

APPENDIX J
CONTAMINATED SOILS ASSESMENT

**Final Feasibility Study
Willow Creek Daylighting
Contaminated Soils Assessment
Edmonds, Washington**

December 18, 2015



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Submitted To:
Mr. Jerry Shuster
Stormwater Engineering Program Manager
City of Edmonds
121 5th Avenue N.
Edmonds, Washington 98020

By:
Shannon & Wilson, Inc.
400 N 34th Street, Suite 100
Seattle, Washington 98103

21-1-12393-407

December 18, 2015

Mr. Jerry Shuster
Stormwater Engineering Program Manager
City of Edmonds
121 5th Avenue N.
Edmonds, WA 98020

**RE: REVISED WILLOW CREEK DAYLIGHT PROJECT CONTAMINATED SOILS
ASSESSMENT, EDMONDS, WASHINGTON**

Dear Mr. Shuster:

This revised letter report presents a summary of our environmental review of proposed channel excavation activities for the Willow Creek Daylight project, and potential impacts from residual contamination remaining from the cleanup of the Former Unocal Edmonds Bulk Fuel Terminal site in Edmonds, Washington (Figure 1).

This report has been revised in October 2015 from a previous Shannon & Wilson, Inc. (Shannon & Wilson) report that was issued for the project in March 2015. The revised report in relies on new information provided by Chevron Environmental Management Company (Chevron) for the Unocal Site under a Draft Interim Action Work Plan (IAWP) for the Former Unocal Edmonds Bulk Fuel Terminal, released in July 2015 (ARCADIS, 2015). The IAWP was submitted to comply with Agreed Order No. DE 4460 with the Washington State Department of Ecology (Ecology).

BACKGROUND

The project site is located at the westernmost part of Edmonds (Figure 1, Vicinity Map). The City of Edmonds proposes daylighting the downstream section of Willow Creek to improve fish passage to the Edmonds Marsh. Willow Creek flows from uplands through Edmonds Marsh and into Puget Sound (Figure 2). The downstream section of Willow Creek flows through culverts under the BNSF Railway Company (BNSF) railroad along Admiralty Way and under Marina Beach Park to an outfall in Puget Sound. The proposed daylight channel will connect to the

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City of Edmonds
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existing channel along BNSF and Unocal property, under the previously upgraded BNSF railroad bridge and outlet through Marina Beach Park to Puget Sound.

Preliminary design for this alignment includes about 700 feet of open channel excavation along the western boundary of former Lower Yard of the Chevron/Unocal property and parallel to the BNSF railroad to Marina Beach Park (Figure 2). The excavation is expected to be 5 to 10 feet deep with a bottom width of 14 feet and a top width of 40 to 50 feet, generating up to 17 cubic yards of soil per unit length of channel.

In Marina Beach Park, there two possible channel alignments through the park into Puget Sound were analyzed by Shannon & Wilson. We conducted field explorations along both channel alignment options to characterize materials and evaluate geologic and environmental conditions present at Marina Beach Park (Shannon & Wilson, 2014). No evidence of contamination was identified in the geotechnical explorations performed for either alignment in the park. However, treated wood piles are suspected to be present within the park boundaries and may be encountered during completion of the project.

Since the 2014 field explorations, the City's Parks, Recreation and Cultural Service Department has developed a Master Plan to accommodate the daylighted channel through Marina Beach Park. The current version of the Master Plan recommends a channel alignment located between the two alignments that were investigated. Additional subsurface investigations along the final alignment will be included in the preliminary design phase of the Willow Creek Daylight Project.

The Lower Unocal Yard has undergone several phases of soil, sediment and groundwater investigation and remediation (ARCADIS, 2007a, 2007b, 2008, 2009a, 2009b, 2010a, 2010b, 2012a, 2012b, 2013a, 2013b and 2015; SLR, Inc., 2005, 2006, 2007a, 2007b, and 2007c; Maul, Foster and Alongi, Inc., 2001, 2002, 2003, and 2004; EMCON 1994, 1995, and 1996).

Soil calculated cleanup levels are based on direct human contact and to evaluate the leaching pathway, gasoline, diesel, oil, benzene, and carcinogenic polynuclear aromatic hydrocarbons (cPAHs) were considered in combination to develop a single remediation level for total petroleum hydrocarbons (TPH). A separate soil cleanup level for benzene and a separate soil cleanup level for toxicity-adjusted total cPAHs were also developed to comply with the Model Toxics Control Act Method B risk target for individual carcinogens (1×10^{-6}). Cleanup work has been performed using the following cleanup levels:

SITE CLEANUP LEVELS AND REMEDIATION LEVELS

Indicator Hazardous Substance	Soil Cleanup Level (mg/kg)
Total TPH ¹	2,775
Benzene ¹	18
Total cPAHS ^{1,2}	0.14
Arsenic ³	20

Notes:

¹ Proposed soil cleanup level based on soil direct contact pathway and proposed soil remediation level based on soil leaching pathway.

² Total cPAHS adjusted for toxicity based on Washington Administrative Code (WAC) 173-340-708(8).

³ Based on natural background concentrations (WAC 173-340-740[5][c]).

cPAHS = carcinogenic polynuclear aromatic hydrocarbons

mg/kg = milligrams per kilogram

TPH = total petroleum hydrocarbons

SURFACE WATER AND GROUNDWATER CLEANUP LEVELS

Indicator Hazardous Substance	Surface Water and Groundwater Cleanup Level¹
Total TPH ²	$TPH_{SWCUL} = \frac{25}{(0.05)(0.01875f)} \mu g/L$
Benzene	51
Total cPAHS ³	0.018

Notes:

¹ Concentrations in micrograms per liter.

² Total TPH calculated on a sample-specific basis, where f_G is the decimal fraction gasoline-range organics.

³ Total cPAHS adjusted for toxicity based on Washington Administrative Code 173-340-708(8).

cPAHS = carcinogenic polynuclear aromatic hydrocarbons

TPH = total petroleum hydrocarbon

As of July 2012 the CUL calculation was modified with CULs for groundwater derived in the following manner:

- Total TPH CUL = $1 / (\%GRO/800 + \%DRO/500 + \%HO/500)$

Where:

- Total TPH CUL = Overall CUL adjusted for HI=1
- %GRO = Sample-specific percentage of GRO in groundwater, expressed as a decimal (i.e., 0.33 is used for 33%)
- 800 = Method A groundwater CUL for GRO micro-grams per liter ($\mu\text{g/L}$)
- %DRO = Sample-specific percentage of DRO in groundwater, expressed as a decimal (i.e., 0.33 is used for 33%)
- 500 = Method A groundwater CUL for DRO and HO ($\mu\text{g/L}$)
- %HO = Sample-specific percentage of HO in groundwater, expressed as a decimal (i.e., 0.33 is used for 33%)

Remediation for a majority of the Unocal Lower Yard is complete. Remediation has not been completed along the: (1) Washington Department of Transportation's (WSDOT's) stormwater line located in the south central part of the site as of fall 2015, and (2) Detention Basin (DB-2) and select areas of residual contamination exceeding the risk-based values are present intermittently elsewhere on the site (Figure 3). Soil samples located directly north of the WSDOT line contained concentrations of TPH ranging from 3,060 to 15,700 milligrams per kilogram (mg/kg). TPH concentrations within the area of the Detention Basin DB-2 (northwest part of the site) range up to 220,400 mg/kg. Confirmation sample number EX-B18-VV-1-6SW adjacent to the property line in the southwest part of the site contained 4,980 mg/kg (Figure 3). Petroleum and/or cPAHs in excess of cleanup criteria have also been found in soil post-cleanup at sample locations EX-BI-F-44-4, SB-80, and MW-129R located in the eastern, south central, and east central parts of the site, respectively.

As of 2015, light non-aqueous-phase liquid was present at select locations in the Lower Yard including monitoring well MW-510 and piezometers P-12, P-13, and P-15. Remediation is planned for Detention Basin DB-2 and WSDOT's stormwater line as part of the IAWP (ARCADIS, 2015).

SCOPE OF WORK

A review was performed of readily available data to evaluate whether data gaps exist relative to the proposed daylighting project. This review identifies whether there is a potential for impacts from documented residual contamination resulting from the site's former use as a tank farm on both the construction and long-term function of the daylight channel, and provides information on potential mitigation design measures where impacts would potentially occur. The analysis

included an assessment of available data (ARCADIS, 2007a, 2007b, 2008, 2009a, 2009b, 2010a, 2010b, 2012a, 2012b, 2013a, 2013b and 2015; SLR, Inc., 2005, 2006, 2007a, and 2007b; Maul, Foster and Alongi, Inc., 2001, 2002, 2003, and 2004; and EMCON 1994, 1995, and 1996) and discussions with Ecology as well as, ARCADIS. No sampling was performed.

DATA GAPS

Based on a review of information and recent discussions with ARCADIS and Ecology, the following list of potential data gaps was identified that require follow-up:

- A statistically based cleanup is being performed using cleanup values which rely on the results of 14 fractionated samples. The location and amount of soil exceeding calculated cleanup levels, and the amount of contaminated but not exceeding the site cleanup levels are not completely documented outside areas of excavation. Due to the variability in contamination levels, proper handling and end use of soil will likely require detailed planning and sampling to avoid misdirection of soil during construction. Work will also require the use of Hazardous Waste Operational Emergency Response (HAZWOPER-) trained workers.
- Soil that is contaminated in excess of calculated cleanup levels is present in the project corridor. Contaminated soil that exceeds cleanup levels, such as at EX-B18-VV-1-6SW near the BNSF railroad bridge crossing, will require disposal at a Resource Conservation and Recovery Act (RCRA) facility at a cost of \$50 to \$70 per ton. Other areas with concentrations exceeding the calculated cleanup criteria may exist and require off-site disposal.
- The TPH concentrations within the area of the Detention Basin DB-2 (northwest part of the site) range up to 220,400 mg/kg. Excavation is being planned to remove contamination in the vicinity of Detention Basin DB-2 (ARCADIS, 2015). Soil samples located directly north of the WSDOT line contained concentrations of TPH ranging from 3,060 to 15,700 mg/kg. In situ remediation is currently under development in the vicinity of WSDOT's storm drain line (ARCADIS, 2015). After in situ remediation, soil will likely continue to have intermittent contamination. Soil that is contaminated, but does not exceed the site cleanup levels, will likely be stained and or have odors such that it will require disposal at a permitted facility such as an inert waste or RCRA Subtitle D landfill if not reused on-site at a cost \$20 to \$70 per ton.

PROJECT ENVIRONMENTAL RISKS

This section describes the results of an assessment of the identified data gaps outlined above, relative to the proposed daylighting project, and how the risks associated with those gaps might impact either the construction or long-term functions of the daylighted channel.

Direct contact values were calculated to establish soil cleanup criteria and assume that the risk driver was human exposure (ARCADIS, 2013a). Polynuclear aromatic hydrocarbons (PAHs) cleanup levels for soil are based on carcinogenic PAHs. Environmental concern is focused on PAHs that range in molecular weight from 128.16 (naphthalene, two-ring structure) to 300.36 (coronene, seven-ring structure). Lower molecular weight PAH compounds, containing two or three rings, exhibit significant acute toxicity and other adverse effects to some organisms including fish and other aquatic life, but are non-carcinogenic (Eisler, 1987). Also, out-migrating salmon will feed on forage fish, including herring and smelt. Contaminants from the former site could directly affect forage fish (herring and smelt) (Incardona and others, 2004) living in the vicinity of the site. Incorporation of a high density polyethylene (HDPE) liner would also address this concern posed by exposing residual contamination in soil along the daylight channel area. An option to the liner would be to complete an aquatic species focused risk evaluation.

Cleanup criteria have been calculated for site soil (ARCADIS, 2015). Given the likely variability in the level of soil contamination, these cleanup levels will be problematic for off-site disposal of contaminated soil generated by the project. The location, quantity and contaminate characteristics of residual soil contamination, either exceeding the cleanup criteria or not, are not documented sufficiently for quantifying project reuse and soil disposal and refining project costs. Additional information would be required on the nature and extent of residual contamination to accurately estimate the costs associated with and plan for handling and disposal, for either onsite placement and/or offsite disposal. Figure 3 generally outlines remedial excavation boundaries and confirmation sample locations. Confirmation sample data by individual excavation is provided in the Phase 1 Remedial Implementation As-Built Report (ARCADIS, 2009b).

Contamination in excess of cleanup levels remain within the Lower Yard, with the maximum reported TPH concentration near Detention Basin 2 (DB-2) at 220,400 mg/kg. Also, free-phase and/or residual product was encountered in eight soil borings located immediately south of DB-2. Further, the WSDOT-owned stormwater line runs across the Lower Yard and across the proposed project corridor with concentrations of total TPH in soil ranging from 3,060 to 17,850 mg/kg, and sample EX-B18-VV-1-6SW near the BNSF bridge crossing had a concentration of 4,980 mg/kg total TPH (Figure 3). Given these results, soils remain exceeding the cleanup criteria and, therefore, it is unclear if the IAWP planned action items alone are sufficient to prevent residual contamination from re-contaminating Willow Creek, even if the current analysis indicates decreasing trends in TPH and benzene concentrations (ARCADIS, 2013a, 2015). As discussed above, either a re-evaluation of risk and/or installation of a HDPE

liner to isolate channel sediment and surface water from underlying soil and groundwater would be required to ensure that protectiveness of that daylight creek for future use.

The BNSF right-of-way (ROW) runs along the western boundary of the Lower Yard. The ROW is down-gradient (Figure 4) and is documented to have been intermittently impacted from contaminated groundwater migrating from the Lower Yard (Figure 5). Soil (in the vicinity of sample EX-B18-VV-1-6SW TPH) with a concentration of 4,980 mg/kg reportedly could not be overexcavated due to its proximity to the BNSF ROW (ARCADIS, 2013a). Given the proximity of the ROW to the proposed corridor and the likely tidal influence (ARCADIS, 2012a), the BNSF ROW may serve as a secondary source of contamination to the newly developed channel intermittently along the entire 750-foot length. Installation of a liner to isolate the channel sediment from underlying soil and groundwater is, therefore, the only option that would ensure that protectiveness of the daylight creek. With the liner, additional information and risk assessments would not be required to understand the potential impacts from residual contamination. Additional on-site sampling is recommended to estimate the costs associated with and plan for handling and disposal soil provided a liner is used.

The presence of contamination will also require use of HAZWOPER-trained workers and special handling and be subject to restrictions for disposal, as discussed above. In addition, where dewatering is required in construction of the channel, water treatment would be required.

MITIGATION

The mitigation of impacts from contamination identified above should be considered as part of the overall project planning. Typically, the order of preference for mitigation is:

- Avoiding the impact altogether by changes to the project.
- Minimizing impacts to the project (risk assessment to demonstrate the protectiveness of the existing condition, permitting onsite disposal of soil, onsite treatment and disposal of groundwater).

