Unocal Cleanup Report

Edmonds Marsh Estuary Advocates, 8/20/2023

Contents

1. Introduction

The initial purpose of this document is to provide background details to support the generation of questions for Ecology prior to the 45 day period when documents will be reviewed by the public. A draft Cleanup Action Plan (CAP) will be a critical part of that review and this information document will be edited after the CAP is made public. The ultimate purpose of information documents is to generate a list of goals for public input that can guide Ecology decisions about how final site cleanup will occur.

Draft questions are attached at the end of the report. Please edit/comment/add to the questions by responding through the EMEA email address. A partial list of draft goals that will be edited prior to the public comment period is also attached. These are meant to be help individual members of the pubic in their responses to Ecology and will be edited as the public comment period approaches.

Information presented here comes from documents discussed in the Notes section below and from sources listed in the References section.

A synopsis of this full document is included below. Various levels of study can be applied to the Unocal cleanup. The synopsis below provides a broad overview with the full document providing more detail. The source references can be researched for Chevron, Arcadis (the Chevron contractor), and Ecology data. Chevron by way of acquisition of Unocal is the entity responsible for cleaning up the Unocal site. .

2. Synopsis

Beginning in the early 1920's, Union Oil Company of California (Unocal) operated a bulk fuel oil terminal and asphalt plant at the site of the Edmonds Marsh. The Unocal site was divided into an Upper Yard and a Lower Yard. The Lower Yard was constructed by filling sections of the historic marsh during the 68-year operation of the Unocal facility. As a result of these operations, petroleum products and other pollutants were released into the environment causing soil, sediment, and groundwater at the site to become contaminated.

After operations ended, Unocal and the Washington Department of Ecology (Ecology) entered an Agreed Order in 1993 to conduct investigations and to begin interim cleanup actions at the site. A subsequent Agreed Order in 2007 required Unocal to conduct further interim cleanup actions to remediate soil, groundwater, and sediment; and to monitor groundwater in the Lower Yard. These interim actions are expected to be completed at the end of 2023.

Interim site cleanup levels (CULs) for soil, surface water, and groundwater were established by Ecology for the contaminants of concern (COCs). Cleanup levels and method decisions have been impacted by the now outdated plans for commercial site use and the Edmonds Crossing project that has been eliminated for consideration by WSDOT. Interim cleanup levels are based on human health impacts. Levels based on the protection of plants and animals that are in close contact with contaminated soil would be more restrictive. Final cleanup levels are being drafted now and have not yet been made public.

In 2005, WSDOT and Unocal entered a purchase and sale agreement. WSDOT agreed to place $8,175,000 into escrow. The agreement specifies that Unocal can pay for remediation expenses from that escrow account. Escrow will close and the title will be transferred within 30 days of receiving confirmation from Ecology that Unocal has "performed the Capital Remediation Work."

The primary remediation interim cleanup action used has been the mass excavation of contaminated soil in the Lower Yard. However, several areas were not excavated due to structural limitations and the cost of excavation evaluation done by Chevron.

The previous Agreed Order was amended in 2017 to require that the Final Interim Action Plan be implemented. This plan specified that remaining contaminated soil left in place be treated with a dual phase extraction (DPE) well system combined with soil vapor extraction. Groundwater is pumped and treated from the DPE wells to lower the water table while the vapor extraction system removes volatile contaminants from the exposed soil.

Since the interim actions have been implemented, Ecology has been concluded that no further cleanup is necessary in places where excavations have occurred in the Lower Yard. However, impacts to soil and groundwater still remain in the area around the Point Edwards and WSDOT stormwater pipelines. One selected remedy for treatment is continued operation of the DPE system in that area.

Another proposed remedy is the implementation of an environmental covenant and engineered controls. This remedy includes the installation of physical barriers to prevent exposure to potential receptors and that the barriers be maintained in the future. The physical barrier remedy would result in cleanup standards not being met across the entire site, i.e. not where contaminated soil has been left in place under a physical barrier.

A Cleanup Action Plan (CAP) will follow the Interim Action Plan. A draft CAP has been produced by Unocal and submitted to Ecology. The CAP, when approved by Ecology, will be available for public comment, along with the Feasibility Study, draft Consent Decree, and State Environmental Policy Act (SEPA) permit.

A monitoring phase will follow the cleanup actions. Compliance testing will be mainly done through periodic groundwater sampling. Established cleanup levels (CULs) for a minimum of eight consecutive quarterly periods (i.e., 2 years) must not be exceeded during this phase. A contingency plan must be developed and submitted to Ecology if exceedance of CULs is confirmed. Contingency steps could include continued operation of the DPE system, excavation, thermal remediation, and/or extending the life of the WSDOT pipeline.

3. Acronyms and Notes

CAP – Cleanup Action Plan (final version, not Interim)
cPAH - carcinogenic Polycyclic Aromatic Hydrocarbon
CUL - CleanUp Level
DB-2 – Settling basin 2
DPE – Dual Phase Extraction
FIAWP - Final Interim Action Work Plan
MTCA – Model Toxic Control Act
REL – Remediation Level
TEE - Terrestrial Ecological Evaluation
TPH - Total Petroleum Hydrocarbons which is combined gasoline range organics (GRO), diesel range organics (DRO), and heavy range oil organics (HO).
WSDOT - Washington State Department of Transportation

Elevations are based on NAVD88 mean sea levels.
The Table of Contents are linked to the sections for ease of navigation. Opening the sidebar in Word and selecting the Contents icon leaves it on-screen while the document text is open.
Pages and figure numbers are references to the Final Interim Action Work Plan July 19, 2016, which is attached to the UNOCAL Edmonds Agreed Order Amendment.
Other relevant documents for reviewers are attached to the UNOCAL Edmonds Agreed Order Amendment:

- The Terrestrial Ecological Evaluation, Appendix E, FIAWP p. 305
- The SEPA Checklist, Appendix H, FIAWP p. 502

Cleanup alternatives and costs are discussed in the Draft Final Feasibility Study Report.

4. Timeline

- 1923-1991, UNOCAL site operation
- 1953-seventies, asphalt plant operation
- 1965, lower yard fill completed
- 1972-75, WSDOT stormdrain installed
- 1993, Agreed Order - agreement between parties, investigations begin
- 2001, CH2M Hill EIS for Edmonds Crossing, included wetland delineations
- 2001, remediation of the Upper Yard begins
- 2001, interim action begun removing soil and groundwater from four areas of the Lower Yard
- 2003, Upper yard sold to Point Edwards, LLC, Point Edwards stormdrain installed
- 2003, additional interim actions, soil excavations in the southwest Lower Yard and DB-1
- 2004, Landau Assoc study of offsite areas (Admiral Way, BNSF railroad, Port property)
- 2005, Purchase and Sale Agreement with WSDOT for the Lower Yard
- 2007, Agreed Order to conduct an interim remedial actions to remediate, supersedes previous orders
- 2015, Determination of Nonsignificance for remediation of 2 remaining areas issued based on SEPA checklist
- 2016, Final Interim Action Plan – additional interim actions at Detention Basin 2 and the WSDOT stormdrain area
- 2017, Agreed Order Amendment DE4460, required that interim actions be performed
- 2017, DPE system installed
- 2023, Ecology preparing draft final documents

5. Model Toxics Control Act Regulation

Cleanup of the site is occurring under the Ecology Model Toxics Control Act (Chapter 173-340 WAC). Cleanup levels are derived under the regulation based on the current and expected future use of the property. Use restrictions are allowed and may be required depending on the current and future land use.

