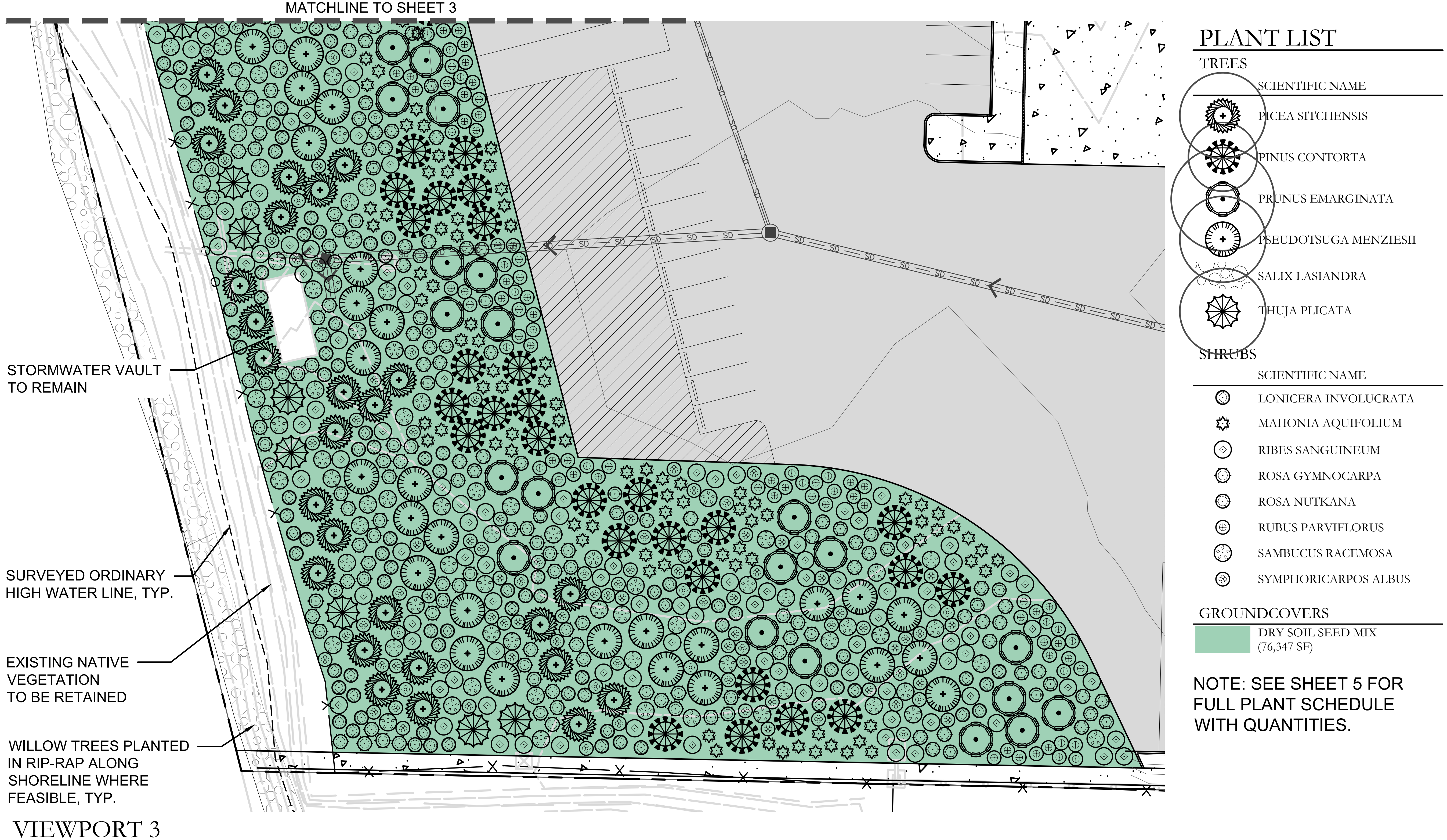
CENTERPOINT TUKWILA
8801 EAST MARGINAL WAY SOUTH
SEATTLE, WASHINGTON 98108
THE SE ¼ OF SECTION 33, TOWNSHIP 24N, RANGE 04E, W.M.

DATE: 10/29/2020
JOB: 1853.0001
BY: MW
SCALE: AS SHOWN
SHEET 3 OF 7

CENTERPOINT TUKWILA - PLANTING PLAN VIEWPORT 3



NOTE: SEE SHEET 5 FOR FULL PLANT SCHEDULE WITH QUANTITIES.

VIEWPORT 3

0 15 30 60

GRAPHIC SCALE
1"= 30'

SOURCES:

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(425)251-6222
(425)251-8782 FAX
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CENTERPOINT TUKWILA
8801 EAST MARGINAL WAY SOUTH
SEATTLE, WASHINGTON 98108

THE SE ¼ OF SECTION 33, TOWNSHIP 24N, RANGE 04E, W.M.