Based on available information, avoiding the impacts is not feasible given that there are no alternative daylight alignments that are considered feasible (Shannon & Wilson, 2013a). Several alternative alignments were considered in the project early feasibility study, and the current alignment through the Unocal property is the only one feasible.

To provide for design of mitigation, additional information will be required as to the levels and locations of residual soil and groundwater contamination that may pose a risk. A series of

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geoprobe borings or test pits should be completed along the daylight alignment corridor to estimate the location and quantity of soil suitable for replacement on site versus requiring off-site disposal. In addition, a limited number of monitoring wells will be required to understand the volume and level of contamination to design treatment for dewatering, calculate groundwater pressures for liner design, and if special dewatering water quality treatment measures are needed. Provided Chevron/Unocal (or WSDOT) provides access, existing monitoring wells could be used for the dewatering evaluation, eliminating the need to install new wells.

Mitigation for residual contamination could involve a few different approaches. We recommend removal of contaminated soil and lining the channel along the daylight sections of the creek. We do not recommend additional risk assessment, as there are limitations in the existing data, site access and additional sampling at this time will be difficult, and the ability of the risk assessment to reduce the mitigation costs is limited. Also, stakeholders such as the tribes have not been always accepting of risk-based cleanups regardless of their science. For example, because of stakeholder concern, Horse Creek in Bothell (Shannon & Wilson, 2013b) had to be lined in all areas where there was a potential for contamination; risk-based evaluations were not acceptable.

Excavation of all the contaminated soil with the potential to affect the project is the most protective, and expensive. However, given the likely extent of residual contamination, fill excavation and off-site disposal is expected to be cost prohibitive. We strongly recommend the City confirm with Ecology and WSDOT (the future landowner) that contaminated soils within the calculated cleanup criteria be reused at the site. A thorough understanding of soil contamination is required in order to plan for handling and disposal of spoils generated by the project.

Therefore, lining of the creek in areas of contamination, with an acceptable reuse and disposal plan, is likely to provide the most reliable and cost-effective outcome. Lining would involve additional investigation. The contaminated reaches of the channel requiring lining would need to be identified or entire daylight channel could be lined. Typical liners for this application consist of compacted clay liners (CCLs), geomembranes (specialized plastic sheetings), or geosynthetic clay liners (GCLs). Also, a groundwater model mounding analysis would be needed to analyze the normal groundwater migration and demonstrate effective isolation of contaminated groundwater from the daylight channel. For installation, the liner would require overexcavation to account for buoyancy forces and to allow for anchoring/armoring of the liner. The excavated soil's level of contamination and final disposition, hauling, and disposal or on-site disposal needs to be evaluated.

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CCLs for this application would likely consist of 1 to 2 feet of compacted clay- or bentonite-augmented till soil overlain by an anchor/armor layer. The clay is installed by laying down 4- to 6-inch layers and then compacting each layer with a heavy roller. The installation of clay liners is difficult, consistency is difficult to maintain, and drying of the clay during construction results in cracks that reduce the liner effectiveness and may lead to leakage. Lining of the creek with CCL is likely to cost between \$4 and \$8 a square foot of channel, based on the proposed dimensions, not including engineering or soil disposal and assuming a local source of bulk clay.

Geomembrane liners are constructed from various plastic materials, including polyvinyl chloride and HDPE. HDPE is the preferred material for use in municipal solid waste and secure landfills. It is strong, resistant to most chemicals, and is considered to be impermeable to water. However, geomembranes require protective bedding and/or geotextiles and have special design and installation considerations and require increased field quality assurance/quality control. Therefore, geomembrane liners typically are only used where the nature of contaminants requires their use or where there is sufficient information to allow for the level of design required. Another limiting factor for using geomembrane liners is the thickness of the anchor material needed, especially if groundwater pressures are elevated around the creek bed. Geomembrane material procurement typically requires a significant lead time. Lining of the creek with HDPE is likely to cost between \$5 and \$10 a square foot of channel, based on the proposed dimensions, not including engineering or soil disposal.

GCLs offer some unique advantages over conventional geomembrane or compacted clay liners. GCLs are fast and easy to install, have low hydraulic conductivity (i.e., low permeability), and have the ability to self-repair tears or holes caused by construction or due to swelling. GCLs can also prevent organic contaminant transport. Their adsorptive capacity would reduce the required cap thickness because they do not require bedding. The product's adsorptive capability would mitigate petroleum contaminant transport into the waterway. GCLs also have a high capacity for low-soluble organic compounds such as non-aqueous phase liquid, PAHs, and dissolved TPH. In addition, they provide a maximum of flexibility in the field because they are installed as overlapping panels, so no field welding would be required. ASTM International standards have been developed, which may be used for designing liner systems using GCLs as well as comparing GCL products. Lining of the creek with GCL is likely to cost between \$5 and \$9 a square foot of channel, based on the proposed dimensions, exclusive of engineering and soil disposal. We have included a conceptual design section(s), showing a typical liner configuration in Figure 6.

In addition to mitigation to allow for the built channel, the project will generate a large volume of excess soil some of which will be contaminated above or below calculated cleanup levels (up

to an estimated 15,000 tons). Off-site disposal of contaminated soil would require disposal at a RCRA Subtitle D or inert waste landfill depending on the level of contamination. Disposal of petroleum-contaminated soil at a Subtitle D facility typically costs \$50 to \$70 per ton (not including hauling) for soil that exceeds a regulatory requirement. Soil that is contaminated, but does not exceed a regulatory criterion, if not reused on-site would likely cost between \$20 to \$40 per ton (not including hauling) for disposal at an inert waste landfill such as the CEMEX landfill in South Everett.

As indicated above, replacing on site the soil generated from the project would eliminate off-site transport and disposal costs and greatly reduce the overall environmental impact of the project if contamination below cleanup levels is found to be extensive. However, on-site disposal will require coordination with Chevron (or approval of WSDOT depending on the timing of the project) for it to remain on site. Decisions on the appropriate method for placing excavated soil on site will be made based on whether its placement is sufficiently protective and acceptable based on public opinion. The soil is likely to be identified as a Category 2 or 3 soil based on Ecology's *Guidance for Remediation of Petroleum Contaminated Sites* (Ecology, 2011). Table 12.1 in the guidance suggests the following limitations be considered for Category 2 soil which is soils with residual levels of petroleum hydrocarbons that could have adverse impacts on the environment in some circumstances:

- *Should be placed above the highest anticipated high water table. If seasonal groundwater elevation information is not available, place at least 10 feet above the current water table. It should be noted that cleanup levels are intended to be protective of groundwater (i.e., not leachable).*
- *Should not be placed within 100 feet of any private drinking water well or within the 10-year wellhead protection area of a public water supply well. It should be noted that the groundwater in the project areas is not potable.*
- *Should not be placed in or directly adjacent to wetlands or surface water where contact with water is possible. As above, it should be noted that cleanup levels are intended to be protective of groundwater (i.e., not leachable).*
- *Should not be placed under a surface water infiltration facility or septic drain field. Again, it should be noted that cleanup levels are intended to be protective of groundwater (i.e., not leachable).*
- *Any other limitations in state or local regulations.*

Plans for soil placement should be developed and require review and approval prior to their implementation. Capping of the contaminated soil with topsoil will likely be required.

STATUS OF CLEANUP AND TRANSFER

Chevron is currently planning additional cleanup activities at the Unocal Lower Yard site. To date, most of the on-site petroleum contamination has been cleaned up in a series of interim actions. Groundwater in most wells at the property boundary is clean. Documented petroleum-contaminated soil remains in at least two areas that could not be excavated during previous work. Groundwater contamination is associated with these areas. Soil vapor – the air in the pore spaces between the soil grains – also has elevated concentrations of petroleum in these areas. Chevron plans the installation of a dual-phase extraction system for soil vapor. Chevron is currently planning final actions for the site and having issued a Cleanup Action Plan for public comment sometime in the second half of 2015 (ARCADIS, 2015). The Cleanup Action Plan will likely be the basis for the Record of Decision outlining the pathway to site closure and ultimately transfer of the property to WSDOT.

RECOMMENDATIONS

Based on a review of available documentation along with discussions with ARCADIS and Ecology, it is likely that intermittent levels of contaminated soil will be encountered during the Willow Creek daylight excavations through the Unocal property, and its presence will likely impact the approach to design and construction and overall cost of the project. Although select hotspots are documented, the quantity and location of contaminated soil that falls below the calculated cleanup criteria is not well documented in existing reports. Additional field testing along the daylight alignment on the nature and extent of contamination is recommended for the next phase of preliminary design to demonstrate the feasibility of soil on-site replacement and off-site disposal plans to gain agreement by the parties (City of Edmonds, Ecology and Chevron, or WSDOT). In order to address these data gaps, the following steps should be taken including:

- Consultation with Chevron (or WSDOT) and Ecology on preferred methods for placing soil that does not exceed the site cleanup criteria back on-site and, if acceptable, what requirements, if any, would be put on the placement of the soil.
- Completion of test pits or probes along the daylight channel to document the distribution of contaminated soil. We understand site access may be limited while Chevron/Unocal and Ecology and WSDOT finalize actions for the site. Sampling of soil and groundwater would be required.
- Completion of estimates of the quantities of various levels of contaminated soil likely to be encountered during completion of the project.

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- Consultation with permitted RCRA Subtitle D and inert waste landfill operators to estimate the cost of transportation and disposal of soil generated by the project, if onsite disposal is not feasible.
- Completion of a groundwater model and hydraulic analysis to understand the extent of liner required and understand any mitigation that might be required for impacts to site groundwater flow and any continuing remedial measures performed by consultants to Chevron.
- Develop recommendations for preferred liner types. Consult with local vendors and contractors to develop up-to-date estimates for the installation of liner.
- Development of a preliminary design plan that addresses soil handling and disposal and liner construction.

LIMITATIONS

Within the limitations of scope, schedule, and budget, the conclusions and recommendations presented in this letter report were prepared in accordance with generally accepted professional geotechnical and environmental engineering principles and practices in this area at the time this letter report was prepared.

The data presented in this letter report are based on information available on the Chevron/Unocal cleanup websites. No sampling or characterization was performed in support of the project. Shannon & Wilson is not responsible for conditions or consequences arising from relevant facts that were concealed, withheld, or not fully disclosed at the time the letter report was prepared. We also note that the facts and conditions referenced in this letter report may change over time, and that the facts and conditions set forth here are applicable to the facts and conditions as described only at the time of this letter report. We believe that the conclusions stated here are factual, but no guarantee is made or implied.

This letter report was prepared for the exclusive use of City of Edmonds, and their respective representatives, and in no way guarantees that any agency or its staff will reach the same conclusions as Shannon & Wilson. Our services did not include any evaluation regarding the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air on or below or around the site beyond those discussed in the report. We have prepared the enclosed, "Important Information About Your Environmental Site Assessment/Evaluation Report," to help you and others in understanding our reports.

Sincerely,

Mr. Jerry Shuster
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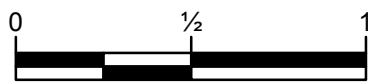
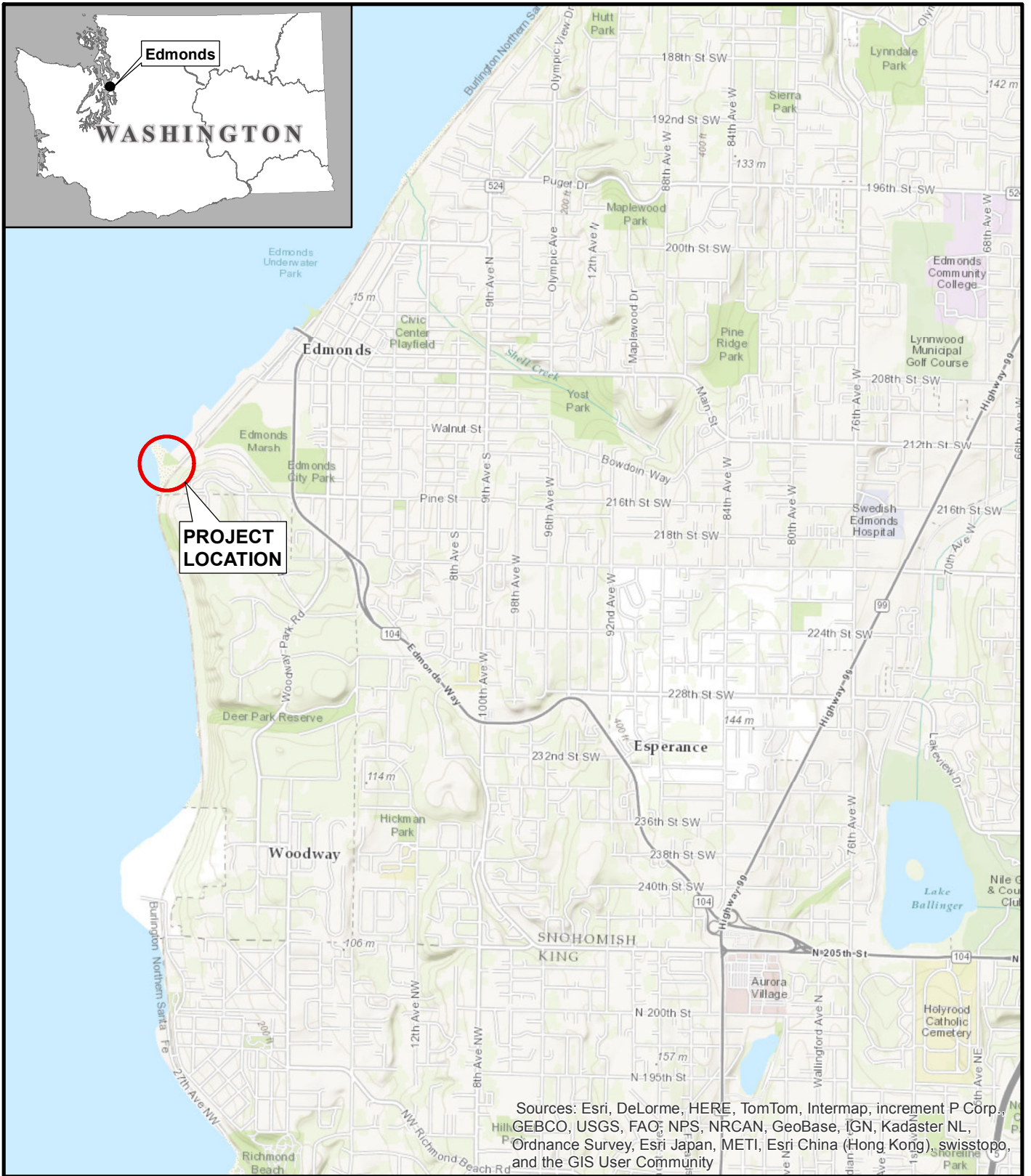
SHANNON & WILSON, INC.



