

SR104 Stormdrain Report Design and Clean-up Status

DRAFT 2/6/24

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1. Summary

Contaminated soil, not meeting cleanup standards, remains on the Unocal Edmonds Bulk Fuel Terminal site in some areas around a buried stormdrain that carries runoff from the State Route 104 (SR104) watershed. This stormdrain carries water under the Unocal parcel and into Puget Sound.

Reconnection of the Edmonds Marsh to Puget Sound requires that a channel be excavated near this contaminated soil and through an area that was previously cleaned through excavation and soil removal. A part of the potential reconnection channel over the stormdrain currently exists at the tidal basin but may need to be widened and deepened.

This report summarizes known information about the stormdrain area and the cleanup that has taken place to date.

The remaining, unexcavated, contaminated soil is near the Point Edwards hillside, see the figure below. This soil has been treated with a dual phase extraction (DPE) system since 2017 but does not meet current cleanup standards.

The potential channel area closer to the railroad tracks has been excavated in the past. In 2001, in Excavation Area A, contaminated soil was removed to the top of the stormdrain. Some of the removed soil that may not meet current cleanup levels was returned to the excavation and some contamination may have migrated from surrounding contaminated soils into the area.

Later excavations (2017) in the areas near the stormdrain used clean soil. These excavations were not completed over, under, or around the pipeline.