DATE: 10/29/2020

JOB: 1853.0001

BY: MW

SCALE: AS SHOWN

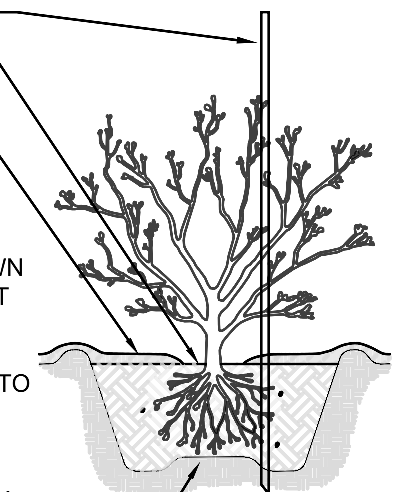
CENTERPOINT TUKWILA - PLANT SCHEDULE & DETAILS

PLANT SCHEDULE

Plant Name			50% trees, 50% shrubs, 100% coverage				
Scientific	**Common**	**Plant Status**	**Shoreline Buffer Area Plant Quantities**	**Spacing**	**Size**	**Condition**	**Planting Area**
Trees		Area:	74,087				
Picea sitchensis	Sitka spruce	FAC	75	**10 - 12 ft**	**6 - 8 ft**	**Container**	**Moist**
Pinus contorta	Shore pine	FAC	75	**10 - 12 ft**	**6 - 8 ft**	**Container**	**Dry/Moist**
Prunus emarginata	Bitter cherry	FACU	46	**10 - 12 ft**	**6 - 8 ft**	**Container**	**Dry**
Pseudotsuga menziesii	Douglas fir	FACU	55	**10 - 12 ft**	**6 - 8 ft**	**Container**	**Dry**
*Salix lasiandra**	Pacific willow*	FACW	140	**10 - 12 ft**	**3 - 4 ft**	**Stakes***	**Riverbank***
Thuja plicata	Western red cedar	FAC	46	**10 - 12 ft**	**6 - 8 ft**	**Container**	**Dry/Moist**
	Total		**437**			*** Plant 2 stakes per symbol**	
Shrubs/Herbaceous Plants							
Lonicera involucrata	Black twinberry	FAC	210	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Moist/Wet**
Mahonia aquifolium	Tall Oregon grape	FACU	210	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry**
Ribes sanguineum	Red-flowering currant	FACU	230	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry**
Rosa gymnocarpa	Bald hip rose	FACU	230	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry/Moist**
Rosa nutkana	Nootka rose	FAC	180	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry/Moist**
Rubus parviflorus	Thimbleberry	FACU	210	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry**
Sambucus racemosa	Red elderberry	FACU	210	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry**
Symphoricarpos albus	Snowberry	FACU	230	**4 - 5 ft**	**3 - 5 ft**	**Container**	**Dry**
	Total		**1,710**				
Dry Soil Seed Mix 30 lbs/acre (all disturbed buffer areas)			**% by wt.**				
Agrostis exarata	Spike bentgrass	FACW	10				
Deschampsia cespitosa	Tufted hairgrass	FACW	10				
Deschampsia danthonioides	Annual hairgrass	FACW	10				
Deschampsia elongata	Slender hairgrass	FAC	10				
Elymus glaucus	Blue wildrye	FACU	25				
Hordeum brachyantherum	Meadow barley	FACW	25				
Lupinus polyphyllus	Streamside lupine	FAC	10				
Total			**100**				
1 - Scientific names and species identification taken from Flora of the Pacific Northwest, 2nd Edition (Hitchcock and Cronquist, Ed. by Giblin, Ledger, Zika, and Olmstead, 2018).							
2 - Over-sized or container plants are suitable for replacement pending project biologist's approval.							
3 - Final plans are subject to regulatory approval.							
4 - All disturbed buffer areas to receive Dry Soil Seed Mix.							
5 - Planting density adjustments in some locations may be appropriate based on retention of existing native vegetation and density of invasive species.							
* - Plant two Pacific willow stakes per symbol.							

SHRUB PLANTING DETAIL

NOT TO SCALE

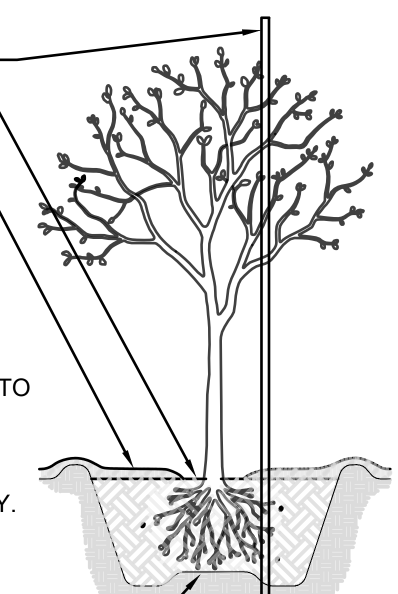


NOTES:

1. PLANT SHRUBS OF THE SAME SPECIES IN GROUPS OF 3 to 9 AS APPROPRIATE, OR AS SHOWN ON PLAN. AVOID INSTALLING PLANTS IN STRAIGHT LINES TO ACHIEVE A NATURAL-LOOKING LAYOUT.
2. EXCAVATE PIT TO FULL DEPTH OF ROOT MASS AND 2 X ROOT MASS DIAMETER. SPREAD ROOTS TO FULL WIDTH OF CANOPY. SCARIFY SIDES OF PIT.
3. MIDWAY THROUGH PLANTING ADD AGROFORM TABLET AND WATER THOROUGHLY.
4. BACKFILL TO BE COMPACTED USING WATER ONLY.
5. WATER IMMEDIATELY AFTER INSTALLATION.

TREE PLANTING DETAIL

NOT TO SCALE



NOTES:

1. PLANT TREES AS INDICATED ON PLAN. AVOID INSTALLING PLANTS IN STRAIGHT LINES.
2. EXCAVATE PIT TO FULL DEPTH OF ROOT MASS AND 2 X ROOT MASS DIAMETER. SPREAD ROOTS TO FULL WIDTH OF CANOPY. SCARIFY SIDES OF PIT.
3. MIDWAY THROUGH PLANTING ADD AGROFORM TABLET AND WATER THOROUGHLY.
4. BACKFILL TO BE COMPACTED USING WATER ONLY.
5. WATER IMMEDIATELY AFTER INSTALLATION.