Scott W. Gaulke, P.E., L.H.G.
Vice President

SWG:DRC/swg

Enc: References (3 pages)
Figure 1 – Vicinity Map
Figure 2 – Willow Creek Restoration Area
Figure 3 – Lower Yard Remaining, Soil Impacts Map
Figure 4 – Second Quarter, 2012 Groundwater Elevations and Contours, June 2012
Figure 5 – Pre-Remediation Dissolved Total Petroleum Hydrocarbon Concentration and LNAPL Map (2006)
Figure 6 – Sections A-A and B-B, Design Section Details
Important Information About Your Environmental Site Assessment/Evaluation Report



Scale in Miles



**Willow Creek Daylight Project
Contaminated Soils Assessment
Edmonds, Washington**

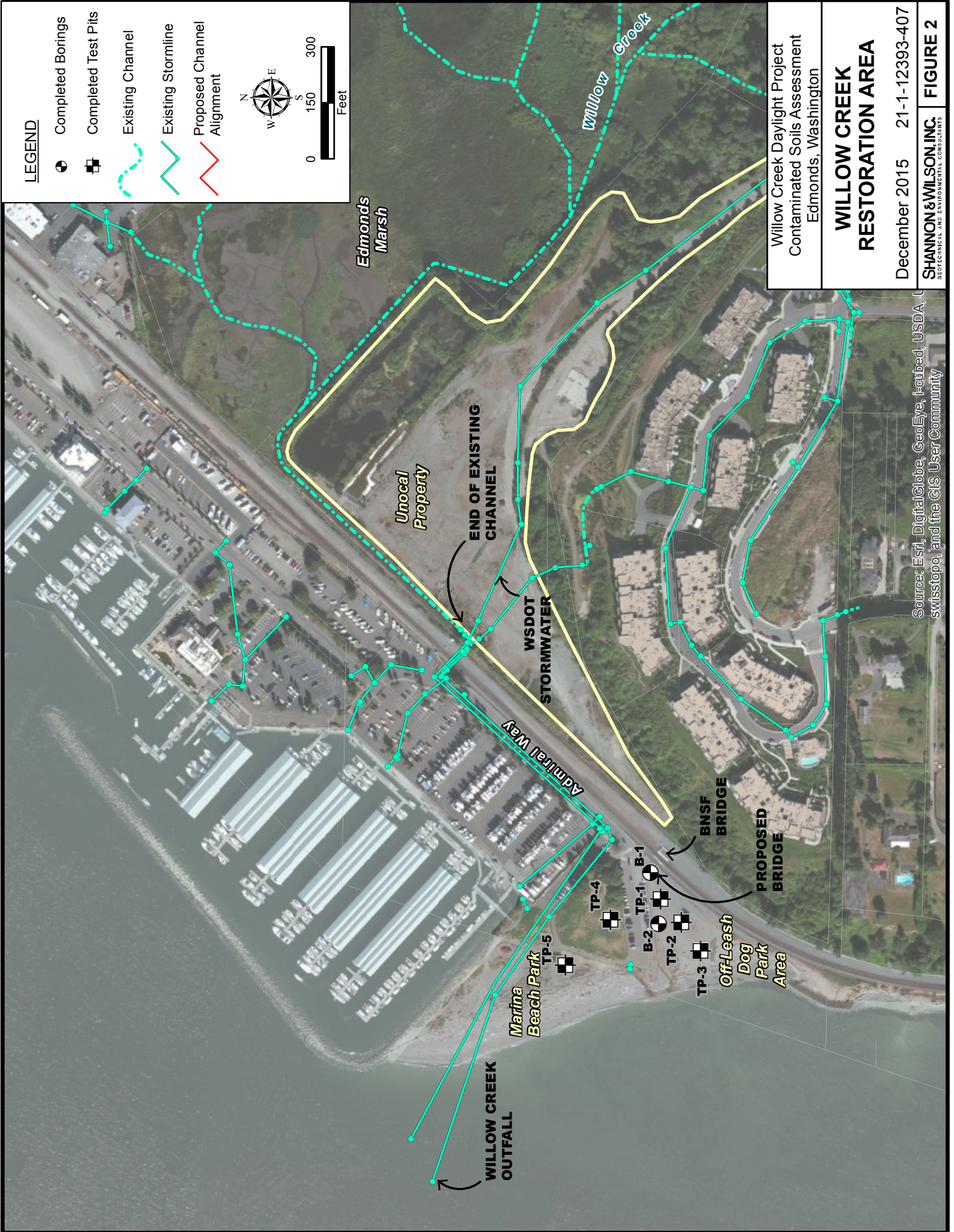
VICINITY MAP

December 2015

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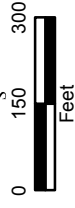
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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIGURE 1



LEGEND

- Completed Borings
- ⊠ Completed Test Pits
- - - Existing Channel
- Existing Stormline
- Proposed Channel Alignment



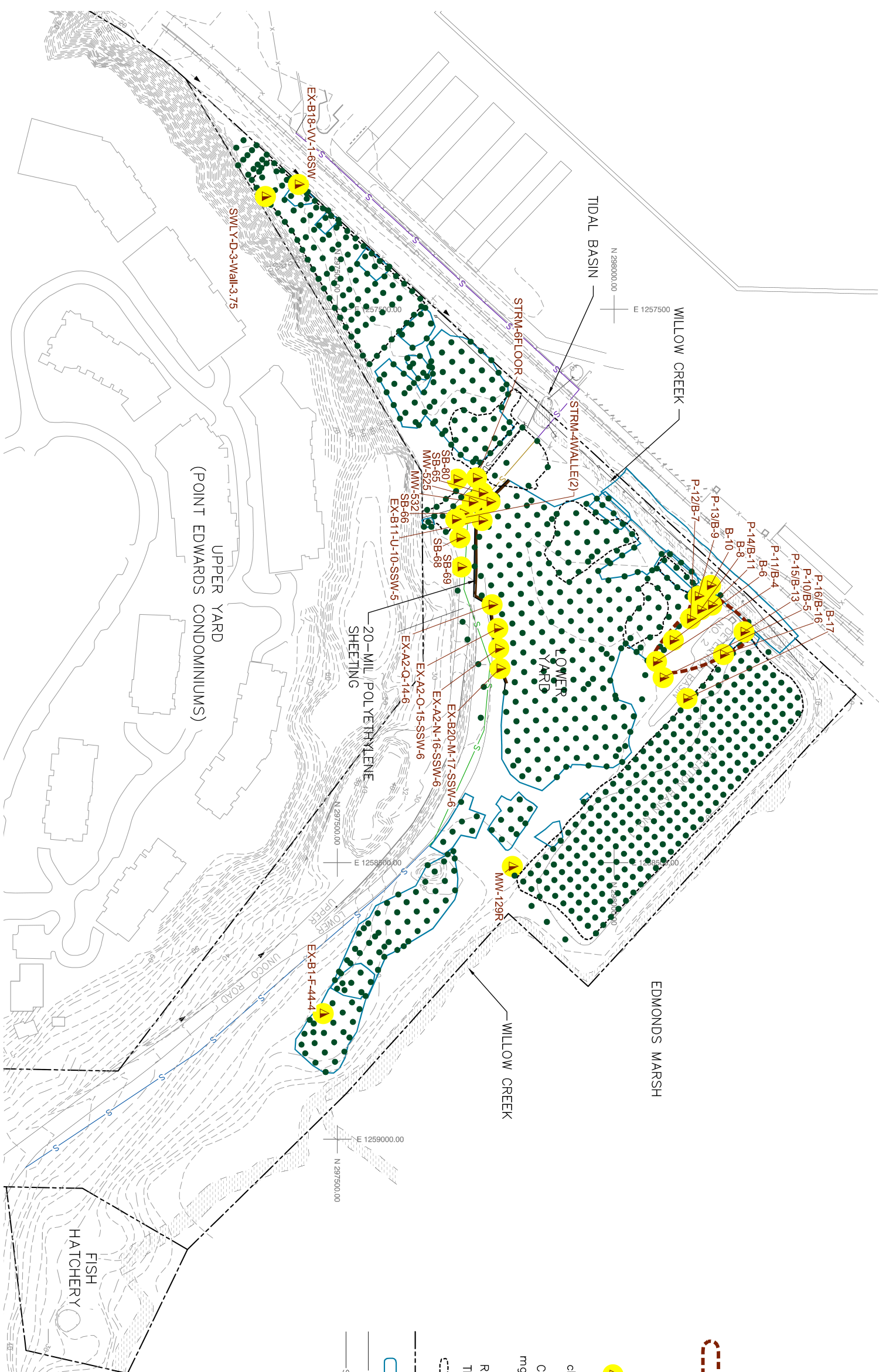
Willow Creek Daylight Project
Contaminated Soils Assessment
Edmonds, Washington

**WILLOW CREEK
RESTORATION AREA**

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Source: Esri, DigitalGlobe, GeoEye, Earthstar, USDA, Swisstopo, and the GIS User Community

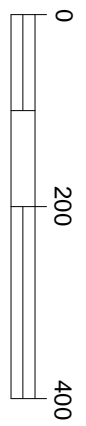


LEGEND:

- ESTIMATED RECOVERABLE LNAPL BOUNDARY
- SOIL SAMPLE COLLECTION LOCATION WITH CONCENTRATIONS OF TPH AND, cPAH AND/OR BENZENE NOT EXCEEDING APPLICABLE SITE CULS AND/OR RELS.
- SOIL SAMPLE COLLECTION LOCATION WITH CONCENTRATIONS OF TPH AND/OR cPAH, EXCEEDING APPLICABLE SITE CULS AND/OR RELS. CARCINOGENIC POLYNUCLEAR AROMATIC HYDROCARBONS, ADJUSTED FOR TOXICITY. CLEANUP LEVEL
- mg/kg
- INDICATES AN ESTIMATED VALUE
- REMEDIATION LEVEL
- TOTAL PETROLEUM HYDROCARBONS 2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
- PROPERTY BOUNDARY
- 2007/2008 EXCAVATION BOUNDARIES
- WSDOT STORMWATER LINE
- POINT EDWARDS STORM DRAIN LINE

NOTES:

1. 20-MIL POLYETHYLENE SHEETING INSTALLED UPON COMPLETION OF PHASE I EXCAVATION. SHEETING REACHES TO APPROXIMATELY 7.5 FEET ABOVE MEAN SEA LEVEL.
2. HORIZONTAL DATUM: WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE (NAD 83/98). VERTICAL DATUM: N.A.V.D. 88 UNITS: U.S. SURVEY FEET HORIZONTAL AND VERTICAL CONTROL ESTABLISHED BY GPS VIA VERTICAL REFERENCE STATION NETWORK (VRSN).
3. SOUTHEAST PORTION OF WSDOT STORMWATER LINE HAS NOT BEEN SURVEYED.



NOTE
Figure adapted from electronic file.
Pages from ARCADIS, Public Draft Interim Action Workplan, 2015

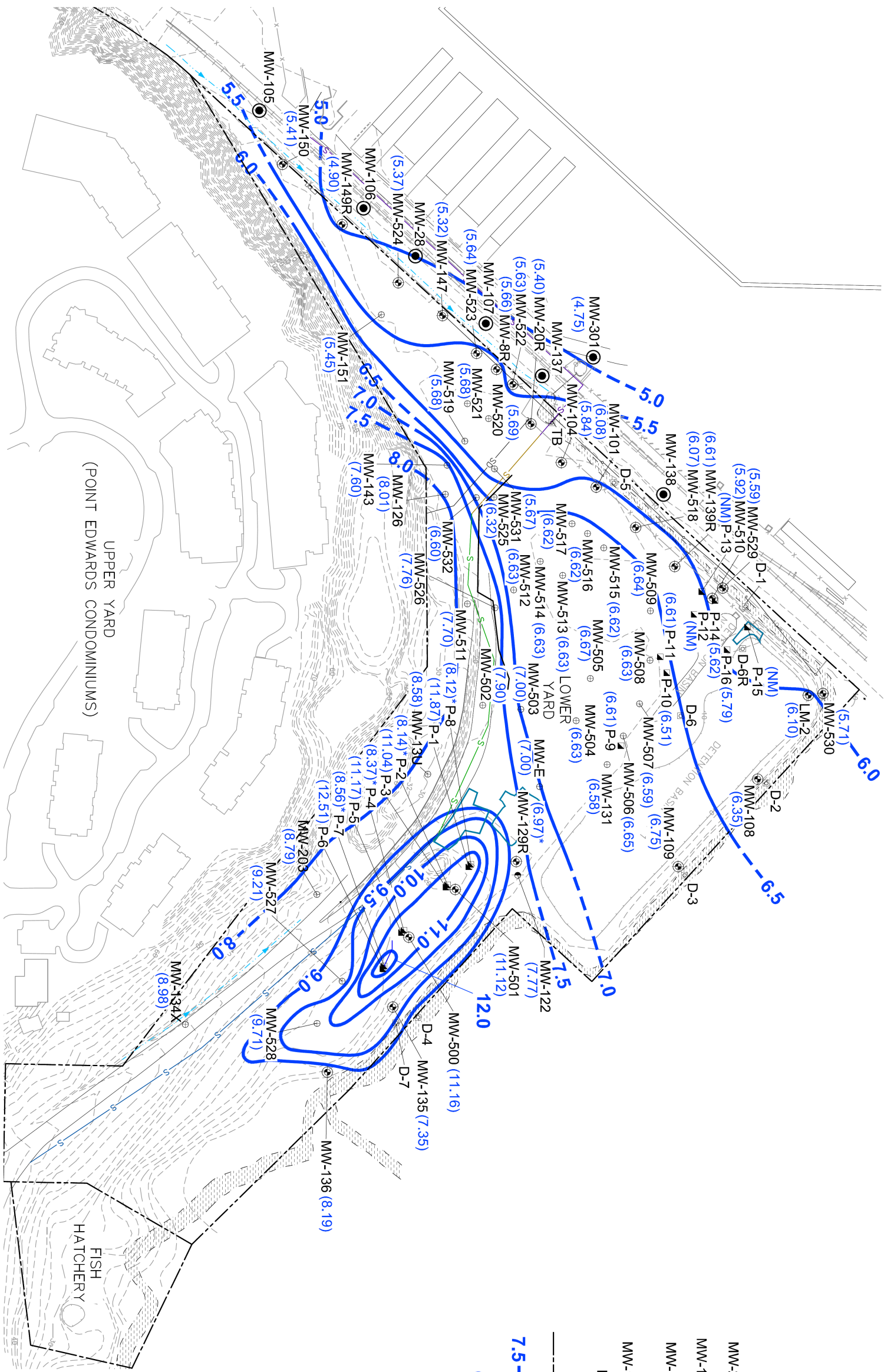
Willow Creek Daylight Project
Contaminated Soils Assessment
Edmonds, Washington

**LOWER YARD REMAINING
SOIL IMPACTS MAP**

December 2015 21-1-12393-407

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIGURE 3



- MW-203 INTERIOR MONITORING WELL LOCATION AND DESIGNATION
- MW-105 BNSF MONITORING WELL LOCATION
- ◆ MW-122 DEEP MONITORING WELL LOCATION AND DESIGNATION
- ⊙ MW-109 PERIMETER MONITORING WELL LOCATION
- ▴ P-11 PIEZOMETER
- ⊕ D-1 STAFF GAUGE
- PROPERTY BOUNDARY

- 7.5 — GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INTERFERED)
- (12.51) GROUNDWATER ELEVATION
- (8.24)* GROUNDWATER ELEVATION NOT USED IN CONTOURING
- (NM) NOT MEASURED

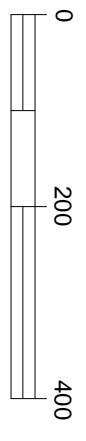
NOTES:

1. 20-MIL POLYETHYLENE SHEETING INSTALLED UPON COMPLETION OF PHASE I EXCAVATION. SHEETING REACHES TO APPROXIMATELY 7.5 FEET ABOVE MEAN SEA LEVEL.
2. HORIZONTAL DATUM: WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE (NAD 83/98). VERTICAL DATUM: N.A.V.D. 88 UNITS: U.S. SURVEY FEET HORIZONTAL AND VERTICAL CONTROL ESTABLISHED BY GPS VIA VERTICAL REFERENCE STATION NETWORK (VRSN).
3. SOUTHEAST PORTION OF WSDOT STORM DRAIN LINE HAS NOT BEEN SURVEYED.