Cleanup levels and points of compliance, must be established for each site. When more than one method of cleanup is used at a site, it may be necessary to establish "remediation levels" to indicate what concentrations of contaminants will be handled using the different cleanup methods.

There are three options for establishing cleanup levels:

- Method A: Method A cleanup levels are used for routine cleanup actions where there are relatively few hazardous substances impacting soil or groundwater. Common contaminants and their respective Method A cleanup levels are listed in the MTCA regulation.
- Method B: Method B cleanup levels are the universal method for determining cleanup levels for all media at all sites. Method B cleanup levels are used at more complex cleanup sites involving multiple contaminants affecting several media with multiple exposure routes. Sites that are cleaned up to Method B cleanup levels generally do not need future restrictions on the use of the property due to the small amount of residual contamination that may be left on the property.
- Method C: Conditional method used to set soil and air cleanup levels at industrial sites. Site cleanups establishing Method C cleanup levels must have restrictions placed on the property (institutional controls) to ensure future protection of human health and the environment.

Methods for working with Ecology under MTCA include:

- Consent decrees: a formal legal agreement filed in court.
- Agreed Orders**:** Unlike a consent decree, an agreed order is not filed in court. It is a legally binding order issued by Ecology and agreed to by the liable party.
- Voluntary Cleanup Program (VCP)*:* The VCP is for property owners conducting a cleanup independently.

Cleanup has occurred to this point under MTCA interim actions. Interim actions only partially address cleanup and additional remedial actions may be required unless compliance with cleanup standards are confirmed during the interim actions.

6. Interim Cleanup Standards

Cleanup standards discussed in the Final Interim Action Work Plan are preliminary "until Ecology makes a determination on the applicable final cleanup standards in the final Cleanup Action Plan for the Site" (FIAWP p81).

Cleanup standards consist of cleanup levels and points of compliance – the locations where CULs must be met. Setting the interim standards involves determining what substances are to be measured and what endpoints or targets the levels should achieve. The selected hazardous substances are chemicals that are expected to account for most of the risks at a site.

The interim cleanup standards were developed using the MTCA Method B approach and include the use of RELs as part of the interim action soil removal. RELs are used as triggers for determining which of the three different remediation methods are used.

“The current draft Cleanup Action Plan was not designed to incorporate needs of habitat restoration or daylighting tidal connection” (Questions and Answers Sheet Unocal Edmonds Bulk Fuel Terminal 0178) . “The planned use for the Lower Yard is commercial. The Lower Yard qualifies for an exclusion from a terrestrial ecological evaluation so long as its future land use will cover the Lower Yard with physical barriers to prevent plants and wildlife from being exposed to contamination. An Environmental Covenant to maintain the barrier is required. The planned future use shall include a completion date that is acceptable to Ecology [WAC 173-340-7491(1)(b)].” (FIAWP P92)

Historical investigations were conducted offsite on Admiral Way, along the BNSF railroad, and on the port of Edmonds property. The offsite investigations identified contaminated soil which is believed to be the result of offsite releases and are not expected to cause impacts to the site. These conclusions were based soil chromatograms from laboratory analysis. Soil and groundwater collected along the BNSF railroad did not exceed Site REL or CULs.

The Edmonds Marsh (deeded from Unocal in 1981) was determined (2015 Responsiveness Survey) to not need contamination testing. This determination was based on historical records and sediment testing in Willow Creek. The marsh was deeded as a gift to the City from Unocal in 1981. The deed limits claims made against Unocal for petroleum products spillage damages.

Soil
Four CUL endpoints were considered for soil: TEE, direct human contact (incidental ingestion), leaching to groundwater, and residual saturation.

The final soil Indicator Hazardous Substances for the TEE and residual saturation endpoints are TPH constituents, Benzene, cPAHs (TEE), and Arsenic (TEE only). For direct contact and leaching pathway they are TPH constituents, Benzene, Toxicity-adjusted total cPAHs, and Arsenic (direct contact only).

The points of compliance for soil CULs are throughout the Lower Yard within 15 feet of the ground surface. The CUL and REL values for the direct human contact endpoint is shown below.

Table 5-3. Soil Cleanup and Remediation Levels

IHS	Soil Cleanup Level (mg/kg)
TPH[1]	2,775
Benzene[1]	18
Total cPAHs[1,2]	0.14
Arsenic[3]	20

Notes:
[1] Proposed soil CUL based on soil direct contact pathway and proposed soil REL based on soil leaching pathway (See 5.5.4).
[2]Total cPAHs adjusted for toxicity based on WAC 173-340-708(8).
[3] Based on natural background concentrations [WAC 173-340-740(5)(c)].

Cleanup standards for the TEE endpoint were determined to be concentration of 5,000 mg/kg for GRO, 6,000 mg/kg for DRO, and 12 mg/kg for cPAHs.

The soil cleanup standards in the interim plan state that “The planned use for the Lower Yard is commercial. The Lower Yard qualifies for an exclusion from a terrestrial ecological evaluation so long as its future land use will cover the Lower Yard with physical barriers to prevent plants and wildlife from being exposed to contamination. An Environmental Covenant to maintain the barrier is required. The planned future use shall include a completion date that is acceptable to Ecology.” (FIAWP P92.)

Arsenic is in compliance with interim CULs.

Surface and Groundwater
Ground and surface water cleanup levels are the same since the endpoint for ground water is surface water. The points of compliance for groundwater are throughout the Lower Yard.

The endpoints for both are Washington State Water Quality Standards, NRWQC for marine organisms and humans ingesting organisms, National Toxics Rule related to human health, and MTCA Method B equation values for hazardous substances for which sufficiently protective standards have not been established for surface water.

The surface water cleanup levels (Table 5-1) are the lowest of the state and federal water quality standards for protection of fish and other aquatic life as well as protection of human health for consumption of organisms.

The final surface water and groundwater Indicator Hazardous Substances are TPH, Benzene, Toxicity-adjusted total cPAHs.

The point of compliance for groundwater is throughout the Lower Yard. This is monitored at 52 wells - 23 located along the downgradient (western, northwestern, northeastern, and eastern) perimeter of the Lower Yard and 29 in the interior (see Fig 4-3).

Table 5-1. Surface-Water Cleanup Levels

IHS	Surface Water Cleanup Level (µg/L)
TPH	–[1]
Benzene[2]	16
Total cPAHs[2,3]	0.05

Notes:

[1] Method A (WAC 173-340-900, Table 720-1); TPH calculated on a sample-specific basis. The CUL will fall between 500 and 800 µg/L, depending on the sample's composition.

[2] NRWQC for human-health (organisms only) (USEPA 2015). NRWQC. https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table Accessed on June 6, 2016.

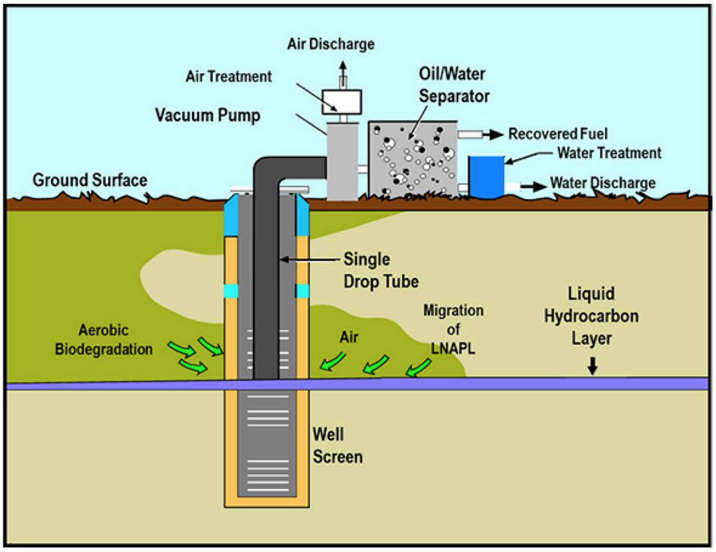
[3] Total cPAHs adjusted for practical quantitation limit based on WAC 173-340-730(5)(c).