SOURCES:
BARGHAUSEN CONSULTING ENGINEERS, INC.
18215 72ND AVENUE SOUTH
KENT, WA 98032
(425)251-6222
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CIVIL ENGINEERING, LAND PLANNING, SURVEYING, ENVIRONMENTAL SERVICES

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2907 HARBORVIEW DRIVE, SUITE D
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WWW.SOUNDVIEWCONSULTANTS.COM

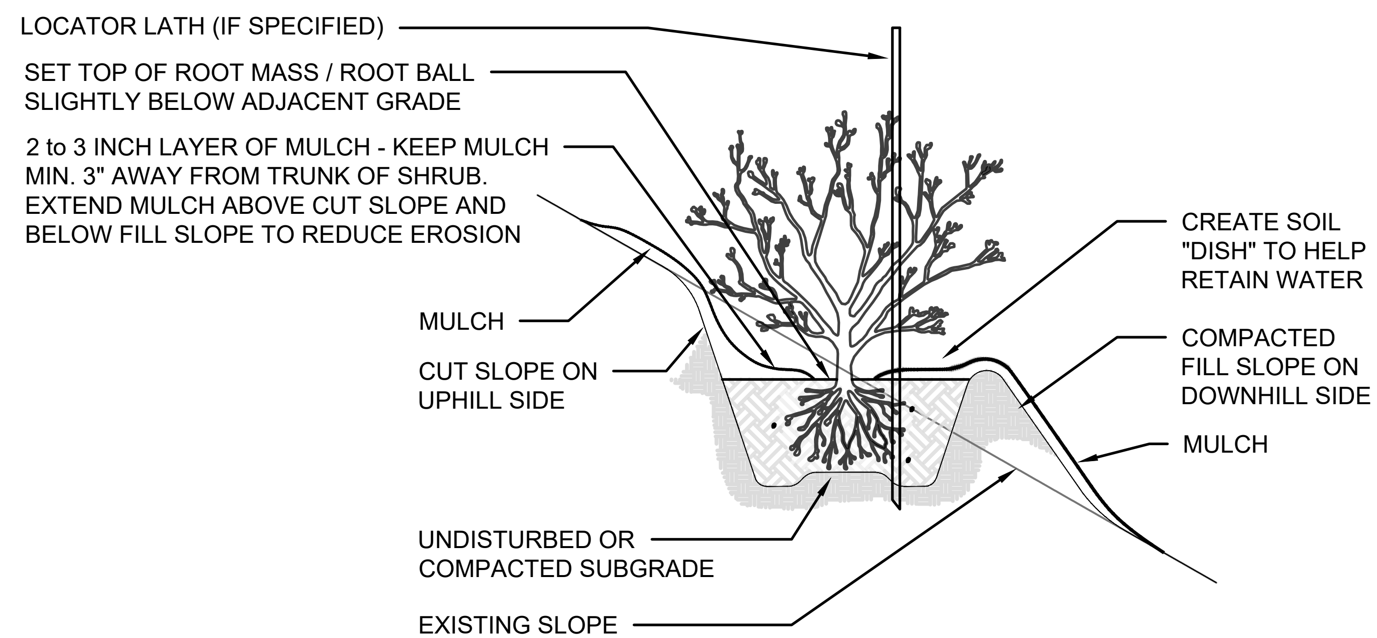
CENTERPOINT TUKWILA
8801 EAST MARGINAL WAY SOUTH
SEATTLE, WASHINGTON 98108
THE SE ¼ OF SECTION 33, TOWNSHIP 24N, RANGE 04E, W.M.

DATE: 10/29/2020
JOB: 1853.0001
BY: MW
SCALE: AS SHOWN
SHEET 5 OF 7

CENTERPOINT TUKWILA - PLANTING DETAILS

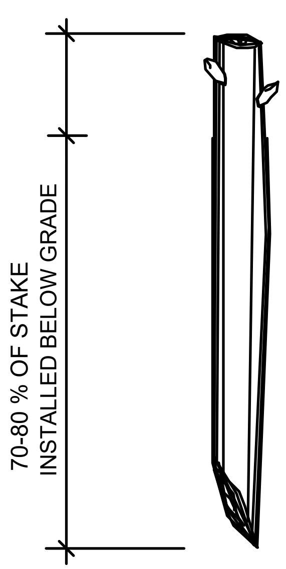
TREE AND SHRUB PLANTING ON STEEP SLOPE

NOT TO SCALE



LIVE STAKE PLANTING DETAIL

NOT TO SCALE



STORAGE OF LIVE STAKES

ALL WOODY PLANT CUTTINGS COLLECTED MORE THAN 12 HR PRIOR TO INSTALLATION, MUST BE CAREFULLY BOUND, SECURED, AND STORED OUT OF DIRECT SUNLIGHT AND SUBMERGED IN CLEAN FRESH WATER FOR A PERIOD OF UP TO TWO WEEKS.

OUTDOOR TEMPERATURES MUST BE LESS THAN 50 DEGREES F AND TEMPERATURE INDOORS AND IN STORAGE CONTAINERS MUST BE BETWEEN 34 AND 50 DEGREES F.