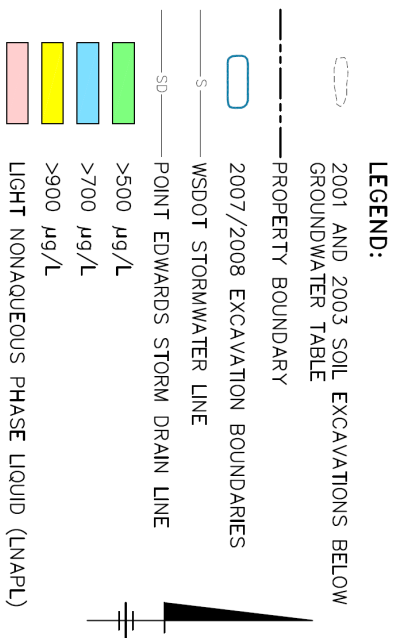
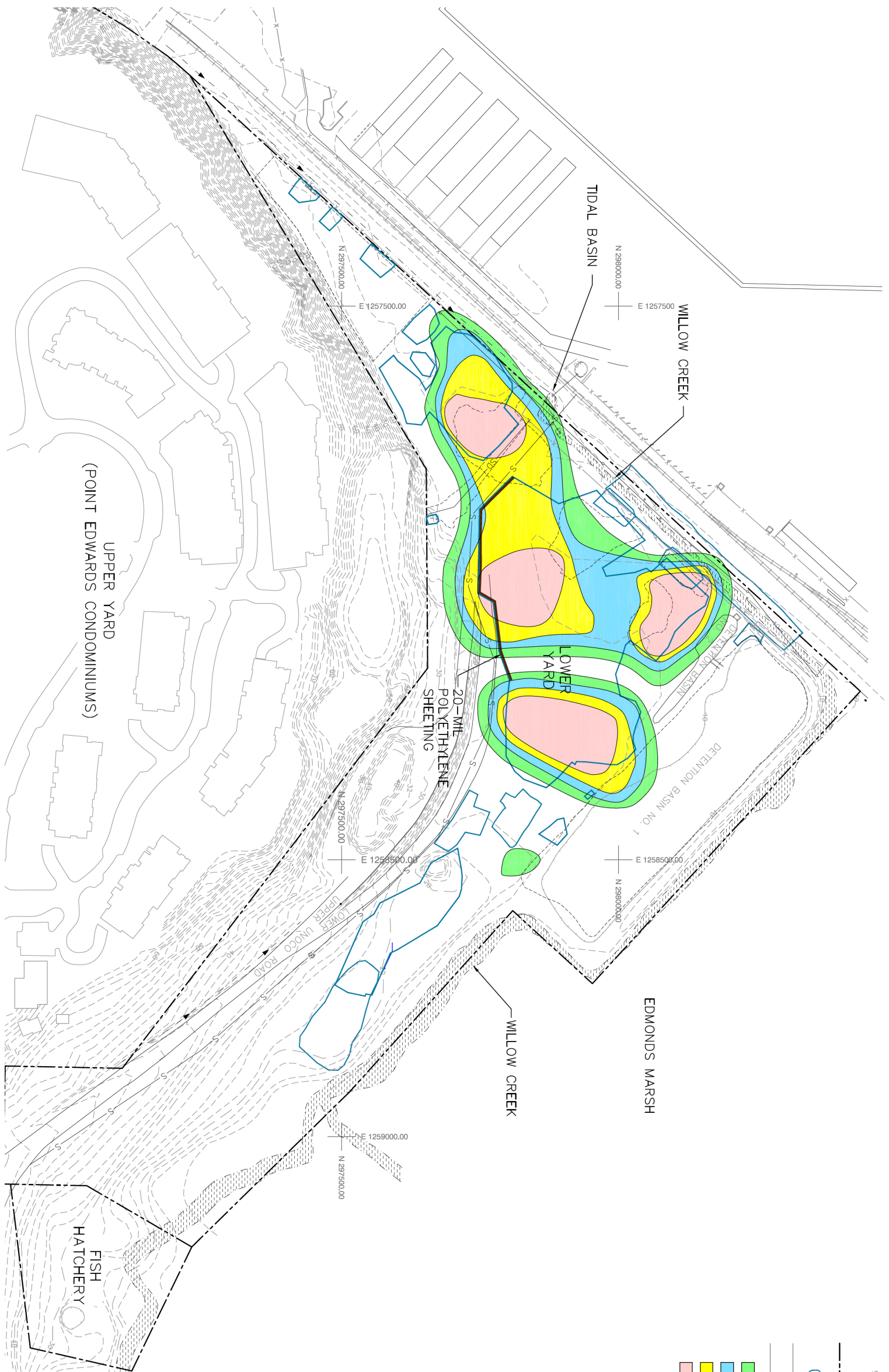


NOTE

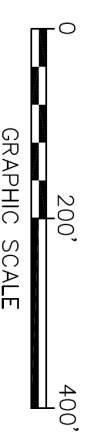
Figure adapted from electronic file.
Pages from ARCADIS, Public Draft Interim Action Workplan, 2015



Willow Creek Daylight Project Contaminated Soils Assessment Edmonds, Washington	
SECOND QUARTER, GROUNDWATER ELEVATIONS AND CONTOURS, JUNE 2012	
December 2015	21-1-12393-407
SHANNON & WILSON, INC. Geotechnical and Environmental Consultants	FIGURE 4



- NOTES:**
1. µg/L = MICROGRAMS PER LITER.
 2. TOTAL TPH CONCENTRATIONS BASED ON SEPTEMBER 2006 SAMPLING EVENT RESULTS.
 3. 20-MIL POLYETHYLENE SHEETING INSTALLED UPON COMPLETION OF PHASE I EXCAVATION. SHEETING REACHES TO APPROXIMATELY 7.5 FEET ABOVE MEAN SEA LEVEL.
 4. HORIZONTAL DATUM: WASHINGTON STATE COORDINATE SYSTEM NORTH ZONE (NAD 83/98). VERTICAL DATUM: N.A.V.D. 88 UNITS: U.S. SURVEY FEET HORIZONTAL AND VERTICAL CONTROL ESTABLISHED BY GPS VIA VERTICAL REFERENCE STATION NETWORK (VRSN).
 5. SOUTHEAST PORTION OF WSDOT STORMWATER LINE HAS NOT BEEN SURVEYED.



NOTE

Figure adapted from electronic file.
Pages from ARCADIS, Public Draft Interim Action Workplan, 2015

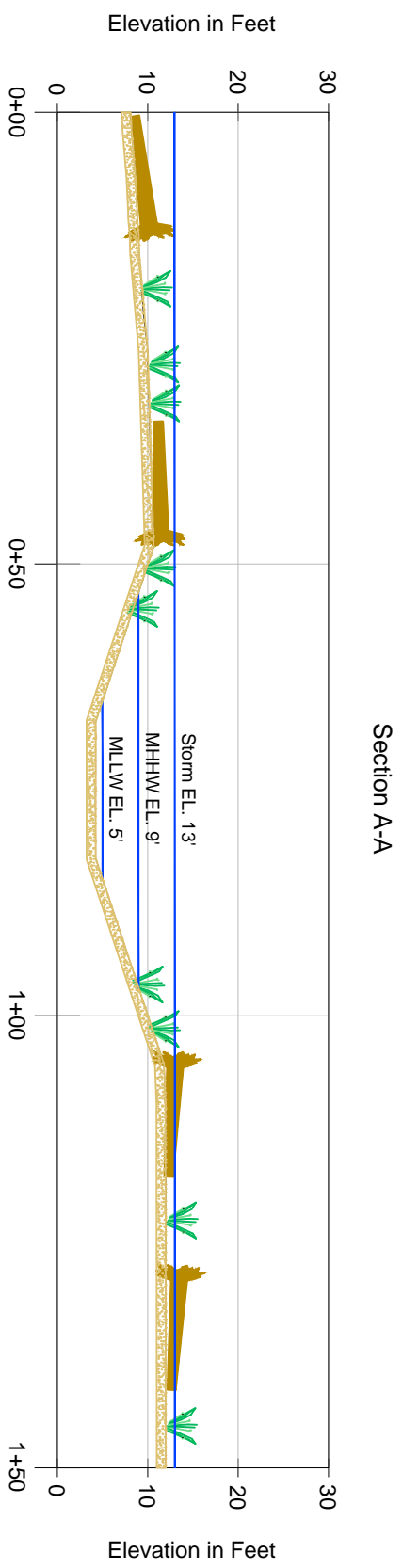
Willow Creek Daylight Project
Contaminated Soils Assessment
Edmonds, Washington

PRE-REMEDIATION DISSOLVED TOTAL PETROLEUM HYDROCARBON CONCENTRATION AND LNAPL MAP (2006)

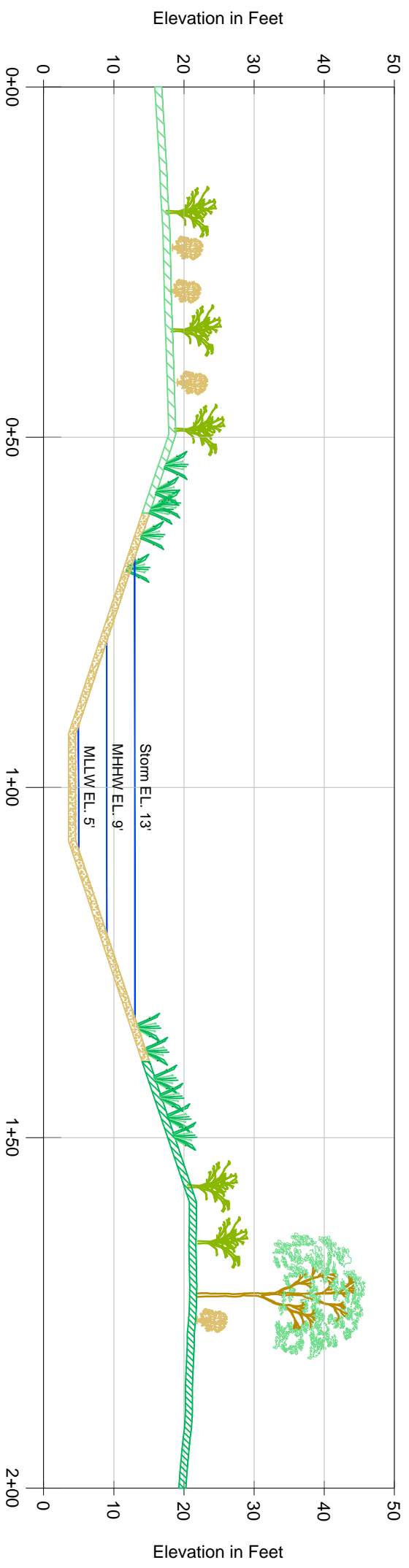
December 2015 21-1-12393-407

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

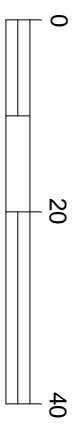
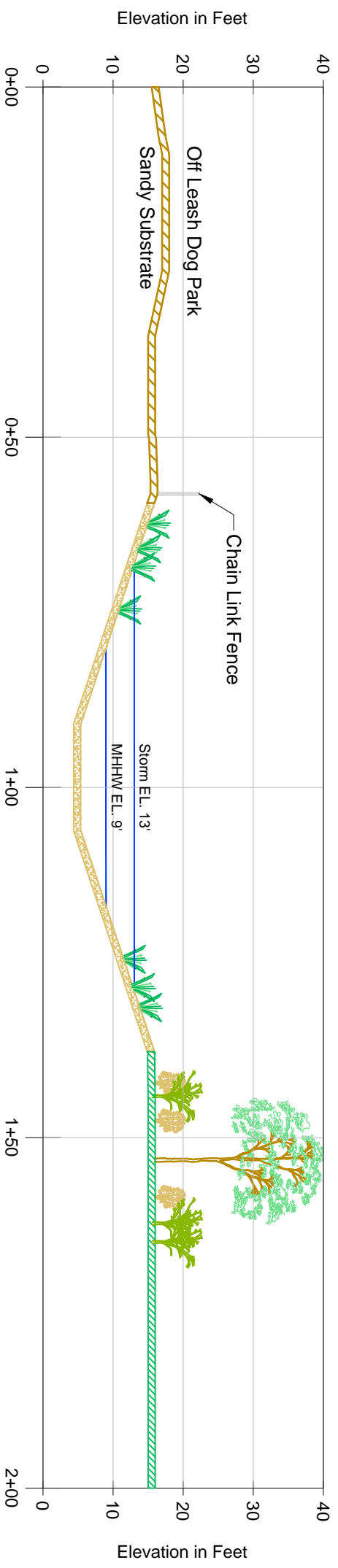
FIGURE 5



Section B-B

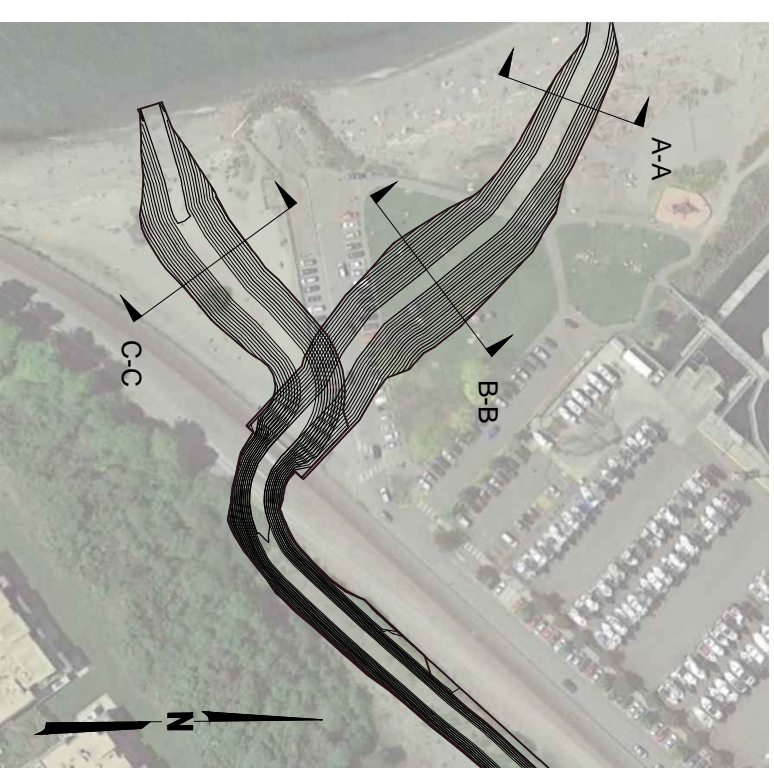


Section C-C



NOTE

Figure adapted from electronic files,
2004_Willow_Cr_Survey.dwg,
2008_Marsh_Survey.dwg, 20120049
TOPO.dwg and Basemap.dwg received
08-04-2014.
Aerial.jpg received 08-11-2014.