7. Cleanup Methods

Three methods of dealing with contaminated soil and groundwater are considered. Two involve cleanup and the third leaves contaminated soil in place.

The massive excavation (see below) of contaminated soil was the main treatment system for the majority of the Lower Yard.

Several areas were not excavated due to site and structure limitations. These unexcavated areas are being treated since 2017 with a dual phase extraction system, the second method. The DPE system removes contaminants several ways. It cleans groundwater pumped from the ground in an above ground treatment system. Also, the wells are attached to a vacuum system that removes and then treats vapors extracted from the soil. The lowering of the water table encourages aerobic extraction by petroleum feeding microbes.



This schematic shows the basic functions of the DPE system. Actual site DPE well construction is shown in FIAWP (Fig 8-5).

Monitoring wells allow periodic testing of groundwater contamination levels. Well locations are shown in at Fig 4-3 (attached below) and typical depths and screened intervals in Fig 9-4 (attached below).

The third method is institutional controls, in the form of deed restrictions.

8. Institutional Controls

The draft Cleanup Action Plan proposes institutional controls as a way to "remedy" areas where contaminated soil will remain after cleanup. The basic control method would be an engineered cover over the stormwater pipelines. The cover would be installed in places where contaminants of concern concentrations remain above twice the REL or CULs.

The Environmental Covenant included in the draft CAP could include:

- A soil management plan at four remaining isolated locations.
- A soil management and engineered cover at areas near the Point Edwards and WSDOT stormwater pipelines. This would require twice yearly inspections and repair of the cover if damaged.
- "Guidance" for preventing vapor intrusion from ground construction activities.
- Maintenance of the Lower Yard future use consistent with current zoning. The Comprehensive Plan designation is now "Master Plan Hillside Mixed Use, District 2", MP-2. A multi-modal transportation center and mixed residential and commercial uses are permitted. Residential uses are prohibited on the ground floor of any future building.
- Maintain conditions consistent with the TEE.
- Requirements for long-term maintenance and/or monitoring.

The engineered cover is proposed to consist of a geotextile fabric and a 6 inch thick aggregate cover.

9. Remedial Alternative Selection

The following alternatives were evaluated for WSDOT stormwater line and DB-2 impacted soil and groundwater impacts (see the Public Review of Draft Final Feasibility Study Report).

- Alternative 1: Excavation and Monitored Natural Attenuation with Environmental Covenants
- Alternative 2: Groundwater Containment System Using Groundwater Extraction Wells, and Monitored Natural Attenuation with Environmental Covenants
- Alternative 3: Groundwater Containment System Using Groundwater Extraction Trench, and Monitored Natural Attenuation with Environmental Covenants
- Alternative 4: Excavation and Limited Environmental Covenant (remove the pipelines, excavate the remaining 1929 fill, and re-install them)
- Alternative 5: Excavation and In-Situ Solidification and Monitored Natural Attenuation with Environmental Covenants
- Alternative 6: Excavation, Dual-Phase Extraction Treatment and Limited Environmental Covenant

Chevron selected alternative 6 as the recommended remedial alternative. "Alternative 6, Excavation and DPE Treatment, is the alternative that is permanent to the maximum extent practicable. The alternative is relatively easy to implement, offers easier short-term risk management procedures, addresses the public's concerns both locally and regionally, removes and/or destroys

contaminants permanently, and will cost approximately one-half of the cost of Alternative 4. The increased incremental cost of Alternative 4 over Alternative 6 is disproportionate to the degree of benefits achieved." The Alternative 4 cost was estimated at $8,645,000 in 2017.

10.Final Interim Action Plan

The goal of this plan has been to remediate soil that still contained petroleum hydrocarbon concentrations above the RELs and CULs as of 2017. These soil are located in 2 areas (see Fig 4-1).

1. Detention Basin 2. Area is near the northwest corner of the large basin 1. C. Soil the DB-2 contained residual LNAPL and concentrations of TPH ranging from 4,413-220,400 mg/kg. Soil has been excavated from this area.
2. WSDOT Stormdrain Vicinity. Concentrations of TPH that remained are 3,060-16,900 mg/kg, at depths between 4 and 8 feet below ground surface. A dual phase extraction system will be used here. It will consist of 13 groundwater extraction wells spaced 60 feet apart, oriented along the alignment of the WSDOT stormwater line. The water table is about 5 feet below ground surface. Wells are assumed 30 feet deep (screened from 5 to 25 feet) and pump 2 and 3 gpm each.

Other interim actions include:

- Conduct an additional soil vapor assessment through installation of 10 probes (3 and 5 feet deep). "The soil vapor assessment will focus on collecting data from additional locations in the Lower Yard to assess whether soil vapor hazards exist in the selected areas of the Lower Yard that were not previously tested; the collected data will also be used to optimize the DPE design." P98
- Create a groundwater containment zone near the WSDOT stormwater line.
- Obtain the data necessary to evaluate if the remaining soil concentrations will cause an exceedance in groundwater.

As of 2021, 7 of 53 groundwater monitoring wells and 8 of 19 soil borings (2018) locations were not in compliance with CULs.

11. Future Steps

Ecology is negotiating a draft Cleanup Action Plan and Consent Decree (settlement) with Unocal/Chevron. When completed, a 45 day public comment period will be scheduled where the following documents will be reviewed:

- **Feasibility Study:** An evaluation of ways to clean up the Site and the recommendation of a preferred remedial alternative.
- **Draft Cleanup Action Plan:** Ecology's plan that describes the cleanup work to address contamination within the site.
- **Consent Decree:** A legal agreement between Ecology and Chevron that requires Chevron to complete cleanup actions at the site.
- **State Environmental Policy Act (SEPA) Determination of Nonsignificance:** Ecology's determination that the cleanup work is not likely to harm the environment

The selected remedies to achieve final cleanup proposed in the draft CAP will be treatment of remaining impacts near the WSDOT pipeline with the DPE system and institutional controls (described in a previous section) . Modeling predicted that the DPE system would remediate soil and groundwater to below CULs within 6 years.

The draft CAP will:

- Describe the Site and summarize current conditions.
- Identify site-specific cleanup levels (CULs) and points of compliance (POCs) for each hazardous substance and medium of concern.
- Identify applicable state and federal laws pertaining to the proposed cleanup action.
- Summarize the cleanup action alternatives selection process.
- Describe the selected cleanup actions for the Site and summarizes the rationale for selecting this cleanup action alternative.
- Identify restrictions on future uses and activities to ensure continued protection of human health and the environment.
- Discuss the use of contingent remedies, if necessary.
- Discuss compliance monitoring requirements.
- Present the schedule for implementation of the Draft CAP.

As of 8/1/23 a Terrestrial Ecological Evaluation is being prepared by Chevron.

A Compliance Monitoring Plan will be included in the draft CAP that will be available. Compliance will the monitored for soil, soil vapor, and ground water. It will consist of three types of monitoring: protection, performance, and confirmation.