IF THE LIVE STAKES CANNOT BE INSTALLED DURING THE DORMANT SEASON, CUT DURING THE DORMANT SEASON AND HOLD IN COLD STORAGE AT TEMPERATURES BETWEEN 33 AND 39 DEGREES F FOR UP TO 2 MONTHS.

NOTES:

1. LIVE STAKES TO BE 1 TO 2 INCH DIAMETER 24 TO 32 INCHES LENGTH.
2. USE 1/2 INCH DIAMETER REBAR OR ROCK BAR TO MAKE PILOT HOLE.
3. INSTALL LIVE STAKES TAPER END DOWN WITH BUDS POINTED UP.
4. MINIMUM TWO BUDS ABOVE GRADE.
5. SET LIVE STAKES WITH DEAD-BLOW HAMMER.
6. WATER IMMEDIATELY AFTER INSTALLATION.

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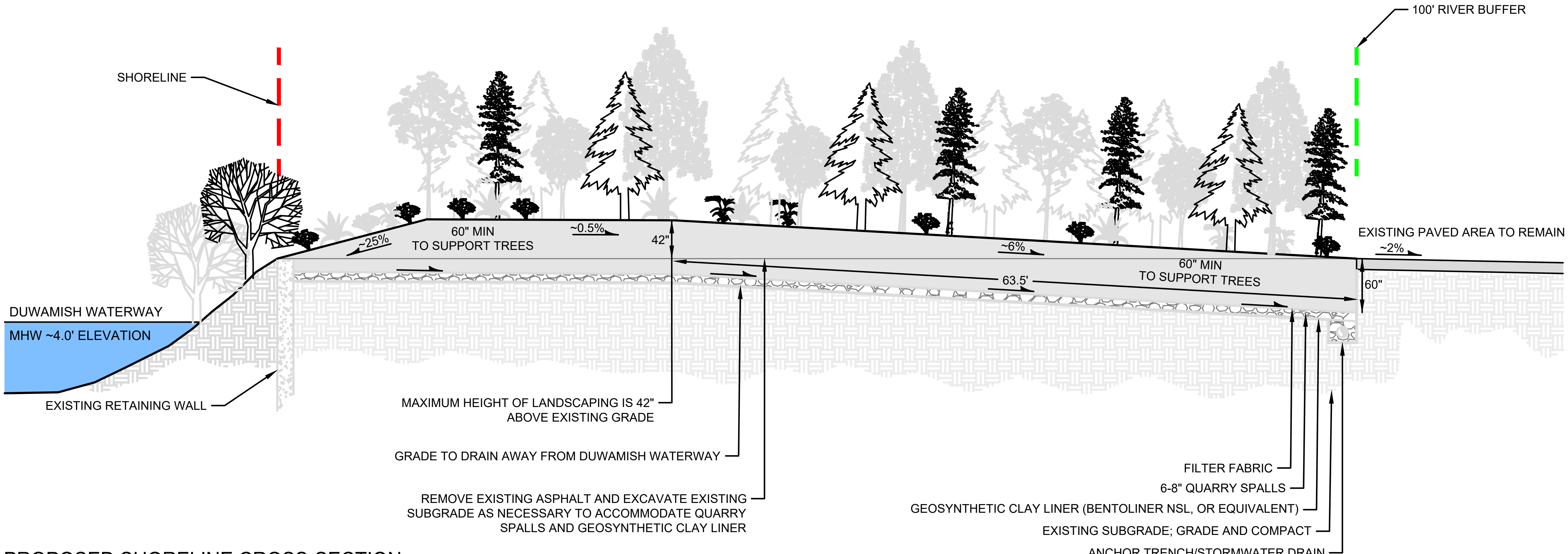
DATE:	10/29/2020
JOB:	1853.0001
BY:	MW
SCALE:	AS SHOWN
SHEET	6 OF 7

CENTERPOINT TUKWILA - PROPOSED SHORELINE CROSS-SECTION



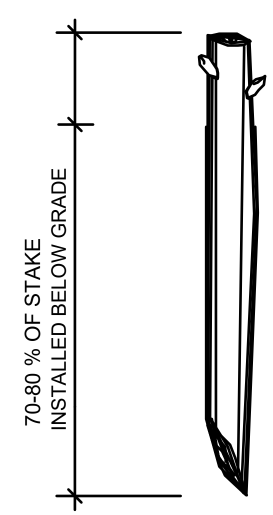
PROPOSED SHORELINE CROSS-SECTION

10 0 10

SCALE IN FEET

LIVE STAKE PLANTING DETAIL

NOT TO SCALE



STORAGE OF LIVE STAKES

ALL WOODY PLANT CUTTINGS COLLECTED MORE THAN 12 HR PRIOR TO INSTALLATION, MUST BE CAREFULLY BOUND, SECURED, AND STORED OUT OF DIRECT SUNLIGHT AND SUBMERGED IN CLEAN FRESH WATER FOR A PERIOD OF UP TO TWO WEEKS.

OUTDOOR TEMPERATURES MUST BE LESS THAN 50 DEGREES F AND TEMPERATURE INDOORS AND IN STORAGE CONTAINERS MUST BE BETWEEN 34 AND 50 DEGREES F.

IF THE LIVE STAKES CANNOT BE INSTALLED DURING THE DORMANT SEASON, CUT DURING THE DORMANT SEASON AND HOLD IN COLD STORAGE AT TEMPERATURES BETWEEN 33 AND 39 DEGREES F FOR UP TO 2 MONTHS.