INSET MAP OF ALIGNMENT OPTIONS
SCALE: 1"=200'

Willow Creek Daylight Project
Contaminated Soils Assessment
Edmonds, Washington

**BEACH OUTLET
DAYLIGHT ALIGNMENT
OPTION SECTIONS**

December 2015 21-1-12393-407

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants **FIGURE 6**



Date: December 18, 2015
To: Mr. Jerry Shuster
City of Edmonds

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

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

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

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

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

SUBSURFACE CONDITIONS CAN CHANGE.

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

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

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

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

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

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

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

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

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

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

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

READ RESPONSIBILITY CLAUSES CLOSELY.

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

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

APPENDIX K

**COMMENTS ON THE CONTAMINATED SOILS ASSESMENT
FROM THE WASHINGTON STATE DEPARTMENT OF ECOLOGY AND
ARCADIS U.S., INC., ON BEHALF OF
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY**

Mr. Jerry Shuster
Stormwater Engineering Program Manager
City of Edmonds
121 5th Avenue N.
Edmonds, WA 98020

Arcadis U.S., Inc.
1100 Olive Way
Suite 800
Seattle
Washington 98101
Tel 206 325 5254
Fax 206 325 8218
www.arcadis.com

Subject:

Shannon & Wilson, Inc.'s draft Revised Willow Creek Daylight Project Contaminated Soils Assessment, Edmonds, Washington, dated October 28, 2015

Environment

Dear Mr. Shuster:

Thank you for the opportunity to comment on the draft Revised Willow Creek Daylight Project Contaminated Soils Assessment (Report) dated October 28, 2015 prepared by Shannon & Wilson, Inc. for the City of Edmonds. We appreciate the revisions made to the Report after our meeting with you, Shannon & Wilson, and Washington Department of Ecology (Ecology) on October 7, 2015. The purpose of this letter is to: (a) document the areas of the Report where Chevron Environmental Management Company (Chevron) and Arcadis disagree regarding conditions at the former Unocal Bulk Fuel Terminal (Site); and (b) provide information to the City of Edmonds to consider for further revisions.

Contact:

Scott Zorn

Date:

November 18, 2015

Phone:

206.713.8292

Email:

Scott.Zorn@arcadis.com

Surface Water Cleanup Level. The Report uses the following equation for the surface water cleanup level for total petroleum hydrocarbons (TPH):

Our ref:

B0045362.0006

$$TPH_{SWCUL} = \frac{25}{(0.05)(0.01875f)} \mu g/L$$

This equation only takes into account the gasoline fraction of the sample and does not take into consideration all fractions of TPH and does not adjust them to ensure that the hazard index, or the sum of two or more hazard quotients for multiple hazardous substances and/or multiple exposure pathways, does not exceed 1. In accordance with MTCA Method B, the following equation should be used to document the surface water cleanup level for the site:

Equation 1: $TPH\ CUL = 1/(\%GRO/800+\%DRO/500+\%HO/500)$

Where:

TPH CUL =	Overall CUL adjusted for HI=1
%GRO =	Sample-specific percentage of GRO in groundwater, expressed as a decimal
800 =	Method A groundwater CUL for GRO ($\mu\text{g/L}$)
%DRO =	Sample-specific percentage of DRO in groundwater, expressed as a decimal
500 =	Method A groundwater CUL for DRO and HO ($\mu\text{g/L}$)
%HO =	Sample-specific percentage of HO in groundwater, expressed as a decimal

Soil Cleanup Levels. The Report makes frequent reference to soil contamination at the Site being in excess of calculated cleanup levels, suggesting that contamination exists throughout the Site. There is no basis for such a claim. Except for two areas designated for upcoming remediation in the Public Review Draft Interim Action Work Plan (IAWP), soil elsewhere on the Site currently meets State cleanup standards. See Ecology's statements in their *Draft Comments on Shannon & Wilson Report Willow Creek Daylight Project Contaminated Soils Assessment dated October 6, 2015*:

Under MTCA, cleanup levels are a measure of the concentration of a hazardous substance which is not to be exceeded **on average**. Compliance monitoring procedures provide that for cleanup levels based on chronic or carcinogenic threats the upper ninety-five percent confidence limit on the true mean soil concentration shall be less than the soil cleanup level. Further, up to ten percent of the sample concentrations may exceed the cleanup level so long as no single sample exceeds twice the cleanup level. Compliance monitoring at the Unocal Edmonds site has shown that, outside of the known areas of remaining impacts, only three individual samples out of a several hundred compliance monitoring soil samples exceed the soil TPH remediation level of 2,775 mg/kg, and none exceed twice the cleanup level. One sample exceeds the cleanup level for carcinogenic polyaromatic hydrocarbons, but does not exceed twice the cleanup level.

Environmental Conditions at the Site. Statements in the Report which indicate that cleanup has not been, and will not be, achieved to Ecology's standards are not correct. Cleanup at the former Unocal Edmonds Bulk Fuel Terminal is being completed to meet the most stringent cleanup standards available based on current exposure scenarios, zoning, and land use restrictions. For example, the statement found in the Data Gaps section, third bullet of the Report:

"After in situ remediation, soil will likely continue to have intermittent contamination," This and other statements like it in the Report are defining contamination based on soil reuse or disposal criteria for an unrestricted land use and do not apply to the former Unocal Edmonds Bulk Fuel Terminal Site.

Furthermore, the statement below from the Report would indicate that contamination not only exists, but is re-contaminating the Lower Yard:

"Soil (in the vicinity of sample EX-B18-VV-1-6SW TPH) with a concentration of 4,980 mg/kg reportedly could not be over-excavated due to its proximity to the BNSF ROW (ARCADIS, 2013a). Given the proximity of the ROW to the proposed corridor and the likely tidal influence (ARCADIS, 2012a), the BNSF ROW may serve as a secondary source of contamination to the newly developed channel intermittently along the entire 750-foot length."

The Report fails to recognize that current groundwater monitoring data demonstrate that groundwater in all areas of the Site, except the two areas where further remediation is planned, meets cleanup levels protective of surface water, which for the Site is equal to potable drinking water, i.e., the most stringent cleanup standard under MTCA. The data collected from the area of the proposed Willow Creek daylighting project (adjacent to the above mention of BNSF ROW) shows that soil concentrations are protective of human health and the environment through empirical demonstration per Washington Administrative Code (WAC) 173-340-747(3)(f), and do not pose a risk of recontamination.

Post-remediation Soil Quality Data. The Recommendations section of the Report suggests that contamination levels at the Site have not been well documented.

"Although select hotspots are documented, the quantity and location of contaminated soil that falls below the calculated cleanup criteria is not well documented in existing reports."

Mr. Jerry Shuster
November 18, 2015

This suggestion is unfounded. Soil conditions at the former Unocal Edmonds Bulk Terminal Site have been extensively documented through the collection and analysis of over 1,200 soil samples: confirmation soil samples taken during remedial excavations, additional soil borings, and soil samples collected during installation of select groundwater monitoring wells. Confirmation soil samples were collected on no less than a 25-foot centered grid in all remedial excavations and demonstrate remaining soils are below established cleanup criteria. Confirmation soil samples were collected on floors and side walls of all remedial excavations and provide a robust understanding of soil conditions at the Site. Lastly, all remedial excavations were backfilled with clean backfill soil purchased from an Ecology-approved offsite source that could not contain impacts from the former terminal operations.

In conclusion, we appreciate the revisions that Shannon & Wilson (dated March 19, 2015) made in response to the October 7, 2015 meeting with Ecology, but recommend that further revisions be made to the Report consistent with this letter and Ecology's input. If you should have any questions or further comments, please do not hesitate to contact us.

Sincerely,

Arcadis U.S., Inc.



Scott Zorn
Region Manager

Copies:

Kim Jolitz, Chevron EMC

Dave Cline

From: South, David (ECY) <DSOU461@ECY.WA.GOV>
Sent: Wednesday, November 18, 2015 5:00 PM
To: Jolitz, Kim S; Shuster, Jerry
Cc: Williams, Phil; Zorn, Scott; Dave Cline
Subject: RE: Revised Contaminated Soils Memo- Willow Creek Daylight Project Feasibility Study
Attachments: Use of Method A TPH Values for Surface Water CULs_with_addendum.doc

Actually, an equation can be derived that uses only the gasoline fraction. This is because if the gasoline fraction is known the combined diesel and heavy oil fraction is known, and the cleanup levels for both diesel and heavy oil are the same (500 µg/L). It is simply 1 minus the gasoline fraction.

The derived equation is, with f_G = gasoline fraction:

$$TPH_{SWCUL} = \frac{25}{0.05 - 0.01875f_G} \mu\text{g/L}$$

Note that if $f_G = 0$, the TPH cleanup level comes out to 500 µg/L. If $f_G = 1$ the TPH cleanup level comes out to 800 µg/L. And, of course, everything in between as the gasoline fraction varies between 0 and 1. The f_G term decreases the denominator as f_G increases to 1.

The equation in the draft Revised Willow Creek Daylight Project Contaminated Soils Assessment left out the minus sign between the (0.05) and the (0.01875 f_G), so when $f_G = 1$ the memo equation comes out to 26,667 µg/L, which is incorrect. The equation should be corrected. It would probably be better to use the equation that Arcadis is using because switching to the arcane equation that only uses f_G could be confusing to readers looking at both documents

Also, the report uses the equation in Arcadis memo, not the one I derived. I was trying to get something simpler to code, but the one with all the fractions in it (Equation 1 in Arcadis's comments) is more intuitive.

The full derivation of this extension of Pete Kmet's work is in the attached memo with addendum.

DLS

From: Jolitz, Kim S [<mailto:kjolitz@chevron.com>]
Sent: Wednesday, November 18, 2015 3:29 PM
To: Shuster, Jerry; South, David (ECY)
Cc: Williams, Phil; Zorn, Scott; Dave Cline
Subject: RE: Revised Contaminated Soils Memo- Willow Creek Daylight Project Feasibility Study

Jerry,

Thank you for giving us the opportunity to review the current draft of Shannon & Wilson's Revised Willow Creek Daylight Project Contaminated Soils Assessment, dated October 28, 2015. Attached are comments that Arcadis provided on our behalf on the draft document for your consideration.

Please let me know if you have any questions.

Thank you,
Kim

Kim Jolitz
Project Manager
Mining and Specialty Portfolios Business Unit

Chevron Environmental Management Company
Mining and Specialty Portfolios
6101 Bollinger Canyon Road
San Ramon, CA 94583
Tel +925 790-3946
Fax +925 790-6772
Mobile +925 487-3584
kjolitz@chevron.com

From: Shuster, Jerry [<mailto:Jerry.Shuster@edmondswa.gov>]
Sent: Thursday, November 05, 2015 7:23 AM
To: Jolitz, Kim S; 'South, David (ECY)'
Cc: Williams, Phil; Zorn, Scott; Dave Cline
Subject: [****EXTERNAL****] RE: Revised Contaminated Soils Memo- Willow Creek Daylight Project Feasibility Study

Kim,
Here is the word document.

From: Jolitz, Kim S [<mailto:kjolitz@chevron.com>]
Sent: Tuesday, November 03, 2015 2:15 PM
To: Shuster, Jerry; 'South, David (ECY)'
Cc: Williams, Phil; Zorn, Scott; Dave Cline
Subject: RE: Revised Contaminated Soils Memo- Willow Creek Daylight Project Feasibility Study

Jerry,
Would it be possible to get this in .doc format (Microsoft Word)?
Kim

From: Shuster, Jerry [<mailto:Jerry.Shuster@edmondswa.gov>]
Sent: Friday, October 30, 2015 1:48 PM
To: 'South, David (ECY)'; Jolitz, Kim S
Cc: Williams, Phil; Zorn, Scott; Dave Cline
Subject: [****EXTERNAL****] Revised Contaminated Soils Memo- Willow Creek Daylight Project Feasibility Study

Hello,

We have revised the aforementioned document based on information received our October 7, 2015 meeting at Arcadis' offices and additional information from the draft Interim Action Work Plan. Enclosed is a link to the current document ([Link](#)). This document is an appendix to the current Draft Willow Creek Daylight Final Feasibility Study.

We will be finalizing the document in early December.

Sincerely,

Jerry Shuster, P.E.
Stormwater Engineering Program Manager
Jerry.Shuster@edmondswa.gov

425-771-0220 x1323



City of Edmonds
121 5th Ave N.
Edmonds, WA 98020

DEPARTMENT OF ECOLOGY

May 6, 2003

TO: David South

FROM: Pete Kmet

SUBJECT: Use of the Total Petroleum Hydrocarbons (TPH) Cleanup Levels in Table 720-1 for Developing Method B Surface Water Cleanup Levels under WAC 173-340-730(3)

You have asked how to apply the TPH cleanup levels in Table 720-1 for developing Method B surface water cleanup levels for protection of human health at a site containing a mixture of petroleum products. The answer to your question requires consideration of not only the risk posed by individual petroleum products, but also the additive risk posed by the mixture of those products.