The following components will be included in the monitoring for the DPE system around the WSDOT pipeline:

- Puget Sound Clean Air Agency (PSCAA) compliance monitoring of effluent air,
- NPDES monitoring of treated water effluent,
- Groundwater capture zone assessment,
- Performance monitoring of system operational data to confirm DPE is performed in a manner that will allow for cleanup standards to be attained.
- Performance soil sampling along the established compliance soil sampling grid to determine if REL and CULs have been met.

Periodic groundwater monitoring will occur through periodic sampling of compliance wells. Monitoring will continue until contaminant concentrations are below CULs for 8 consecutive quarters. This groundwater program will assess potential soil leaching to groundwater. No soil vapor monitoring is proposed due to the expected effectiveness of engineers covers and environmental controls.

A contingency plan must be developed and submitted to Ecology if exceedance of CULs is confirmed or if sediment contamination of Willow Creek occurs after the restoration timeframe (the end of 2023). The contingency plan must include a schedule for implementing, monitoring, and reporting response actions.

Contingency steps may include continued operation of the DPE system, more excavation, thermal soil remediation, and/or extending the life of the WSDOT pipeline. If concentrations continue to exceed twice the RELs or CULs, an Environmental Covenant could be written as a remedy.

12. Excavations, Pipeline Data

A total of approximately 175,000 tons of soil has been removed and replaced with clean gravel, sand, and silt, see Fig 2-4, 9-4 and 2-10.

- In 2001 excavations occurred near the former railcar loading rack, former asphalt plant, and north-central area near the former slops pond. 10,700 tons of soil was removed.
- The 2003 excavations were in the southwest Lower Yard, DB-1, Metals Area 3 (located adjacent to the Southwest Lower Yard Excavation Area), and the Point Edwards Storm Drain Line Area. 39,100 tons of soil were removed.
- 2007-2008 excavations were backfilled to 6 to 12 inches above the observed groundwater table in the open excavations with coarse gravel (⅜ to 1 inch) and little to no fines. Above the coarse gravel to ground surface was a mixture of very fine to medium sand and gravel (see Fig 9-4). 125,000 tons of soil was removed.
- In 2017, 813,00 tons of soil was removed off-site during the excavation of DB-2.

Approximate average existing ground elevations through most of the Lower Yard fill:

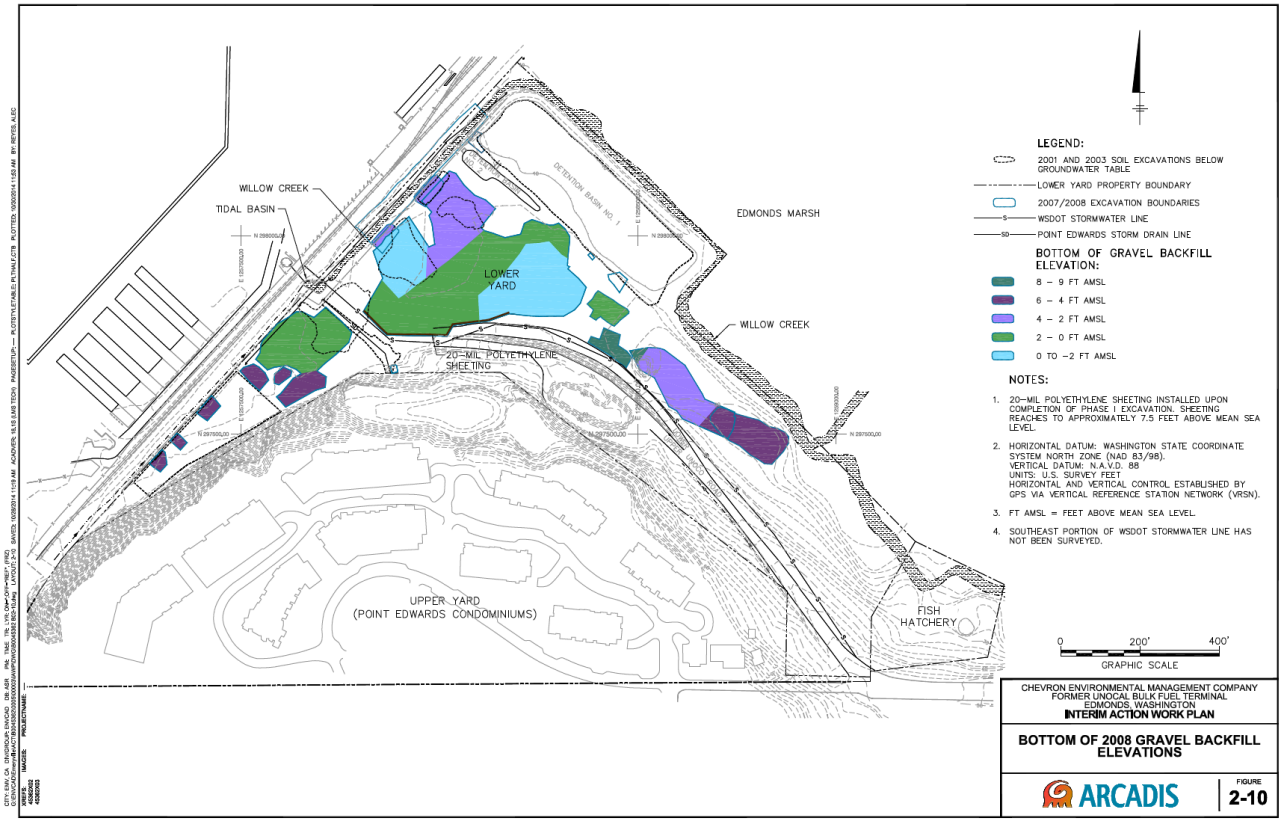
- Groundwater elevation is 6’–7’ in June (about 5’ below ground surface). There are seasonal and tidal elevation changes.
- Maximum 2008 excavation depth was 9’ below ground surface.
- The soil surface elevations are about 13’ in the fill area with a site range of 10’-19’.