NOTES:

1. LIVE STAKES TO BE 1 TO 2 INCH DIAMETER 24 TO 32 INCHES LENGTH.
2. USE 1/2 INCH DIAMETER REBAR OR ROCK BAR TO MAKE PILOT HOLE.
3. INSTALL LIVE STAKES TAPER END DOWN WITH BUDS POINTED UP.
4. MINIMUM TWO BUDS ABOVE GRADE.
5. SET LIVE STAKES WITH DEAD-BLOW HAMMER.
6. WATER IMMEDIATELY AFTER INSTALLATION.

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BY: MW
SCALE: AS SHOWN
SHEET 7 OF 7

PRODUCT DATA SHEET

GSE BentoLiner NSL Geosynthetic Clay Liner

GSE BentoLiner "NSL" is a needle-punched reinforced composite geosynthetic clay liner (GCL) comprised of a uniform layer of granular sodium bentonite encapsulated between a woven and a nonwoven geotextile. The product is intended for moderate to steep slopes and moderate to high load applications where increased internal shear strength is required.

[*]

AT THE CORE:
This composite clay liner is intended for moderate to steep slopes and moderate to high load applications where increased internal shear strength is required.

Product Specifications

Tested Property	Test Method	Frequency	Value
Geotextile Property			
Cap Nonwoven, Mass/Unit Area	ASTM D 5261	1/200,000 ft^2	6.0 oz/yd^2 MARV[1]
Carrier Woven, Mass/Unit Area	ASTM D 5261	1/200,000 ft^2	3.1 oz/yd^2 MARV
Bentonite Property			
Swell Index	ASTM D 5890	1/100,000 lb	24 ml/2 g min
Moisture Content	ASTM D 4643	1/100,000 lb	12% max
Fluid Loss	ASTM D 5891	1/100,000 lb	18 ml max
Finished GCL Property			
Bentonite, Mass/Unit Area[2]	ASTM D 5993	1/40,000 ft^2	0.75 lb/ft^2 MARV
Tensile Strength[3]	ASTM D 6768	1/40,000 ft^2	30 lb/in MARV
Peel Strength	ASTM D 6496 ASTM D 4632[4]	1/40,000 ft^2	3.5 lb/in MARV 21 lb MARV
Hydraulic Conductivity[5]	ASTM D 5887	1/Week	5×10^{-9} cm/sec max
Index Flux[5]	ASTM D 5887	1/Week	1×10^{-8} $m^3/m^2/sec$ max
Internal Shear Strength[6]	ASTM D 6243	Periodically	500 psf Typical
TYPICAL ROLL DIMENSIONS			
Width x Length[7]	Typical	Every Roll	15.5 ft x 150 ft
Area per Roll	Typical	Every Roll	2,325 ft^2
Packaged Weight	Typical	Every Roll	2,600 lb

NOTES:
- [1]Minimum Average Roll Value.
- [2]At 0% moisture content.
- [3]Tested in machine direction.
- [4]Modified ASTM D 4632 to use a 4 in wide grip. The maximum peak of five specimens averaged in machine direction.
- [5]Deaired, deionized water @ 5 psi maximum effective confining stress and 2 psi head pressure.
- [6]Typical peak value for specimen hydrated for 24 hours and sheared under a 200 psf normal stress.
- [7]Roll widths and lengths have a tolerance of ±1%.

APPENDIX D: DISPROPORTIONATE COST ANALYSES TABLES AND GRAPHS

Appendix D

Disproportionate Cost Analyses Tables and Graphs

CONTENTS

Table D-1 - Evaluation of Threshold Requirements - Shoreline Alternatives

Preliminary Alternative	Protects Human Health and the Environment	Complies with Cleanup Standards	Complies with Applicable State and Federal Laws	Provides for Compliance Monitoring	Carried Forward
No action.	No	No	No	Yes	No
Excavate soil above RELs and do not replace cap.	No	No	No	Yes	No
Excavate to 3 feet bgs, install clay liner, and build vegetated shoreline above clay cap.	No	No	No	Yes	No
Excavate all soil above CULs* to a depth of 15 feet bgs, backfill and vegetate shoreline.	Yes	Yes	Yes	Yes	Yes
Remove surface paving, subbase, and unsaturated soil to a depth of 2 feet bgs; excavate all unsaturated soil above CULs* to a depth of 8 feet bgs; excavate accessible soil above REL (three areas) including saturated soil; backfill to base of former subbase; cap remaining shoreline with clay layer and drainage layer; and build vegetated shoreline above clay layer.	Yes	Yes	Yes	Yes	Yes
Remove surface paving, subbase, and unsaturated soil to a depth of 2 feet bgs; excavate accessible soil above REL* (three areas) removing both unsaturated and saturated soil; backfill to base of former subbase; cap remaining shoreline with clay layer and drainage layer; and build vegetated shoreline above clay layer.	Yes	Yes	Yes	Yes	Yes

NOTES:

* Except gasoline area in northwest (excavation addressed in groundwater remedy).