Development of Individual TPH Cleanup Levels based on the Protection of Human Health

Under Method B, surface water cleanup levels that are protective of human health (based on fish consumption) must be established in accordance with WAC 173-340-730(3)(b)(iii)(C), which is set forth below.

(C) Petroleum mixtures. For noncarcinogenic effects of petroleum mixtures, a total petroleum hydrocarbon cleanup level shall be calculated using Equation 730-1 and by taking into account the additive effects of the petroleum fractions and volatile hazardous substances present in the petroleum mixture. As an alternative to this calculation, the total petroleum hydrocarbon cleanup levels in Table 720-1 may be used. Cleanup levels for other noncarcinogens and known or suspected carcinogens within the petroleum mixture shall be calculated using Equations 730-1 and 730-2. See Table 830-1 for the analyses required for various petroleum products to use this method; and...

In brief, the rule provides two options for establishing cleanup levels:

- (1) Calculate cleanup levels using Equation 730-1 and site-specific petroleum product composition data.
- (2) Use the Method A TPH ground water cleanup levels found in Table 720-1, which are based on default petroleum product compositions.

Adjustment of Individual TPH Cleanup Levels based on Total Site Risk

Under Method B, individual cleanup levels, including TPH cleanup levels, must be adjusted downward to account for additive risk in accordance with WAC 173-340-730(5)(a). These adjustments must be made irrespective of how the individual TPH cleanup levels were established. Thus, even if the individual TPH cleanup levels are based on the values in Table 720-1, the individual TPH cleanup levels must be adjusted downward to account for additive risk in accordance with WAC 173-340-730(5)(a).

Application at the Unocal Edmonds Site

In a March 12, 2003 letter to Ecology, Unocal has proposed establishing and applying individual TPH surface water cleanup levels at the Unocal Edmonds site based on the protection of human health as follows:

Regarding the application of the Method A CULs for TPH, it is our understanding that, in demonstrating compliance with the Method A CULs, ground water samples meet the gasoline CUL of 800 ug/L (benzene present), the diesel CUL of 500 ug/L, and the heavy oil CUL of 500 ug/L. It is our understanding that you would not sum the CULs or the TPH concentrations in the sample; each result would be compared individually against the respective CUL for that range. For example, a ground water sample contains TPH in all three ranges at the following concentrations: 700 ug/L in the gasoline range, 400 ug/L in the diesel range, and 300 ug/L in the heavy oil range. Issues of representation, etc., aside, this sample would meet the Method A CULS for TPH.

Although Unocal may establish individual TPH surface water cleanup levels based on the values in Table 720-1 under WAC 173-340-730(3)(b)(iii)(C), those individual cleanup levels must still be adjusted downward under WAC 173-340-730(5)(a) to account for the additive risk posed by the mixture of petroleum products. Consequently, the approach proposed by Unocal is incomplete because it fails to take into account the additive risk posed by the mixture of gasoline, diesel and heavy oil.

Note that each Method A TPH ground water cleanup level in Table 720-1 was based on a noncancer hazard index (HI) of 1. As shown below, applying these cleanup levels without a downward adjustment for additive risk results in the hazard index exceeding 1.

Since the Method A TPH ground water cleanup levels are each based on a hazard index of 1, to meet the requirement that the hazard index = 1 for the overall mixture, the following relationship must hold:

(Equation 1) $(G/800 \text{ ug/l}) + (D/500 \text{ ug/l}) + (O/500 \text{ ug/l}) \leq 1$

Where:

G = Gasoline range organics measured using NWTPH-Gx (ug/l)

D = Diesel range organics measured using NWTPH-Dx (ug/l)

O = Heavy oil range organics measured using NWTPH-Dx (ug/l)

To determine if this relationship is met, the hazard index for a mixture can be calculated as follows:

(Equation 2) $\text{Gas HI} + \text{Diesel HI} + \text{Heavy Oil HI} = \text{Total HI}$
 $(G/800 \text{ ug/l}) + (D/500 \text{ ug/l}) + (O/500 \text{ ug/l}) = \text{HI}$

For the above example, this calculation would be as follows:

$$700/800 + 400/500 + 300/500 = \text{HI}$$
$$0.875 + 0.8 + 0.6 = 2.3$$

Since the hazard index exceeds 1, this sample would fail.

How to apply this approach to prospectively establish a surface water cleanup level for the site is more challenging. I recommend the NWTPH ground water data from the entire site be examined to establish a representative ratio of gas, diesel and heavy oil concentrations for the site or, if there is a lot of variability, representative ratios for subareas of the site. This ratio (or ratios) can then be used to determine the appropriate NWTPH cleanup levels to apply to the site (or subareas of the site).

For example, if the above composition was considered representative of the site, cleanup levels for gas, diesel and heavy oil would be calculated as follows:

(Equation 2) $\text{Gas HI} + \text{Diesel HI} + \text{Heavy Oil HI} = \text{Total HI}$
 $0.875 + 0.8 + 0.6 = 2.3$

Dividing both sides by 2.3 gives an HI = 1

$$(0.875/2.3) + (0.8/2.3) + (0.6/2.3) = 2.3/2.3$$
$$0.38 + 0.35 + 0.26 = 1$$

And the total acceptable TPH can be calculated from the following:

Gasoline CUL = $800 \times 0.38 = 304 \text{ ug/l}$

Diesel CUL = $500 \times 0.35 = 175 \text{ ug/l}$

Heavy Oil CUL = $500 \times 0.26 = 130 \text{ ug/l}$

Total TPH = 609 ug/l

Note that the Table 720-1 TPH ground water values already take into account the noncancer risk posed by all of the components of TPH. Thus, there is no need to establish surface water cleanup levels for protection of human health for individual noncarcinogenic TPH components (such as toluene, ethyl benzene, xylene and naphthalene). However, cleanup levels for these components may still need to be established for other exposure pathways. Also, if other noncarcinogens are present at the site, cleanup levels would need to be established for these substances and a further adjustment made for additive risk.

Because the Table 720-1 TPH values do not take into account carcinogenic risk, if carcinogens such as benzene or cPAHs are present at the site, cleanup levels must be established for these substances using the procedures specified in WAC 173-340-730.

If Unocal believes that this approach is inappropriate for the mixture present at their site, then the site-specific EC fraction data and spreadsheets developed by SAIC can be used to develop site-specific TPH surface water cleanup levels for the site by using Equation 730-1 in accordance with WAC 173-340-730(3)(b)(iii)(C).

Feel free to call me at (360) 407-7199 if you have further questions regarding this matter.

Method A TPH Usage 1.doc

ADDENDUM

The following derivation, performed by David L. South in 2012, results in a simplified equation that is equivalent to Equation 1, above.

Calculating TPH_{SWCUL} start from Eqn.720 – 3:

$$C_w = \frac{(HI)(AT)}{\left[\frac{(DWIR)(DWF)(ED)}{(ABW)(UCF)} \right] \left[\sum_i^n \frac{f(i)(INH(i))}{RfD(i)} \right]}$$

What is the reference dose for TPH_G , TPH_D , and TPH_o ?

Observe that at $HI = 1$, $C_w = TPH_{SWCUL} = 500 \mu g/L$
if Diesel is the only fraction present, that is, $f(i) = 1$ for Diesel

Hence,

$$500 \mu g/L = \frac{(1)(6 y)}{\left[\frac{(1 L/d)(1)(6 y)}{(16 kg)(1000 \mu g/mg)} \right] \left[\sum_1^1 \frac{(1)(1)}{RfD(i)} \right]}$$

$$500 \mu g/L = \frac{(1)}{\left[\frac{(1 L/d)}{(16 kg)(1000 \mu g/mg)} \right] \left[\sum_1^1 \frac{(1)(1)}{RfD(i)} \right]}$$

$$500 \mu g/L = \frac{(1)}{\left[\frac{(1 L/d)}{(16 kg)(1000 \mu g/mg)} \right] \left[\sum_1^1 \frac{(1)(1)}{RfD(i)} \right]}$$

$$500 \mu g/L = \frac{(16,000 kg - \mu g/mg)(RfD_D)}{(1 L/d)}$$

$$\frac{(500 \mu g/L)(1 L/d)}{(16,000 kg - \mu g/mg)} = RfD_D = 0.03125 mg/kg - d$$

Hence $RfD_o = 0.03125 mg/kg - d$,
because the cleanup level for Oil is also $500 \mu g/L$.

And

$$\frac{(800 \mu\text{g}/\text{L})(1\text{L}/\text{d})}{(16,000\text{kg} - \mu\text{g}/\text{mg})} = RfD_G = 0.05\text{mg}/\text{kg} - d$$

Substituting back into Eqn. 72 – 03,

$$TPH_{SWCUL} = \frac{(1)(6\text{y})}{\left[\frac{(1\text{L}/\text{d})(1)(6\text{y})}{(16\text{kg})(1000 \mu\text{g}/\text{mg})} \right] \left[\sum_i^3 \frac{f(i)(INH(i))}{RfD(i)} \right]}$$

$$TPH_{SWCUL} = \frac{(1)}{\left[\frac{(1\text{L}/\text{d})}{(16\text{kg})(1000 \mu\text{g}/\text{mg})} \right] \left[\sum_i^3 \frac{f_G}{RfD_G} + \frac{f_D}{RfD_D} + \frac{f_O}{RfD_O} \right]}$$

$$TPH_{SWCUL} = \frac{(16,000\text{kg} - \mu\text{g}/\text{mg})(1\text{d}/\text{L})}{\frac{f_G}{0.05\text{mg}/\text{kg} - d} + \frac{f_D}{0.03125\text{mg}/\text{kg} - d} + \frac{f_O}{0.03125\text{mg}/\text{kg} - d}}$$

Observe that $f_G + f_D + F_O = 1$, and hence $f_D + f_O = 1 - f_G$

$$TPH_{SWCUL} = \frac{(16,000\text{kg} - \mu\text{g}/\text{mg})(1\text{d}/\text{L})}{\frac{f_G}{0.05\text{mg}/\text{kg} - d} + \frac{1 - f_G}{0.03125\text{mg}/\text{kg} - d}}$$

$$TPH_{SWCUL} = \frac{(16,000\text{kg} - \mu\text{g}/\text{mg})(1\text{d}/\text{L})}{\left(\frac{f_G}{0.05\text{mg}/\text{kg} - d} \right) \left(\frac{0.03125\text{mg}/\text{kg} - d}{0.03125\text{mg}/\text{kg} - d} \right) + \left(\frac{1 - f_G}{0.03125\text{mg}/\text{kg} - d} \right) \left(\frac{0.05\text{mg}/\text{kg} - d}{0.05\text{mg}/\text{kg} - d} \right)}$$

$$TPH_{SWCUL} = \frac{(16,000\text{kg} - \mu\text{g}/\text{mg})(1\text{d}/\text{L})}{\left(\frac{(0.03125)(f_G)}{0.001563\text{mg}/\text{kg} - d} \right) + \left(\frac{(0.05)(1 - f_G)}{0.01563\text{mg}/\text{kg} - d} \right)}$$

$$TPH_{SWCUL} = \frac{(0.001563 \text{ mg/kg} - d)(16,000 \text{ kg} - \mu\text{g/mg})(1 \text{ d/L})}{[0.03125 f_G + 0.05 - 0.05 f_G]}$$

$$TPH_{SWCUL} = \frac{(0.001563 \text{ mg/kg} - d)(16,000 \text{ kg} - \mu\text{g/mg})(1 \text{ d/L})}{[0.03125 f_G + 0.05 - 0.05 f_G]}$$

$$TPH_{SWCUL} = \frac{25}{0.05 - 0.01875 f_G} \mu\text{g/L}$$

APPENDIX L
PROPERTY, REAL ESTATE, AND LAND STRATEGY



Property, Real Estate, and Lands Strategy

Willow Creek Daylight Final Feasibility Study

Partially funded by the Washington Recreation and Conservation Office, Salmon Funding Recovery Board with Puget Sound Acquisition and Restoration program (PSAR) Funding

November 30, 2015

Introduction

This document presents the *Property, Real Estate, and Lands Strategy* as required under Section IV (Design Deliverables) of the funding agreement between the State of Washington (by and through the Salmon Recovery Funding Board [SRFB] and the Recreation and Conservation Office [RCO]) and the City of Edmonds dated 12/4/2013. This document addresses rights of entry, acquisition, and easements required for the project. It provides a summary and professional judgment of discussions with representatives from Chevron Environmental Management Company (CMEC) regarding the availability of the Union Oil Company of California (Unocal¹) property to host part of the channel and with the Burlington Northern Railway Company (BNSF) regarding daylighting the channel under the existing bottomless culverts. It also includes a discussion with the Washington State Department of Transportation (WSDOT), Ferries Division (Ferries). Ferries has placed funds in escrow to acquire the Unocal property. This deliverable is part of the larger permitting and stakeholder consultation discussion required in Appendix D-2 of *Manual 18* for preliminary design deliverables for RCO-funded salmon recovery grants.

History and Current Ownership of Parcels for Proposed Daylighted Willow Creek Channel

Edmonds Marsh is a unique ecological feature in the central Puget Sound basin. Even before it was diked and partially filled, this marsh was likely a rare habitat, and the remnant that we enjoy today is even rarer. Since the early 1900's, approximately 90% of backshore tidal marshes in Puget Sound have been filled for agriculture or other development (People for Puget Sound 2009). Attachment A summarizes the history of Edmonds Marsh and its surroundings, focusing on Willow Creek, one of its tributaries and its sole outlet to Puget Sound.

Figure 1 shows the current parcel ownership in relation to the proposed daylighted channel alignment. The upstream end of the proposed daylighted channel is located on the property currently in escrow. Ferries has entered into a purchase and sale with Unocal to acquire the property. The transfer is contingent on the Department of Ecology (Ecology) being satisfied that Unocal has remediated the site per the requirements of an Agreed Order between Unocal and Ecology.

Leaving the Unocal property, the proposed channel would traverse under the BNSF railroad track and then onto the City-owned Marina Beach Park parcel. In 2011, BNSF constructed two bridges to allow the future daylighted channel to travel under the current track a planned future track. The bridges were

¹ Unocal is a wholly-owned, indirect subsidiary of Chevron.

paid for by Sound Transit as mitigation for track work needed for the commuter rail line north of Edmonds.