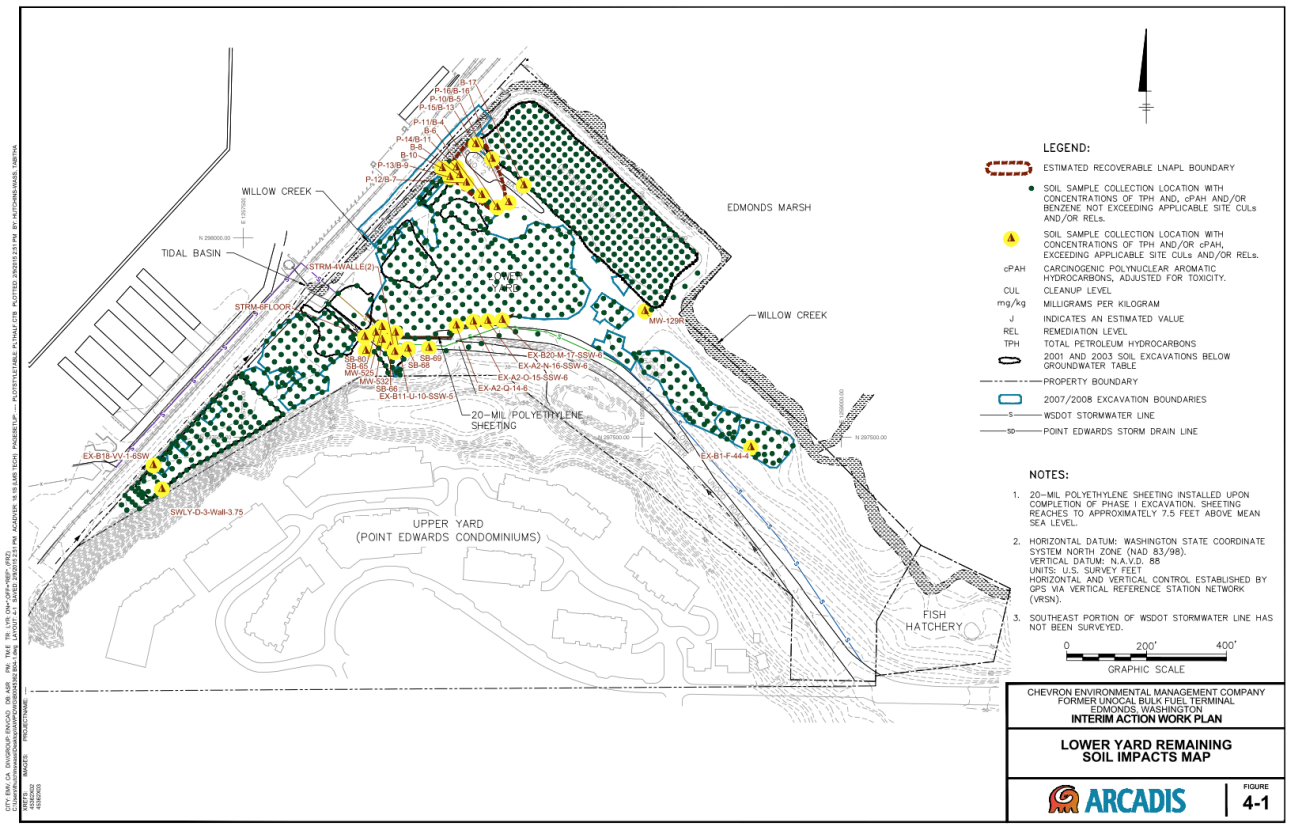
Point Edwards: 36” corrugated ABS plastic, depths of approximately 3 to 5 ft below ground surface. The top of the pipe is about 9’ where it crosses the fill near MW532.

WSDOT Stormwater: asphalt-coated corrugated metal stormwater line was installed in the early 70’s, 60” where is crosses UNOCAL fill, 9 to 12 ft below ground surface. Integrity was checked by WSDOT in 2011. 1971 Washington State Highway Commission drawings show the overt at an elevation of about 4’ (NAVD88), see the attached figure below.

Not considered in the Arcadis cleanup documents is a water main in the southwest corner. It is a 12” ductile iron pipe near MW150.

13. Figures


WILLOW CREEK
TIDAL BASIN
EDMONDS MARSH
LOWER YARD
WILLOW CREEK
20-MIL POLYETHYLENE SHEETING
UPPER YARD
(POINT EDWARDS CONDOMINIUMS)
FISH HATCHERY
LEGEND:
2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
LOWER YARD PROPERTY BOUNDARY
2007/2008 EXCAVATION BOUNDARIES
WSDOT STORMWATER LINE
POINT EDWARDS STORM DRAIN LINE
BOTTOM OF GRAVEL BACKFILL ELEVATION:
8 – 9 FT AMSL
6 – 4 FT AMSL
4 – 2 FT AMSL
2 – 0 FT AMSL
0 TO –2 FT AMSL
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. FT AMSL = FEET ABOVE MEAN SEA LEVEL.
4. SOUTHEAST PORTION OF WSDOT STORMWATER LINE HAS NOT BEEN SURVEYED.
0 200' 400'
GRAPHIC SCALE
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL BULK FUEL TERMINAL
EDMONDS, WASHINGTON
INTERIM ACTION WORK PLAN
BOTTOM OF 2008 GRAVEL BACKFILL ELEVATIONS
ARCADIS
FIGURE 2-10


WILLOW CREEK
TIDAL BASIN
EDMONDS MARSH
LOWER YARD
WILLOW CREEK
20-MIL POLYETHYLENE SHEETING
UPPER YARD
(POINT EDWARDS CONDOMINIUMS)
FISH HATCHERY
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.
cPAH CARCINOGENIC POLYNUCLEAR AROMATIC HYDROCARBONS, ADJUSTED FOR TOXICITY.
CUL CLEANUP LEVEL
mg/kg MILLIGRAMS PER KILOGRAM
J INDICATES AN ESTIMATED VALUE
REL REMEDIATION LEVEL
TPH 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
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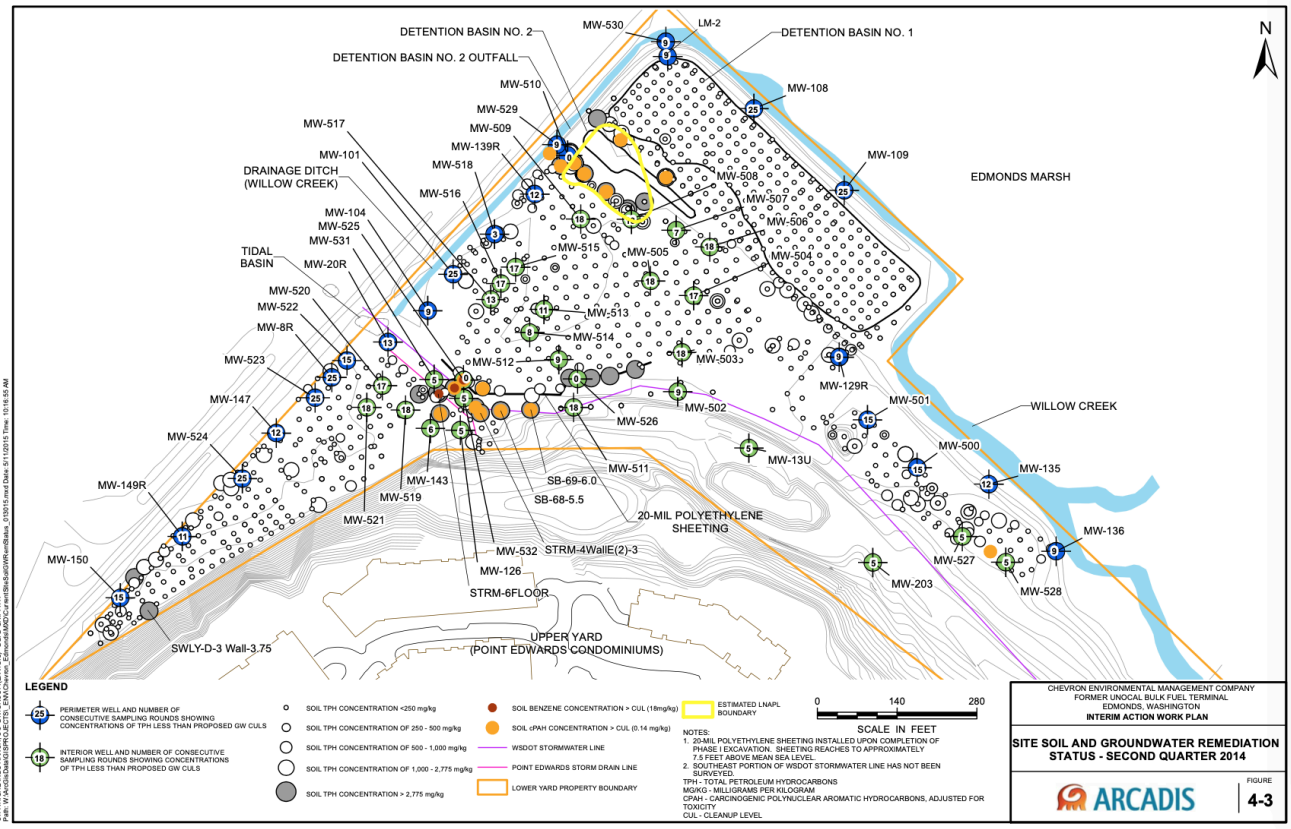
3. SOUTHEAST PORTION OF WSDOT STORMWATER LINE HAS NOT BEEN SURVEYED.
0 200' 400'
GRAPHIC SCALE
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL BULK FUEL TERMINAL
EDMONDS, WASHINGTON
INTERIM ACTION WORK PLAN
LOWER YARD REMAINING SOIL IMPACTS MAP
ARCADIS
FIGURE 4-1