bgs = below ground surface; CUL = cleanup level; REL = remediation level

Table D-2 - Evaluation of Other Requirements - Shoreline Alternatives

Alternative No.	1 - Excavate soil above CULs and vegetate shoreline	2 - Excavate unsaturated soil above CULs*, excavate soil above REL, cap remaining shoreline with clay layer, and build vegetated shoreline above clay layer	3 - Excavate soil above REL*, cap remaining shoreline with clay layer, and build vegetated shoreline above clay layer
Brief Description	Excavate any soil within the 100-foot buffer area that exceeds a CUL except gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Backfill to former surface grade and vegetate the shoreline with plants and trees within the 100-foot buffer zone.	Remove existing pavement, subbase, and soil to a depth of 2 feet bgs. Excavate any unsaturated soil within the 100-foot buffer area that exceeds a CUL except gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Excavate accessible saturated soil within the 100-foot buffer area that exceeds a REL (three areas) including saturated soil. Backfill to 2 feet below former grade. Place a clay layer that prevents infiltration with a drain layer above that restricts root penetration and vegetate shoreline with plants and trees above.	Remove existing pavement, subbase, and soil to a depth of 2 feet bgs. Excavate accessible soil within the 100-foot buffer area that exceeds a REL (three areas) including saturated soil, excluding the gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Backfill to 2 feet below former grade. Place a clay layer that prevents infiltration with a drain layer above that restricts root penetration and vegetate shoreline with plants and trees above.
Considers public concerns?			
Considers public concerns?	Yes	Yes	Yes
Reasonable restoration timeframe? (WAC 173-340-360(4))			
Estimated restoration time frame (years)	1	10	10
Toxicity of COCs	High Toxic COCs, including PCBs and cPAHs, are eliminated	High Toxic COCs, including PCBs and cPAHs, are reduced to protective levels	High Toxic COCs, including PCBs and cPAHs, are reduced to protective levels
Risk to human health and environment during remedy	Moderate Workers will have moderate exposure	Workers will have moderate exposure	Moderate Workers will have moderate exposure
Has natural attenuation been documented to occur on site?	Not applicable Not applicable to this alternative	Not applicable Not applicable to this alternative	Not applicable Not applicable to this alternative
Practical to achieve shorter restoration timeframe? (includes consideration of natural attenuation)	Yes Excavation of soil exceeding CUL will have a short restoration timeframe.	Yes Excavation of soil exceeding CULs is expected to be faster, but timeframe still reasonable.	Yes Excavation of soil exceeding CULs is expected to be faster, but timeframe still reasonable.
Consistent with current use of site, surrounding area, and resources?	Yes Property is currently vacant. Activities will not affect surrounding businesses.	Yes Property is currently vacant. Activities will not affect surrounding businesses.	Yes Property is currently vacant. Activities will not affect surrounding businesses.
Consistent with planned future use of site, surrounding area, and resources?	Yes Planned future developments take shoreline buffer into account. Activities will not affect surrounding businesses.	Yes Planned future developments take shoreline buffer into account. Activities will not affect surrounding businesses.	Yes Planned future developments take shoreline buffer into account. Activities will not affect surrounding businesses.
Availability of alternate water supply	Not applicable Groundwater is not potable and will not be used	Not applicable Groundwater is not potable and will not be used	Not applicable Groundwater is not potable and will not be used
Effectiveness and reliability of institutional controls	Not applicable No institutional controls	High Maintain clay layer and drain	High Maintain clay layer and drain
Ability to monitor and control chemical migration from site	Not applicable No impacts off-site	Yes Maintain clay cap and drain	Yes Maintain clay cap and drain

Table D-2 - Evaluation of Other Requirements - Shoreline Alternatives

Alternative No.		1 - Excavate soil above CULs and vegetate shoreline	2 - Excavate unsaturated soil above CULs*, excavate soil above REL, cap remaining shoreline with clay layer, and build vegetated shoreline above clay layer	3 - Excavate soil above REL*, cap remaining shoreline with clay layer, and build vegetated shoreline above clay layer
Brief Description		Excavate any soil within the 100-foot buffer area that exceeds a CUL except gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Backfill to former surface grade and vegetate the shoreline with plants and trees within the 100-foot buffer zone.	Remove existing pavement, subbase, and soil to a depth of 2 feet bgs. Excavate any unsaturated soil within the 100-foot buffer area that exceeds a CUL except gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Excavate accessible saturated soil within the 100-foot buffer area that exceeds a REL (three areas) including saturated soil. Backfill to 2 feet below former grade. Place a clay layer that prevents infiltration with a drain layer above that restricts root penetration and vegetate shoreline with plants and trees above.	Remove existing pavement, subbase, and soil to a depth of 2 feet bgs. Excavate accessible soil within the 100-foot buffer area that exceeds a REL (three areas) including saturated soil, excluding the gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Backfill to 2 feet below former grade. Place a clay layer that prevents infiltration with a drain layer above that restricts root penetration and vegetate shoreline with plants and trees above.
Permanent to maximum extent practicable? (disproportionate cost analysis, WAC 173-340-360(3))				
Benefit evaluation				
Overall protectiveness	30%	10 Contamination exceeding CULs removed (99%)	8 Many contaminants removed (similar to Alternative 3 + some)	8 Large mass of the contamination is removed and only percentages less mass of COCs than Alternative 2.
Permanence	20%	10 Contamination exceeding CULs removed	8 Removal of contaminants above the REL removes much of the contamination. Additional contaminant removal is added by removing unsaturated soil with contaminants above the CULs; the incremental COC removal though is minimal. Contamination exceeding CULs that remains on site are capped and are not mobilized. Some contaminants naturally attenuate, others do not.	7 Contamination exceeding RELs removed. Contamination exceeding CULs that remain on site are capped and are not mobilized. Some contaminants naturally attenuate, others do not.
Effectiveness over long term	20%	10 Contaminated materials are removed from the site	8 Contaminated materials with higher concentrations are removed from site. Residual contamination is capped.	8 Contaminated materials with higher concentrations are removed from site. Residual contamination is capped.
Management of short-term risks	10%	2 Extensive excavation will potentially expose workers	4 Extensive excavation will potentially expose workers	6 Limited excavation will potentially expose workers, less excavation is easier to control
Technical and administrative implementability	10%	2 Extensive excavation and confirmation sampling along shoreline with utilities is complex. Also, excavating below water table is difficult but proven method exists.	4 Extensive excavation and confirmation sampling along shoreline with utilities is complex. Also, excavating below water table is difficult, but proven method exists.	8 Three excavation areas with well-defined extent based on previous sampling. Also, excavating below water table is difficult, but proven method exists.
Consideration of public concerns	10%	4 Visible impacts would be seen along the shoreline over a long period of time. A large amount of truck traffic would impact roadways. However, the surrounding area is industrial.	6 Visible impacts would be seen along the shoreline over a moderate period of time. A moderate amount of truck traffic would impact roadways. However, the surrounding area is industrial.	8 Visible impacts would be seen in a restricted area of the shoreline over a much shorter period of time. A lesser amount of truck traffic would impact roadways. However, the surrounding area is industrial.