Property owners adjacent to the parcels that would host the proposed daylighted channel include the Port of Edmonds and the Pt. Edwards Condo Association. Edmonds Marsh, owned by the City of Edmonds, is the parcel upstream of the Unocal property (Figure 1). A list of contacts for all property owners and adjacent property owners is presented in Attachment B.

Unocal Property

Since this parcel is currently in escrow, the discussion of this property is divided into two sections: 1) Discussions/agreements with Unocal and 2) Discussions/agreements with Ferries.

Unocal

The City has engaged Unocal (via CEMC) on many different occasions regarding the Willow Creek Daylight project. The initial meeting was in March 2012 during the alternatives analysis of the early feasibility Study. From that meeting the City and Unocal entered into a Site Access Agreement. This Agreement allowed the City and its contractors access to the Unocal site for one year from the effective date to survey the proposed daylight channel alignment. The Agreement was modified by both parties in August 2012 to allow the City to install a data logger to measure the water levels in Willow Creek. The Agreement was modified again in August 2013 to allow the City's contractor to access the data logger and to remove it no later than July 31, 2014.

In April 2013, the City provided CEMC an opportunity to comment on the draft Early Feasibility Study. Comments were received from CEMC in early May 2013 and incorporated into the final report. The City also shared its water level data for Willow Creek with CEMC, per their request.

In May 2014, the City submitted a pre-proposal to the RCO/SRFB Board, for preliminary design of the daylighted Willow Creek channel. One of the comments from RCO/SRFB on the pre-proposal was to include a Landholder Acknowledgement Form for the Unocal property when the City submits a full proposal in August of this year. This form specifies the legal owner of the property, acknowledges that the property owner knows the daylighted channel is proposed on the property, and that the property owner is willing to talk to the City about the project. CEMC responded that Unocal is unable to complete the requested form as the property is under contract for sale.

The City met with representatives from CEMC in June 2014. The parties updated each other on the activities of their respective projects and agreed to share additional data about the property. CEMC also told the City that access by third parties (other than CEMC and Ecology) is no longer permitted since the property is an open environmental case with Ecology and in escrow for sale.

CEMC has planned additional site cleanup actions at the site for the summer of 2016. The main objectives of this interim action are to remediate soil in the Lower Yard that contains petroleum hydrocarbon concentrations above the soil remediation levels and cleanup levels in two areas: Detention Basin 2 (DB-2) and the WSDOT stormwater line. The project also includes additional data

collection. The remediation will include a dual-phase extraction (DPE) system along parts of the WSDOT stormwater line that traverses the property (CMEC 2015). The DPE system is to be transferred to WSDOT once the requirements of the purchase and sale agreement between Unocal and Ferries are met (Ecology 2015).

WSDOT Ferries Division

The City of Edmonds has been engaged with Ferries on the Willow Creek daylighting project since it was first proposed during the Edmonds Crossing environmental impact statement (EIS) process (U.S. Department of Transportation, et al., 2004). Edmonds Crossing was a proposed multi-modal transportation hub that included a new ferry terminal just south of the Port of Edmonds southern breakwater. The preferred alternative in the final EIS shows a daylighted channel flowing through the proposed ferry terminal and out to Puget Sound via Marina Beach park (Figure 2). The Edmonds Crossing project is currently not included in the current long-range plan for Ferries (WSDOT 2009).

The City met with representatives from Ferries and Ecology in July 2014. All parties exchanged information about the Unocal site, the status of the cleanup, and plans for the creek daylighting. Ferries stressed that the City should stick as close as possible to the channel alignment in the Edmonds Crossing final EIS, even though it is not in their current long-range plan. All parties agreed that they will stay in contact with each other on the status of their respective projects.

Since the daylighted channel is proposed to pass through Marina Beach Park, the City of Edmonds, Parks Department initiated a master planning process for the parcel in late 2014. The main objective of the plan was to reconfigure the park to accommodate both the current level of recreational opportunities and the new daylighted tidal channel.

During this master planning process the City engaged Ferries on multiple occasions. First, in February 2015 as part of the stakeholder interview process for the master plan. During the stakeholder interview, the Ferries' representative explained that the record of decision for Edmonds Crossing EIS allows them to proceed with the project whenever it is funded. Ferries is also starting to update their long-range plan and it will likely include Edmonds Crossing since ridership is up.

After the second open house for the Marina Beach master plan was held in May 2015, Ferries requested a meeting with the City of Edmonds to further discuss the Edmonds Crossing project. A meeting was held in early June 2015. Ferries was concerned that the conceptual drawing of park alternatives did not include Edmonds Crossing. The preferred alternative for Edmonds Crossing shows a fly-over on the northeast edge of the park (Figure 2).

A third open house for the Marina Beach master plan was held in early July 2015. Per the request of Ferries, the graphics presented at this meeting included the possible Edmonds Crossing project along the northeast part of the park. The on-site parking beneath the schematic alignment of the proposed Edmonds Crossing project was reconfigured in the Master Plan to best minimize potential future conflicts between the two uses.

At a separate meeting with the Marina Beach Master Plan project team, Ferries reiterated that they are starting to revise their long-range plan and Edmonds Crossing will likely be included, maybe in a 6-to 12-year time-frame, although nothing has been decided. The update of the long-range plan will include significant public and agency participation over a 1-2 year span that will shape the final document. Based on these meeting, the City and Ferries are going to explore the idea of a joint development agreement so both the City and Ferries are able to implement their project in a manner that meets everyone's needs.

In addition, the City of Edmonds is has recently begun a Waterfront Analysis project with Ferries, Sound Transit, BNSF, and other agencies. The project's goal to developed alternatives to improve access and safety at the Main Street and Dayton Street at-grade railroad crossings railroad along the Edmonds waterfront. One focus area of this study is to explore options to the current Edmonds Crossing Project. The alternatives analysis is scheduled to be completed by the end of 2016. The Willow Creek daylight project team will be following this study closely.

BNSF Railway Company

To date City staff have met with representatives of BNSF on two separate occasions. First in February 2015 during the stakeholder's interviews for the Marina Beach Park Master planning process. BNSF reiterated they worked with Sound Transit on design and construction of the existing culverts for the daylight project. All track crossings (including the proposed daylighted creek under bridges) would need to be reviewed and approved by BNSF. Adequate site distance to tracks and signals will be required as well as barriers to deter unauthorized access to tracks.

The City also met with BNSF on May 27, 2015 to discuss possible cross-section options of the daylighted channel adjacent to their tracks. Issues discussed included fencing, channel liner anchoring, and BNSF review timelines. A process was set up for submittals to BNSF for future project deliverables. BNSF offered to begin a draft permit for running the creek under the existing bridges. This will be a help to future grant proposals for the project.

Current Property, Real Estate, and Lands Strategy

This discussion will begin at the downstream end of the proposed daylighted channel and work upstream. It begins in the City-owned Marina Beach parcel, proceeds to the BNSF right-of-way, and then onto the Unocal property.

As of the date of this document (November 2015), the City is completing the final Draft of Master Plan for Marina Beach Park. This plan will be presented to City Council in early 2016 for adoption. . The City worked closely with Ferries to accommodate, as best as possible, the potential Edmonds Crossing Terminal that may be located along the northeast part of the park. The Plan includes the added amenity of a daylighted channel though the property. The City has had discussions with the adjacent property owner, the Port of Edmonds, regarding the Master Plan.

The City has had fruitful discussions with BNSF regarding daylighting the Willow Creek under the existing track bridges. Communication and review protocols have been setup between the City and BNSF for project information and review of future project design documents. The City and BNSF will soon begin working on a draft permit from the railroad for the daylighted creek.

The progress on obtaining agreements for the daylighted channel on the Unocal property has been less straight-forward. The ownership is complex. The property is currently in escrow. Unocal is the seller and Ferries is the buyer. Ferries originally entered into the purchase and sales agreement to build the Edmonds Crossing project. The fate of that project is currently very unclear.

In addition, the Unocal property is undergoing a cleanup activity based on an Agreed Order between Unocal and the Department Ecology. The site must be “cleaned up” per the criteria in the Agreed Order before it can transfer to Ferries. The timeline for the completion of the cleanup will be determined by the success of the interim action scheduled for summer 2016.

The City is vigilantly working with Ferries, Ecology, and Unocal to push the agenda of a daylighted channel through the Unocal property. No agency is against the daylighted channel and the City will continue to push for the approval of the project with all property owners.

References

- CEMC, 2015. Public Review Draft Interim Action Work Plan, Former Unocal Bulk Fuel Terminal. Chevron Environmental Management Company. July 6.
- Ecology, 2015. E-mail from David South Senior Engineer, Department of Ecology to Jerry Shuster, City of Edmonds and to Kojo Fordjour and Patrick Svoboda, Washington State Department of Transportation, Ferries Division. April 27.
- People for Puget Sound, 2009. *Biological Condition of the Edmonds Waterfront and Preliminary Feasibility Considerations for Nearshore Ecosystem Restoration*. Prepared for The Maria Norbury Foundation. January 31.
- U.S. Department of Transportation, et al., 2004. *SR 104 Edmonds Crossing, Final Environmental Impact Statement and Final Section 4(f) Evaluation*. U.S. Department of Transportation, Federal Highway Administration, Federal Transit Administration, Washington State Department of Transportation, and City of Edmonds. November. FHWA-WA-EIS-98-1-F.
- WSDOT, 2009. *Edmonds Ferry Terminal Draft Minimum Build Concept Analysis*. Washington State Department of Transportation, Ferries. January.



FIGURE 1



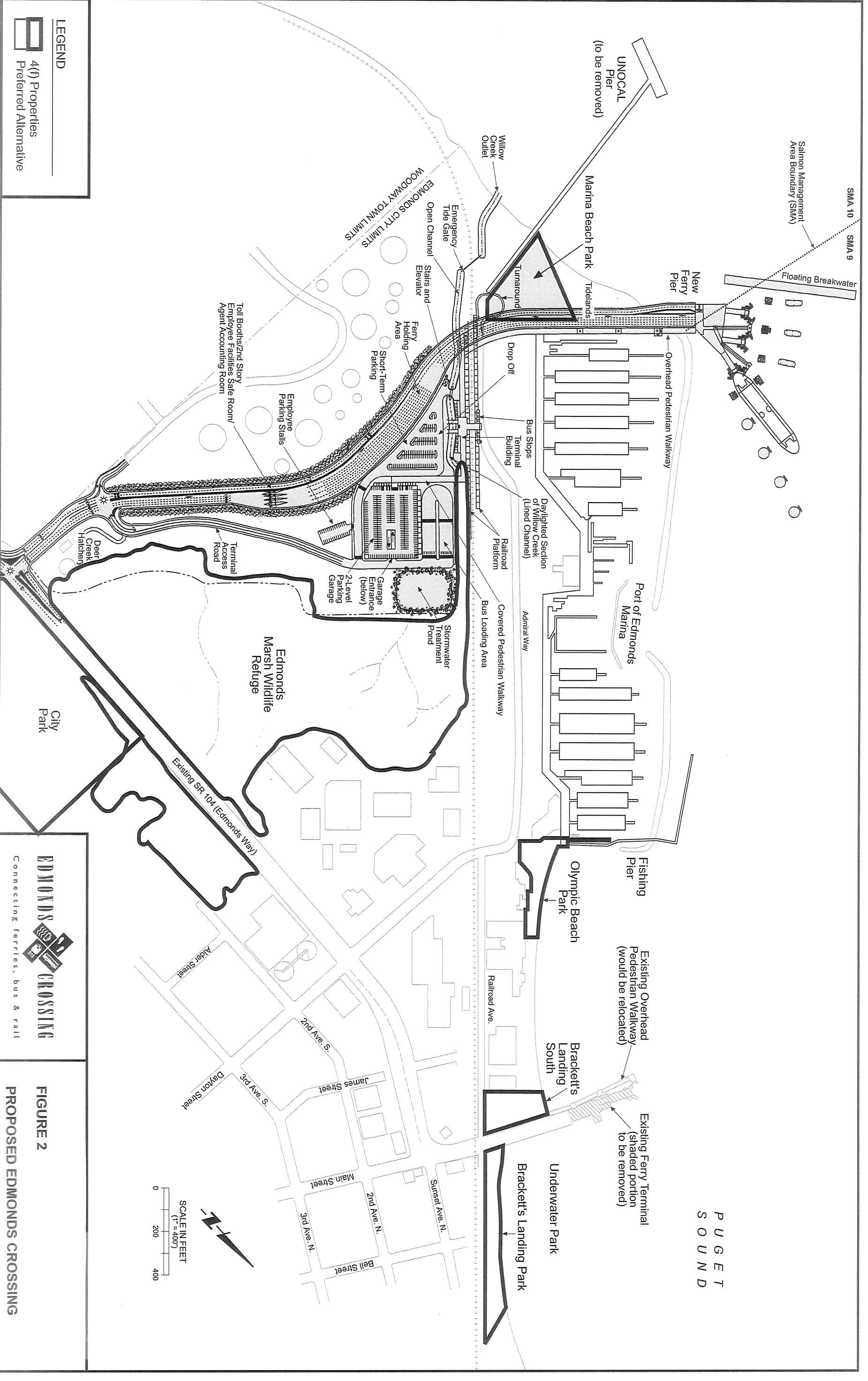
1 in = 300 ft



- Storm Pipes
- Parcel Boundaries
- Approximate location of future daylighted Willow Creek

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LEGEND

4(f) Properties

Preferred Alternative

PUGET
SOUND

SCALE IN FEET
(1" = 400')

0 200 400

EDMONDS CROSSING
Connecting ferries, bus & rail

FIGURE 2
PROPOSED EDMONDS CROSSING

ATTACHMENT A

A BRIEF HISTORY OF EDMONDS MARSH

A BRIEF HISTORY OF EDMONDS MARSH

Historically, Edmonds Marsh connected to Puget Sound via braided tidal channels (Figure A-1). Two small freshwater creeks discharge into the Marsh, Willow Creek from the south and Shellabarger Creek from the east (Figure A-2). The outlet from the Marsh to the Sound is known as Willow Creek.

In 1891, final construction of the Great Northern Railway tracks on a man-made berm limited the direct saltwater connection between the Marsh and Puget Sound. The berm was built to an elevation well above high tide (Watershed Dynamics, Inc. 1991). Most likely, at least one culvert was installed to allow the tidal flow to pass under the tracks. Union Oil of California (Unocal) acquired the property in 1920. Sometime after Unocal's acquisition, the area was known as Union Oil Marsh. Prior to 1947, the main channel from the Marsh to the Sound bisected the Marsh in what is now the Unocal Lower Yard prior to traveling under the railroad tracks. When Unocal imported the fill material for the Lower Yard, the channel or channels were relocated into a newly excavated single new channel along the northern and northwestern portion of the Unocal property (EMCON Northwest, Inc., 1994).