DETENTION BASIN NO. 2
DETENTION BASIN NO. 2 OUTFALL
DETENTION BASIN NO. 1
LM-2
MW-530
MW-510
MW-529
MW-509
MW-139R
MW-518
MW-516
MW-517
MW-101
DRAINAGE DITCH (WILLOW CREEK)
MW-104
MW-525
MW-531
TIDAL BASIN
MW-20R
MW-520
MW-522
MW-8R
MW-523
MW-147
MW-524
MW-149R
MW-150
SWLY-D-3 Wall-3.75
MW-108
MW-109
EDMONDS MARSH
MW-508
MW-507
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MW-505
MW-515
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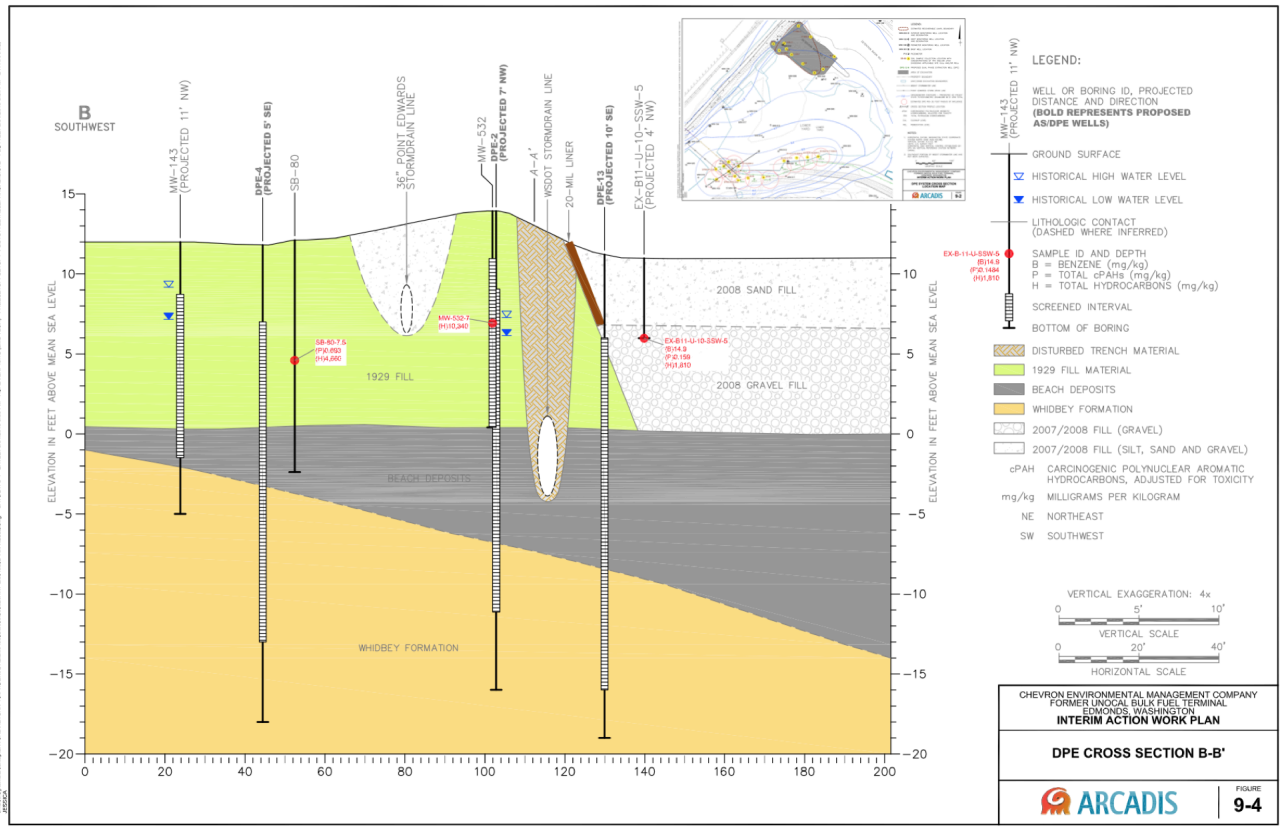
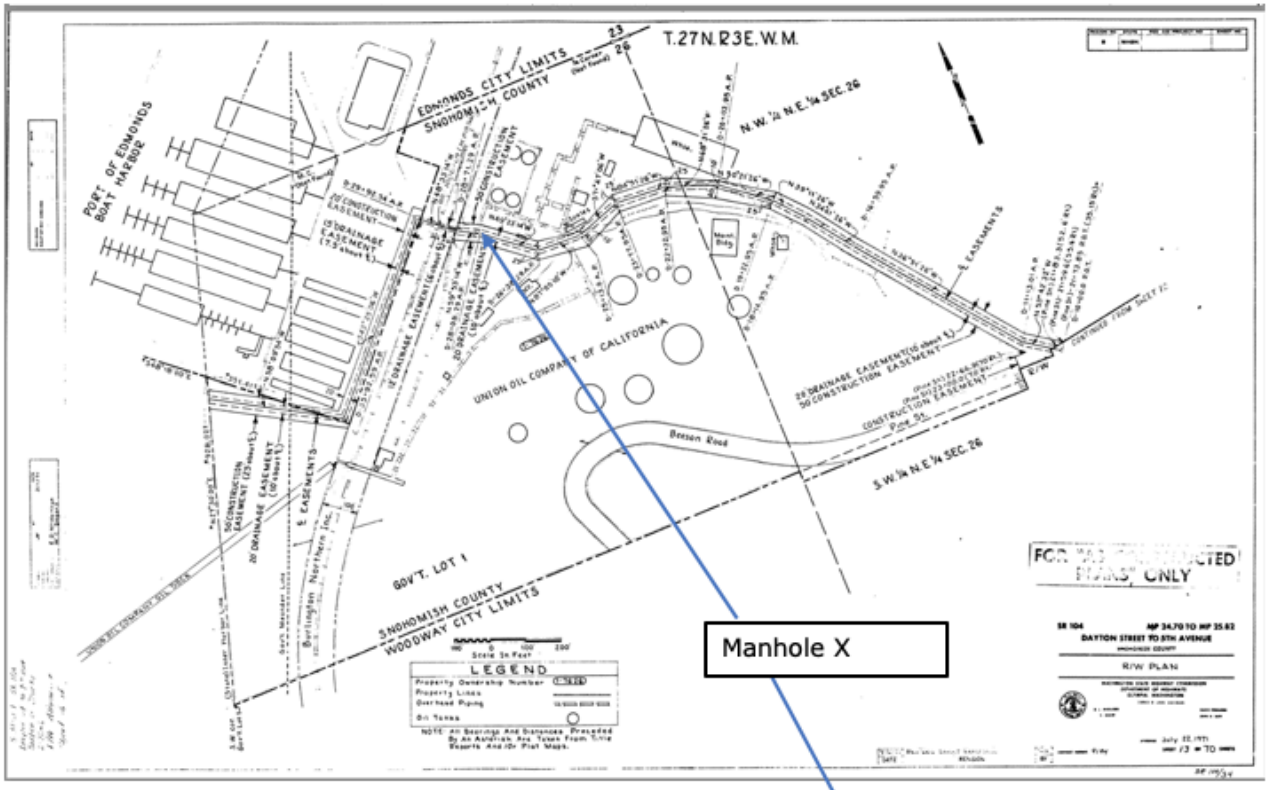
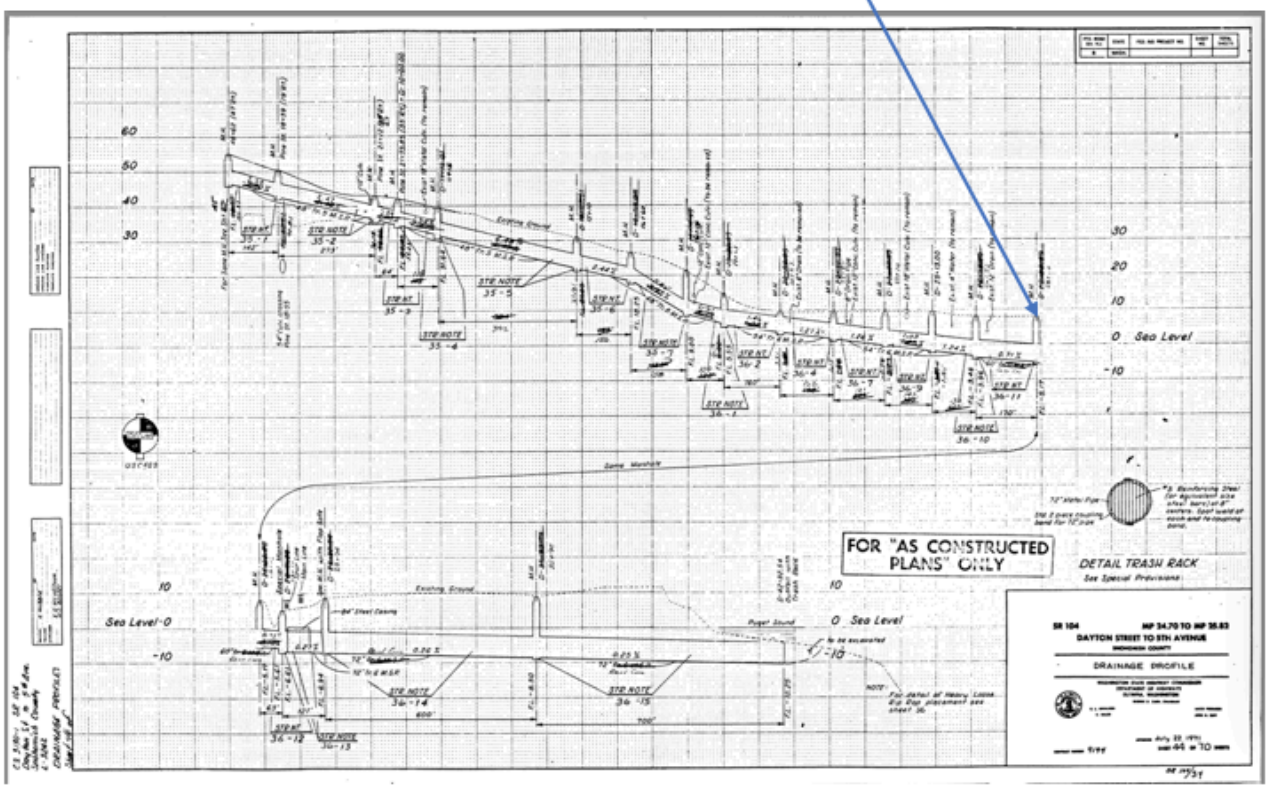
MW-513
MW-514
MW-512
MW-526
MW-502
MW-129R
MW-501
WILLOW CREEK
MW-500
MW-135
MW-13U
MW-511
MW-143
MW-519
MW-521
SB-69-6.0
SB-68-5.5
20-MIL POLYETHYLENE SHEETING
MW-532
STRM-4WallE(2)-3
MW-126
STRM-6FLOOR
MW-136
MW-527
MW-203
MW-528
UPPER YARD (POINT EDWARDS CONDOMINIUMS)
N
LEGEND
PERIMETER WELL AND NUMBER OF CONSECUTIVE SAMPLING ROUNDS SHOWING CONCENTRATIONS OF TPH LESS THAN PROPOSED GW CULS
INTERIOR WELL AND NUMBER OF CONSECUTIVE SAMPLING ROUNDS SHOWING CONCENTRATIONS OF TPH LESS THAN PROPOSED GW CULS
SOIL TPH CONCENTRATION <250 mg/kg
SOIL TPH CONCENTRATION OF 250 - 500 mg/kg
SOIL TPH CONCENTRATION OF 500 - 1,000 mg/kg
SOIL TPH CONCENTRATION OF 1,000 - 2,775 mg/kg
SOIL TPH CONCENTRATION > 2,775 mg/kg
SOIL BENZENE CONCENTRATION > CUL (18mg/kg)
SOIL cPAH CONCENTRATION > CUL (0.14 mg/kg)
WSDOT STORMWATER LINE
POINT EDWARDS STORM DRAIN LINE
LOWER YARD PROPERTY BOUNDARY
ESTIMATED LNAPL BOUNDARY
0 140 280
SCALE IN FEET
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. SOUTHEAST PORTION OF WSDOT STORMWATER LINE HAS NOT BEEN SURVEYED.
TPH - TOTAL PETROLEUM HYDROCARBONS
MG/KG - MILLIGRAMS PER KILOGRAM
CPAH - CARCINOGENIC POLYNUCLEAR AROMATIC HYDROCARBONS, ADJUSTED FOR TOXICITY
CUL - CLEANUP LEVEL
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL BULK FUEL TERMINAL
EDMONDS, WASHINGTON
INTERIM ACTION WORK PLAN
SITE SOIL AND GROUNDWATER REMEDIATION STATUS - SECOND QUARTER 2014
ARCADIS
FIGURE 4-3