Table D-2 - Evaluation of Other Requirements - Shoreline Alternatives

Alternative No.	1 - Excavate soil above CULs and vegetate shoreline	2 - Excavate unsaturated soil above CULs*, excavate soil above REL, cap remaining shoreline with clay layer, and build vegetated shoreline above clay layer	3 - Excavate soil above REL*, cap remaining shoreline with clay layer, and build vegetated shoreline above clay layer
Brief Description	Excavate any soil within the 100-foot buffer area that exceeds a CUL except gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Backfill to former surface grade and vegetate the shoreline with plants and trees within the 100-foot buffer zone.	Remove existing pavement, subbase, and soil to a depth of 2 feet bgs. Excavate any unsaturated soil within the 100-foot buffer area that exceeds a CUL except gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Excavate accessible saturated soil within the 100-foot buffer area that exceeds a REL (three areas) including saturated soil. Backfill to 2 feet below former grade. Place a clay layer that prevents infiltration with a drain layer above that restricts root penetration and vegetate shoreline with plants and trees above.	Remove existing pavement, subbase, and soil to a depth of 2 feet bgs. Excavate accessible soil within the 100-foot buffer area that exceeds a REL (three areas) including saturated soil, excluding the gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Backfill to 2 feet below former grade. Place a clay layer that prevents infiltration with a drain layer above that restricts root penetration and vegetate shoreline with plants and trees above.
Overall weighted benefit score 100%	7.8	7.0	7.6
Cost evaluation ($M)			
Initial capital cost to construct	$11.66	$6.28	$2.80
Annual O&M cost	$0.01	$0.03	$0.03
Estimated restoration timeframe (years)	1	10	10
O&M cost over restoration timeframe	$0.01	$0.34	$0.34
Total cost over life of remedy	$11.67	$6.62	$3.14
Ratio of benefit/cost	0.67	1.06	2.42

NOTES:

bgs = below ground surface; COCs = contaminants of concern; cPAHs = carcinogenic polycyclic aromatic hydrocarbons; CUL = cleanup level; O&M = operation and maintenance; PCBs = polychlorinated biphenyls; REL = remediation level; WAC = Washington Administrative Code