The open channel downstream of the railroad crossing was routed into a pipe when the Port of Edmonds built its south marina in 1961-1962 (Port of Edmonds. 2009). At that time, a tide gate was installed in the pipe that allowed water out of the Marsh but did not allow saltwater back into the Marsh. The loss of this tidal exchange resulted in major change to in the Marsh ecosystem from a saltwater estuary to a freshwater Marsh (Watershed Dynamics Inc. 1991).

In 1981, Unocal quit claimed approximately 24 acres to the City of Edmonds in 1981. This area then became known as Edmonds Marsh. In 1984, the City of Edmonds received a Coastal Zone Management grant through Ecology to study public access improvement to the Edmonds waterfront area. A habitat evaluation of the marsh under this grant recommended the reestablishment of tidal influence within the marsh to restore its historical saltmarsh plant community and to increase habitat diversity (The Watershed Company 1987). As a result of this study, the City of Edmonds began propping opening tide gate from approximately March 1 through September 30. The tide gate is close annually on October 1.

REFERENCES

EMCON Northwest, Inc., 1994. *Background History Report, Unocal Edmonds Bulk Terminal, Edmonds, Washington*. February 15.

Port of Edmonds. 2009. *A Brief History of the Port of Edmonds, How it began...What it is today*. February.

The Watershed Company. 1987. *Union Oil Marsh Habitat Evaluation and Enhancement Recommendations*. Prepared for the City of Edmonds. Funded by the Washington State Department of Ecology Coastal Zone Management Grant #G0087044. June 30.

Watershed Dynamics, Inc. 1991. *Feasibility Study Willow Creek/Union Oil Marsh Enhancement Plan*. Prepared for the City of Edmonds Parks and Recreation Division. June 30.



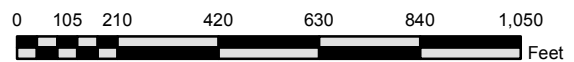
Figure A- 1 – 1872 Topographic Survey with Existing Shoreline

T-1389b;United States Coast & Geodetic Survey Topographic Sheet, Admiralty Inlet, Possession Sound to Point Edmund, Washington Territory; 1872; Scale: 1:10,000; Surveyor: Jas. S. Lawson.



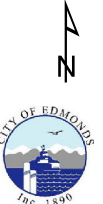
Figure A-2

- Storm Pipes
- Edmonds_Parcels_2015_03



1 in = 400 ft

No warranty of any sort, including accuracy, fitness, or merchantability accompany this product.



ATTACHMENT B

CONTACTS FOR ALL PROPERTY OWNERS AND ADJACENT PROPERTY OWNERS

Willow Creek Daylight Project Contact List

City of Edmonds - Willow Creek Daylight / Marina Beach Master Plan Project Team			
Agency/Company	Name	Phone Number	e-mail Address
City of Edmonds	Jerry Shuster, Project Manager, Willow Creek Daylight	(425) 771-0220	Jerry.shuster@edmondswa.gov
	Phil Williams, Public Works & Utilities Director	(425) 771-0235	Phil.williams@edmondswa.gov
	Carrie Hite, Parks, Recreation & Cultural Services Director	(425) 771-0253	Carrie.hite@edmondswa.gov
	Kernen Lien, Senior Planner, Critical Areas	(425) 771-0220	Kernen.Lien@edmondswa.gov
EarthCorps	Keely O'Connell, Project Manager Willow Creek Daylight	(206) 322-9296	keeley@earthcorps.org
Shannon & Wilson	Dave Cline, Consultant Project Manager, Willow Creek Daylight	(206) 695-6885	DRC@shanwil.com
Walker/Macy	Chris Jones, Marina Beach Master Plan, Consultant Project Manager	(206) 582-3874	cjones@WalkerMacy.com

Chevron Project Team (Unocal property cleanup)			
Agency/Company	Name	Phone Number	e-mail Address
Chevron Environmental Management Company	Kim Jolitz, Project Manager	(925) 790-3946	kjolitz@chevron.com
Arcadis U.S., Inc.	Scot Zorn, Consultant Project Manager	(206) 726-4709	scott.zorn@arcadis-us.com
Lund Consulting	Kjris Lund, Communications Consultant	(206) 442-4254	klund@lundconsulting.com

Department of Ecology (Unocal property cleanup)			
Agency/Company	Name	Phone Number	e-mail Address
Department of Ecology	David South, Senior Project Manager	(425) 649-7200	dsou461@ecy.wa.gov
	Nancy Lui, Admin. Assistant	(425) 649-7117	nlui461@ecy.wa.gov

WSDOT- Ferries Division (Unocal property cleanup and Marina Beach Master Plan)			
Agency/Company	Name	Phone Number	e-mail Address
WSDOT Ferries	Nicole McIntosh, Terminal Engineering Director	(206) 515-3701	mcintosh@wsdot.wa.gov
	Mehrad Moini, Terminal Engineering Deputy Director	(206) 515-3400	moini@wsdot.wa.gov
	Kojo Fordjour, Environmental Permitting Manager	(206) 515-3650	fordjok@wsdot.wa.gov

Primary Contacts are in **Bold**

Willow Creek Daylight Project Contact List (continued)

BNSF Railway Company (Willow Creek Daylight)			
Agency/Company	Name	Phone Number	e-mail Address
BNSF Railway	Walter Smith, General Director Engineering & Construction	(206) 625-6135	Walter.Smith@BNSF.com
	Rick Wagner, Manager Public Projects	(206) 625-6135	Richard.Wagner@BNSF.com

Port of Edmonds (Willow Creek Daylight & Marina Beach Master Plan)			
Agency/Company	Name	Phone Number	e-mail Address
Port of Edmonds	Bob McChesney, Executive Director	(425) 774-0549	bmcchesney@portofedmonds.org
	Marla Kempf, Deputy Director	(425) 673-2012	MKempf@portofedmonds.org

Point Edwards Homeowner Association (Unocal property cleanup)			
Agency/Company	Name	Phone Number	e-mail Address
Point Edwards Owner Association	Kathy Marsh	425-673-0616	kathym@pointedwardshoa.com

Primary Contacts are in Bold

APPENDIX M

**COMMENTS FROM THE WATER RESOURCE INVENTORY AREA 8 TECHNICAL
COMMITTEE AND THE CITY OF EDMONDS' RESPONSES**



Lake Washington/Cedar/Sammamish (WRIA 8) Watershed

201 S. Jackson Street, Suite 600
Seattle, WA 98104-3855

December 2, 2015

Jerry Shuster
City of Edmonds
121 5th Avenue N.
Edmonds, WA 98020

RE: Willow Creek Daylighting Final Feasibility Study – WRIA 8 Review Comments

Dear Mr. Shuster:

Per your request, the Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Technical Committee was provided the Draft Willow Creek Daylighting Final Feasibility Study for review and comment. Both the Technical Committee and WRIA 8 staff appreciate the opportunity to provide input prior to the draft report being finalized, and we appreciate the City's interest in maximizing the restoration opportunity for the benefit of salmonids. The purpose of this letter is to transmit to you the Technical Committee's comments, which are summarized below.

Overall, the draft final feasibility report appears comprehensive and contains a number of important and useful recommendations. Based on the analysis presented, it appears that the preferred alternative will offer channel characteristics and flow velocities allowing juvenile salmon to access the channel and the marsh to the maximum extent possible given site constraints. Specific recommendations and considerations are as follows:

- 1) Section 2.6.4 highlights the limited quantitative water and sediment quality data on stormwater runoff entering Edmonds Marsh and Willow Creek. The study recommends that a stormwater and sediment sampling and analysis plan be developed to evaluate the potential effects of stormwater and chemical contaminants on fish. In addition, Section 10 highlights important issues related to potential site contamination that require additional sampling and analysis (for example, groundwater modeling to evaluate the effects of installing an HDPE protective liner beneath a section of daylighted creek). Given the high estimated costs and uncertainties related to the liner, potential soil contamination, the issues of site contamination and existing pollution loadings, and their potential effects on fish and other organisms, these issues should continue to be investigated. In order to anticipate likely comments during future Salmon Recovery Funding Board reviews, we suggest that these topics are clearly articulated and addressed, and that feasible mitigation steps are identified, in advance of seeking additional salmon recovery funding for design.
- 2) Section 2.6.1 references warm water in the currently confined open Willow Creek channel, and high water temperatures and low dissolved oxygen in the marsh are noted in Section 2.6.2. Further explanation of the water temperature expectations in a new daylighted channel would be helpful to ensure conditions are conducive to juvenile Chinook salmon use. Moving forward

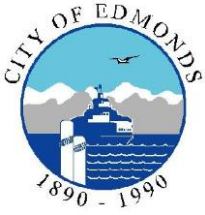
into the design process, the City should attempt to maximize a dense buffer of riparian vegetation along the daylighted channel, complemented by instream habitat structure.

- 3) We appreciate the extensive coordination being initiated by the City of Edmonds with relevant stakeholders and adjacent landowners. The report states that the preferred alignment does not conflict with the future Edmonds Crossing ferry terminal preferred alternative, and we encourage continued coordination with WSDOT Ferries to ensure that conflicts do not emerge as the two projects advance. To echo a comment of WSDOT Ferries noted in Section 11.2, it would be helpful for the Edmonds Crossing preferred alternative to be illustrated on the Willow Creek Daylighting conceptual drawings. Furthermore, it would be helpful to better understand whether the anticipated new ferry terminal at the proposed location could compromise a daylighted Willow Creek channel or result in undesirable impacts to the channel from a habitat restoration perspective. If the ferry terminal and parking will be on the Unocal site, the City should seek ways to maintain an intact stream buffer along the daylighted stream channel and, preferably, preserve space for channel sinuosity along Admiral Way.
- 4) The design plan shows the existing Willow Creek outfall will be abandoned. The pipe should be removed if possible; at a minimum, the pipe should be capped or screened in a manner that ensures fish or other aquatic species don't travel up it once it is decommissioned.
- 5) The description of Alternative 1 mentions dog park exclusion fencing, and Section 15 states dog access to the channel should be restricted. We concur with this recommendation. The dog park location, south of the new daylighted channel alignment, seems problematic. With the level of investment required to implement the project and the goal of providing functional nearshore habitat, it is preferable that the dog park not present conflicts with the restored channel. If relocating the dog park to another area is not feasible, we would like to see the next phase of design determine ways to maximize the stream buffer and eliminate the potential for undesirable user conflicts.
- 6) The City should consider limiting the number of pedestrian crossings over the new channel in Marina Beach Park to one—or eliminating crossings altogether if practical—to allow for dynamic channel processes. If a crossing is necessary, it should be designed in a way that does not limit natural channel movement. In particular, the downstream pedestrian crossing as illustrated in Figure 8 seems to be located in an area that would limit or restrict natural channel processes, which should be avoided to the extent possible.
- 7) Section 4.4 references herbicide applications as a possibility for reducing cattails. We prefer the City use methods other than herbicides to remove cattails in the marsh.

Thank you for the opportunity to review and provide comments on this report. If you have any questions, please contact me at 206-477-4786 or jason.wilkinson@kingcounty.gov.

Sincerely,

Jason Wilkinson
Actions and Funding Coordinator, Lake Washington/Cedar/Sammamish Watershed (WRIA 8)



CITY OF EDMONDS

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DAVE EARLING
MAYOR

PUBLIC WORKS DEPARTMENT

Engineering Division

December 15, 2015

Jason Wilkinson
Actions and Funding Coordinator
Lake Washington/Cedar/Sammamish Watershed (WRIA 8)
201 S. Jackson Street, Suite 600
Seattle, WA 98104-3855

**SUBJECT: WRIA 8 Review Comments
Willow Creek Daylighting Feasibility Study**

Dear Jason,

Thank you to the members of the WRIA 8 technical committee for the time and effort in preparing comments on the aforementioned document.

We appreciate your overall assessment of the draft report. The following provides responses to the numbered comments in your December 2, 2015 letter:

- 1) The City agrees that the current uncertainty related to potential soil contamination should be addressed. Since the Unocal property is still under a Department of Ecology cleanup action, access to the site to reduce the uncertainty is not available at this time. Section 2.6.4 of the report recommends sampling and analysis along the daylighted channel excavation areas on the Unocal property to reduce the uncertainty. The City will pursue this at the earliest possible time in the design process. The results of the sampling and analysis may show that a liner is not needed for the daylighted channel or that it is only needed for a portion of the channel.

Section 6.6 also recommends sediment and water quality data collection along the upper, City-owned, marsh and tidal channel excavation areas. The current plan is to collect sediment and water quality data along the proposed upper marsh tidal channel excavations in 2016.
- 2) The City will modify Section 15 of the report to include discussion of water temperature expectations in the future channel. The flow regime and riparian conditions along the mostly bare, daylighted channel will shift from a shallow, mixed tidal and stream flow condition, to a predominately tidal flow condition with dense riparian vegetation. The tidal flows, in combination with riparian plantings and large woody debris habitat cover will result in lower water temperatures than the observed shallow flows from the streams in the marsh.
- 3) The City is working very closely with Washington State Ferries Division on the future of the Edmonds Crossing project and how it may impact this project. Ferries and the City are

exploring the idea of a joint development agreement so both the parties are able to implement their project in a manner that meets everyone's needs.

- 4) The segment of the current Willow Creek pipe that parallels Admiral Way is owned by the Port of Edmonds and the City "rents" the pipe to run water through it. The City is in negotiation with the Port on the future of the aging pipe. The pipe segment running through Marina Beach Park is owned by the City. Plugging and/or screening its entrance are options being discussed.
- 5) After a robust public process, it was the desire of the community to continue to maintain a dog park in its current location. The design of the park allows for a wider buffer, and fencing to mitigate the conflicts of dogs and the channel.
- 6) Again, during the robust public process, the community identified the desire for two pedestrian bridges. The second, downstream bridge was added as "optional" dependent upon the budget and future studies.
- 7) We agree that using mechanical and biological methods for cattail removal are preferable over herbicides. In the design phase we will consider a range of alternative methods for cattail and invasive species removal and control. These include digging or pulling out plants, cutting below the mud or water line, mowing, inundation and flooding with tidal saltwater, or herbicide applications. An integrated pest or invasive species management plan will be developed at the design phase of the project.

Thank you again for your comments. The City looks forward to working with you on the next phase of this project.

Sincerely,

A handwritten signature in blue ink, appearing to read "Jerry Shuster", with a long horizontal flourish extending to the right.

Jerry Shuster, P.E.,
Stormwater Engineering Program Manager

cc: Josh Lambert, Outdoor Grants Manager, Salmon Recovery Funding Board, Recreation and Conservation Office
Carrie Hite, Parks, Recreation, and Cultural Service Manager, City of Edmonds
Dave Cline, Project Manager, Shannon & Wilson
Keeley O'Connell, Senior Project Manager, EarthCorps