B
SOUTHWEST
MW-143 (PROJECTED 11' NW)
DPE-4 (PROJECTED 5' SE)
SB-80
36" POINT EDWARDS STORMDRAIN LINE
MW-532
DPE-2 (PROJECTED 7' NW)
A-A'
WSDOT STORMDRAIN LINE
20-MIL LINER
DPE-13 (PROJECTED 10' SE)
EX-B11-U-10-SSW-5 (PROJECTED 4' NW)
2008 SAND FILL
1929 FILL
2008 GRAVEL FILL
BEACH DEPOSITS
WHIDBEY FORMATION
ELEVATION IN FEET ABOVE MEAN SEA LEVEL
LEGEND:
WELL OR BORING ID, PROJECTED DISTANCE AND DIRECTION (BOLD REPRESENTS PROPOSED AS/DPE WELLS)
GROUND SURFACE
HISTORICAL HIGH WATER LEVEL
HISTORICAL LOW WATER LEVEL
LITHOLOGIC CONTACT (DASHED WHERE INFERRED)
SAMPLE ID AND DEPTH
B = BENZENE (mg/kg)
P = TOTAL cPAHs (mg/kg)
H = TOTAL HYDROCARBONS (mg/kg)
SCREENED INTERVAL
BOTTOM OF BORING
DISTURBED TRENCH MATERIAL
1929 FILL MATERIAL
BEACH DEPOSITS
WHIDBEY FORMATION
2007/2008 FILL (GRAVEL)
2007/2008 FILL (SILT, SAND AND GRAVEL)
cPAH CARCINOGENIC POLYNUCLEAR AROMATIC HYDROCARBONS, ADJUSTED FOR TOXICITY
mg/kg MILLIGRAMS PER KILOGRAM
NE NORTHEAST
SW SOUTHWEST
VERTICAL EXAGGERATION: 4x
VERTICAL SCALE
HORIZONTAL SCALE
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL BULK FUEL TERMINAL
EDMONDS, WASHINGTON
INTERIM ACTION WORK PLAN
DPE CROSS SECTION B-B'
ARCADIS
FIGURE 9-4