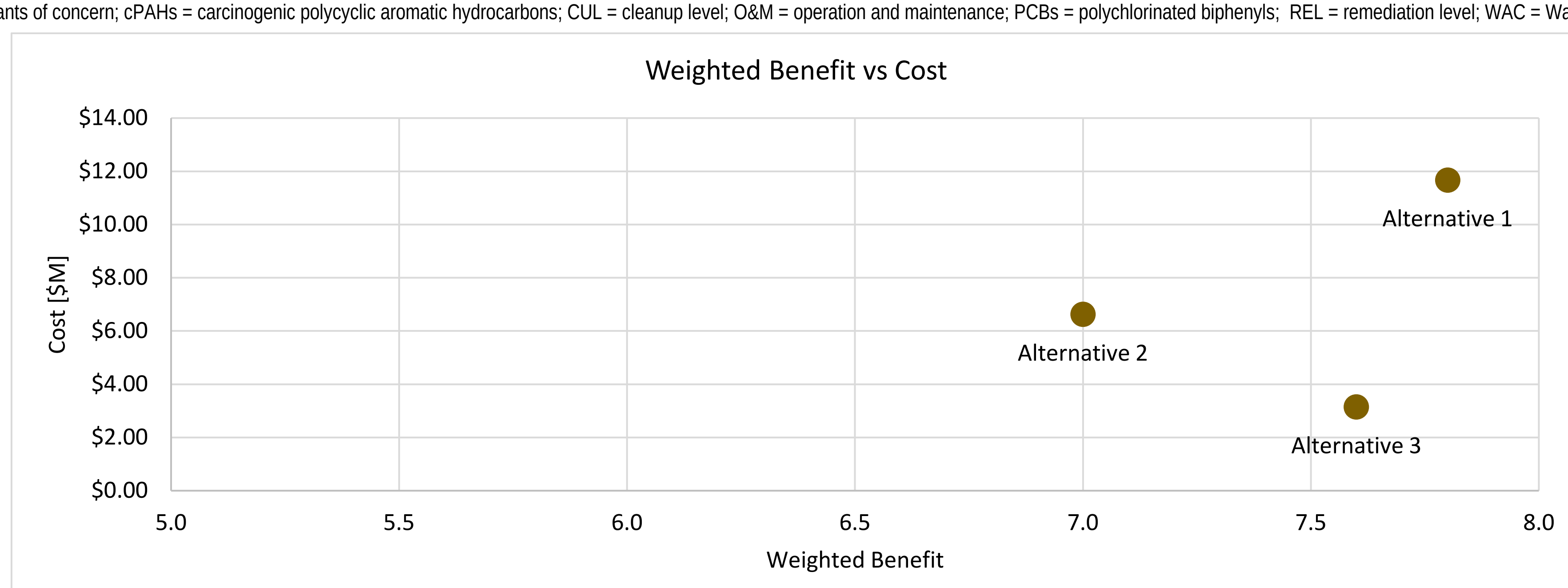

Table D-3 - Cost Breakdown for Shoreline Alternatives

Alternative No.	1 - Excavate soil above CULs and vegetate shoreline	2 - Excavate unsaturated soil above CULs, excavate saturated soil above REL, cap remaining shoreline with clay layer, and build vegetated shoreline above clay layer	3 - Excavate soil above REL, cap remaining shoreline with clay layer, and build vegetated shoreline above clay layer
Brief Description	Excavate any soil within the 100-foot buffer area that exceeds a CUL except gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Backfill to former surface grade and vegetate the shoreline with plants and trees within the 100-foot buffer zone.	Remove existing pavement, subbase, and soil to a depth of 2 feet bgs. Excavate any unsaturated soil within the 100-foot buffer area that exceeds a CUL except gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Excavate accessible saturated soil within the 100-foot buffer area that exceeds a REL (three areas) including saturated soil. Backfill to 2 feet below former grade. Place a clay layer that prevents infiltration with a drain layer above that restricts root penetration and vegetate shoreline with plants and trees above.	Remove existing pavement, subbase, and soil to a depth of 2 feet bgs. Excavate accessible soil within the 100-foot buffer area that exceeds a REL (three areas) including saturated soil, excluding the gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Backfill to 2 feet below former grade. Place a clay layer that prevents infiltration with a drain layer above that restricts root penetration and vegetate shoreline with plants and trees above.
Capital Costs			
Capital Direct Cost (Installed)			
Mob/Demob	$151,830	$151,830	$67,446
Site Survey	$8,500	$8,500	$8,500
Building Demolition	$35,700	$35,700	$35,700
Pavement Demo and Capping	$340,000	$426,550	$426,550
Shoring System	$945,000	$167,700	$167,700
Dewatering with Treatment	$750,000	$30,000	$30,000
Excavation of Solid Waste	$135,625	$73,398	$49,686
Off-Site Disposal of Solid Waste Excavated	$6,781,250	$3,669,967	$1,064,700
Borrowed Clean Fill	$632,917	$342,526	$99,372
Revegetation	$60,000	$366,000	$366,000
Capital Indirect Costs			
Engineering/Oversight/Documentation	$196,816	$105,443	$46,313
Construction Quality Assurance and Management	$492,041	$263,609	$115,783
Closure Documentation	$70,000	$70,000	$70,000
Combined Sales Tax for Tukwila, Washington (10% capital costs)	$1,059,968	$571,122	$254,775
Total Capital Cost	$11,659,647	$6,282,345	$2,802,525

Table D-3 - Cost Breakdown for Shoreline Alternatives

Alternative No.	1 - Excavate soil above CULs and vegetate shoreline	2 - Excavate unsaturated soil above CULs, excavate saturated soil above REL, cap remaining shoreline with clay layer, and build vegetated shoreline above clay layer	3 - Excavate soil above REL, cap remaining shoreline with clay layer, and build vegetated shoreline above clay layer
Brief Description	Excavate any soil within the 100-foot buffer area that exceeds a CUL except gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Backfill to former surface grade and vegetate the shoreline with plants and trees within the 100-foot buffer zone.	Remove existing pavement, subbase, and soil to a depth of 2 feet bgs. Excavate any unsaturated soil within the 100-foot buffer area that exceeds a CUL except gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Excavate accessible saturated soil within the 100-foot buffer area that exceeds a REL (three areas) including saturated soil. Backfill to 2 feet below former grade. Place a clay layer that prevents infiltration with a drain layer above that restricts root penetration and vegetate shoreline with plants and trees above.	Remove existing pavement, subbase, and soil to a depth of 2 feet bgs. Excavate accessible soil within the 100-foot buffer area that exceeds a REL (three areas) including saturated soil, excluding the gasoline-range hydrocarbon area in the northwest (addressed in groundwater remedy). Backfill to 2 feet below former grade. Place a clay layer that prevents infiltration with a drain layer above that restricts root penetration and vegetate shoreline with plants and trees above.
Periodic Costs			
Cap Inspection/Maintenance Costs - Institutional Control	$0	$25,000	$25,000
Annual Sampling/Monitoring/Reporting	$8,000	$8,000	$8,000
Combined Sales Tax for Tukwila, Washington (2% Labor)	$160	$660	$660
Total Periodic Cost: (@2020)	$8,160	$33,660	$33,660
Total Cleanup Cost (Capital + Periodic Cost): @ 2020			
Average	$11,667,807	$6,316,005	$2,836,185
Low End (-30%)	$8,167,465	$4,421,203	$1,985,330
High End (+50%)	$17,501,711	$9,474,007	$4,254,278

NOTES:

Costs do not include net present worth adjustment.

bgs = below ground surface; CUL = cleanup level; REL = remediation level