USC&G datum = NGVD29 = NAVD88 – 3.6′



SR104 As-Built – From Washington State Highway Commission 1971

14. Other Similar Projects

TBD

15. References

Questions and Answers Sheet Unocal Edmonds Bulk Fuel Terminal 0178 (2020)

Unocal Edmonds Bulk Fuel Terminal 0178, Washington Department of Ecology *(124 documents, scroll to the bottom of the page to access)*

Example documents on the website

- Unocal Edmonds Agreed Order Amendment, 2017 *(Complete information on cleanup levels and site history)(the page references below refer to this document)*
- Unocal Edmonds Bulk Fuel Terminal 0178 3-17-23 Update *(Status and public comment update)*
- *o* Unocal Edmonds - August 2017 Cleanup Work *(short summary)*
- Public Review of Draft Final Feasibility Study Report, 2017
- 2021 Groundwater Monitoring and Dual-Phase Extraction System Operation Report
- Unocal Edmonds In the Matter of Remedial Action: Union Oil Company dba Unocal, 1993
- Willow Creek Daylighting, App. J, Contaminated Soil Assessment, Shannon and Wilson, 2015
- Responsiveness Summary 2015 Interim Action Work Plan, WDOE, 2015 (*Marsh determination and deed*)

Purchase and Sale Agreement UNOCAL/WSDOT, 2005 (need the link)

WAC 173-340-900, Table 749-3, Indicator Soil Concentrations *(referenced in the TEE)*

Guidance for Remediation of Petroleum Contaminated Sites, WDOE, 2016

Sediment Management Standards, Chapter 173-204 WAC, WDOE, 2013

Model Toxics Control Act Cleanup Reg.: Process for Cleanup of Hazardous Waste Sites, WDOE *(focus paper - summary)*

Model Toxics Control Act Regulation and Statute, WDOE, 2013

Model Remedies for Sites with Petroleum Contaminated Soil, WDOE, 2017

Lower Yard: Monitoring and Cleanup Actions, Chevron

- Procedure 440A: Establishing Environmental Covenants under the Model Toxics Control Act, WDOE, 2016
- Terrestrial Ecological Evaluations under the Model Toxics Control Act, WDOE, 2017
- Public Review Draft Cleanup Action Plan, Arcadis, 2021
- Washington State Highway Commission, 1971 (*SR104 as-built drawings*)

General Questions for Ecology

- Reconnection of the marsh to Puget Sound means that contaminated soil may be exposed to surface water. One alternative is to remove significant amounts of fill from the Lower Yard and return the area to a saltwater marsh. What CULs and points of compliance would need to be met for this?
    - *Would these reconnection actions potentially exposing contaminated soil cause Ecology to rescind previous NFA and reopen the case?*
    - *If new remedial actions are required from reconnection activities, who would be the potentially responsible party?*
    - *Could Unocal oppose any future actions affecting their approved cleanup action?*
- Why do points of compliance for groundwater not extend past 15ft? Where can information on vertical pollutant profiles be found?
- Why do all the remedial actions evaluated include ECs as a cleanup method?
- What is the current lawsuit with Chevron about?
- Is the TEE being redrafted?
- Will the TEE be available for public review and will it be included in the CAP?
    - The 2007 TEE states that no endangered or "priority" or "species of concern" use the UNOCAL site. Is this correct?
- Is any compliance monitoring is needed beyond the monitoring period?
- All of the remedial alternatives considered included "environmental covenants". What are those covenants?
- Another Remedial Alternative is the removal of the Point Edwards stormwater line and excavation of the 1929 contaminated soil down to the WSDOT stormwater line (without removing it). Why was this not considered?
- Has WSDOT applied for a "Prospective Purchaser Consent Decree"?
- Has the 2017 Draft Final Feasibility Report been edited?
- Is groundwater testing the only way that soil compliance will be monitored?
- On June 29, 2023 Ecology wrote "In 2022, the cleanup levels were adjusted to consider ecological receptors (wildlife, plants, soil insects) which means they were significantly lowered…". What are the new levels?
- What were and will be the data quality objectives for the past and future clean up action levels? Did these data quality objectives address fish and aquatic biota and will the new ecological risk assessment address cleanup action levels for fish and aquatic biota?
- Did the data quality objectives in the 2017 draft Feasibility Report address fish and aquatic biota?

Detailed Questions for Ecology

- There are no structural limitations to excavating soil above the stormdrains, why wasn't that done?
- What was the source of the fill for each of the excavations? What are the fill specifications?
- What is the groundwater CUL for Benzene? Different values are listed. P96
- Why is the water main crossing the southwest corner not shown on maps or considered? 2007/2008 excavations and MW150 are close to this pipeline.
- Have there been CUL exceedances in wells installed in excavated areas? *These wells may <u>not</u> be considered compliance wells and could be subject to RELs as opposed to CULs.*
- Where can the WSDOT stormdrain depth profile be found? Two Arcadis drawings (Final Interim Action Plan Figures 2-6 and 9-4) and the Washington Highway Commission as-built drawings all show this pipeline at different depths.
- What is the statistical basis for selecting 8 consecutive quarters for the monitoring period?

DRAFT Goals

(to be completed prior to the public comment period)

A completely clean site safe for humans, fish, and wildlife as soon as possible.

- Cleanup levels should protect plants and wildlife that are in close contact with the soil.
- Remove all references to Edmonds Crossing and use of the site as a ferry terminal. An alternative future land use may be restoration to a saltwater estuary. Removal of fill would expose potentially contaminated soil to air and water. Adjust ecological receptor pathways, exposures, RELs, and CULs to account for this potential future land use.
- Do not use environmental covenants, deed restrictions, or engineered constraints as an alternative to clean-up. Cleanup standards should not include containment alternatives.
- The monitoring period of 8 quarters may not be long enough.
- What Statistical tools will be used to determine the effectiveness of the groundwater remediation, compliance and attainment monitoring of the cleanup levels
- Include another Remedial Alternative in the Feasibility Study that does not include ECs as a cleanup method.

- Select Remedial Alternative 4 - excavate all the contaminated 1929 fill around the WSDOT pipeline and replace the pipeline.
- The feasibility study should include another Remedial Alternative - removal of the Point Edwards pipeline and excavation of all soils down to a level that does not require removal of the WSDOT pipeline.