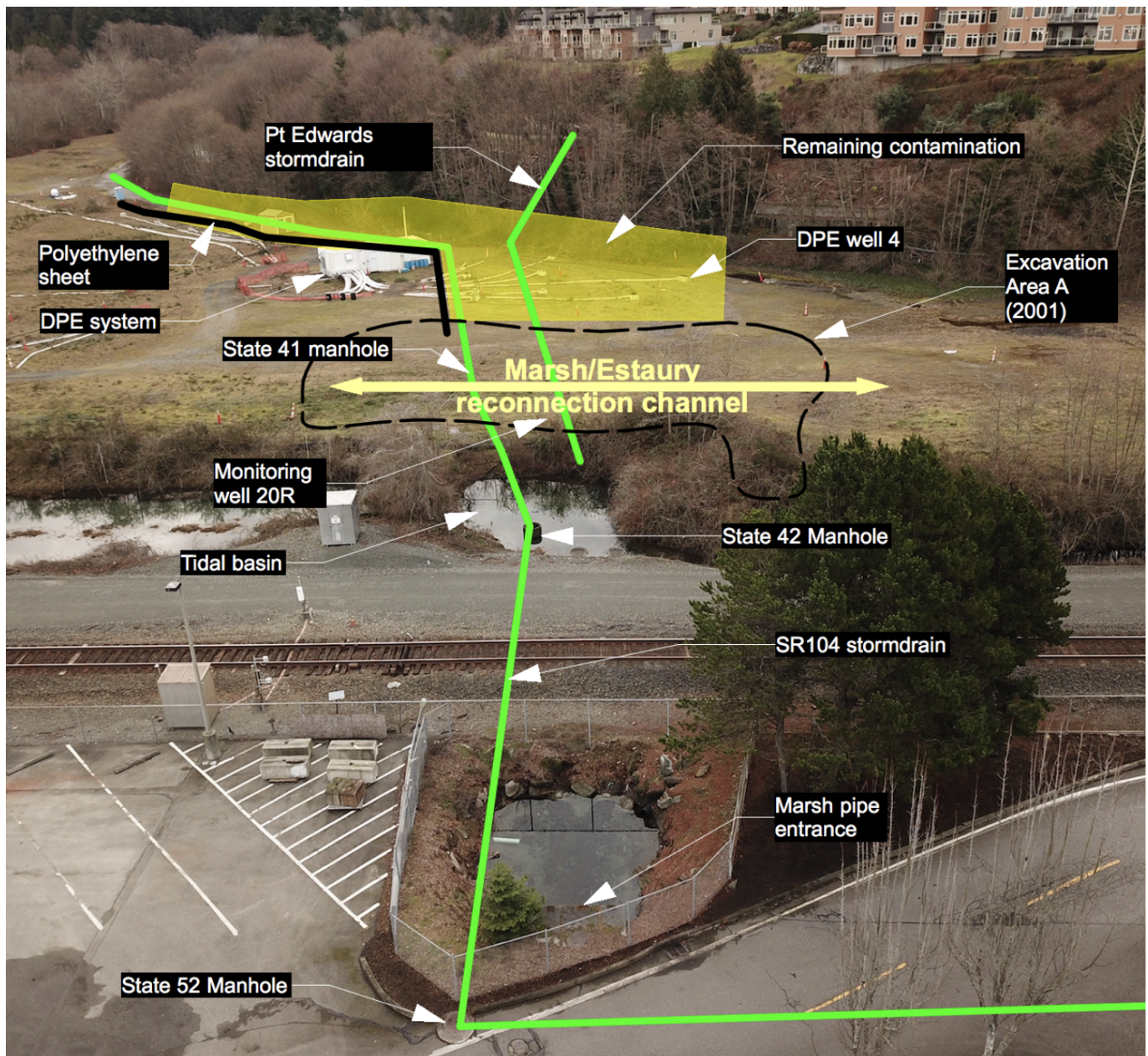


Figure 1. The SR104 stormdrain and surrounding features.

2. Watershed

The SR104 pipeline collects runoff from a watershed that extends to Hwy 99. This is a larger area than Shellabarger and Willows Creek watersheds, both of which flow into the Marsh. Flow volumes in the stormdrain are unknown but will be estimated during completion of a NFWF/NOAA grant (City of Edmonds, 2023).

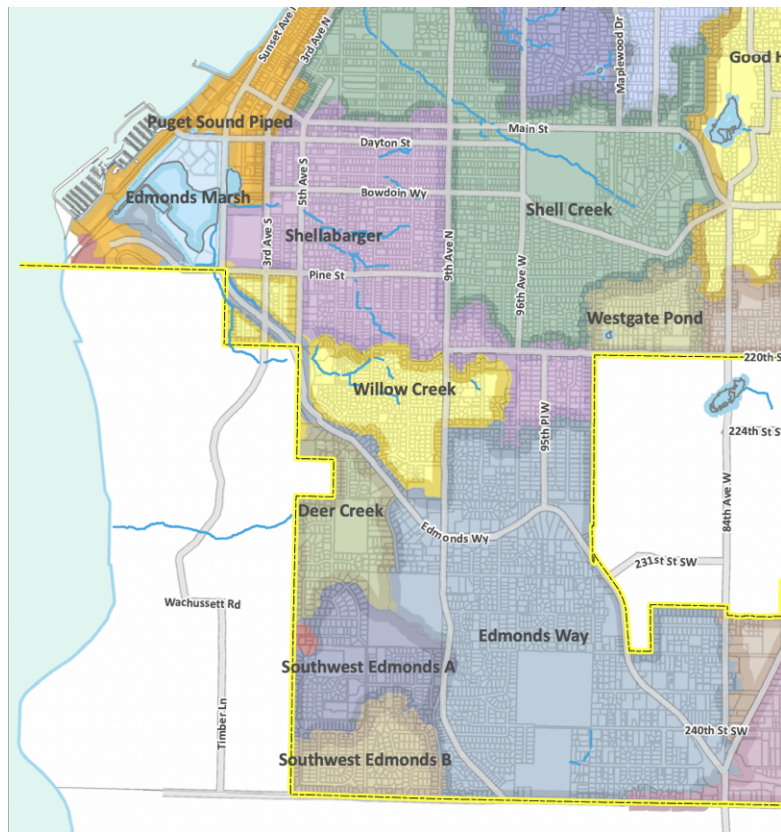


Figure 2. Edmonds Marsh watersheds (Herrera, 2010)

Water in the stormdrain is untreated runoff from an urban environment. It can be characterized as having high peak flow discharges and contamination rates.

Options that may be considered during the Marsh restoration planning process are the diversion of all or part of this flow into the marsh. The potential impact of this additional flow on flood elevations will be evaluated through the NOAA grant.

3. SR104 Stormdrain

The SR104 stormdrain travels along the Unocal access road at the foot of the steep Point Edwards hillside in the Lower Yard. It crosses the filled section of the Lower Yard and under the railroad tracks before exiting into Puget Sound. It was installed between 1972-1975.

The area around the manholes designated State 42 and State 41 is the location of a proposed channel connecting the Marsh with Puget Sound. The stormdrain becomes larger in diameter as it gets closer to the Sound. In the proposed reconnection channel area it is 60' in diameter. It is an asphalt coated, corrugated metal pipe. The integrity was checked by WSDOT in 2011 and was found to have "no visible signs of deterioration" (Arcadis, 2016).

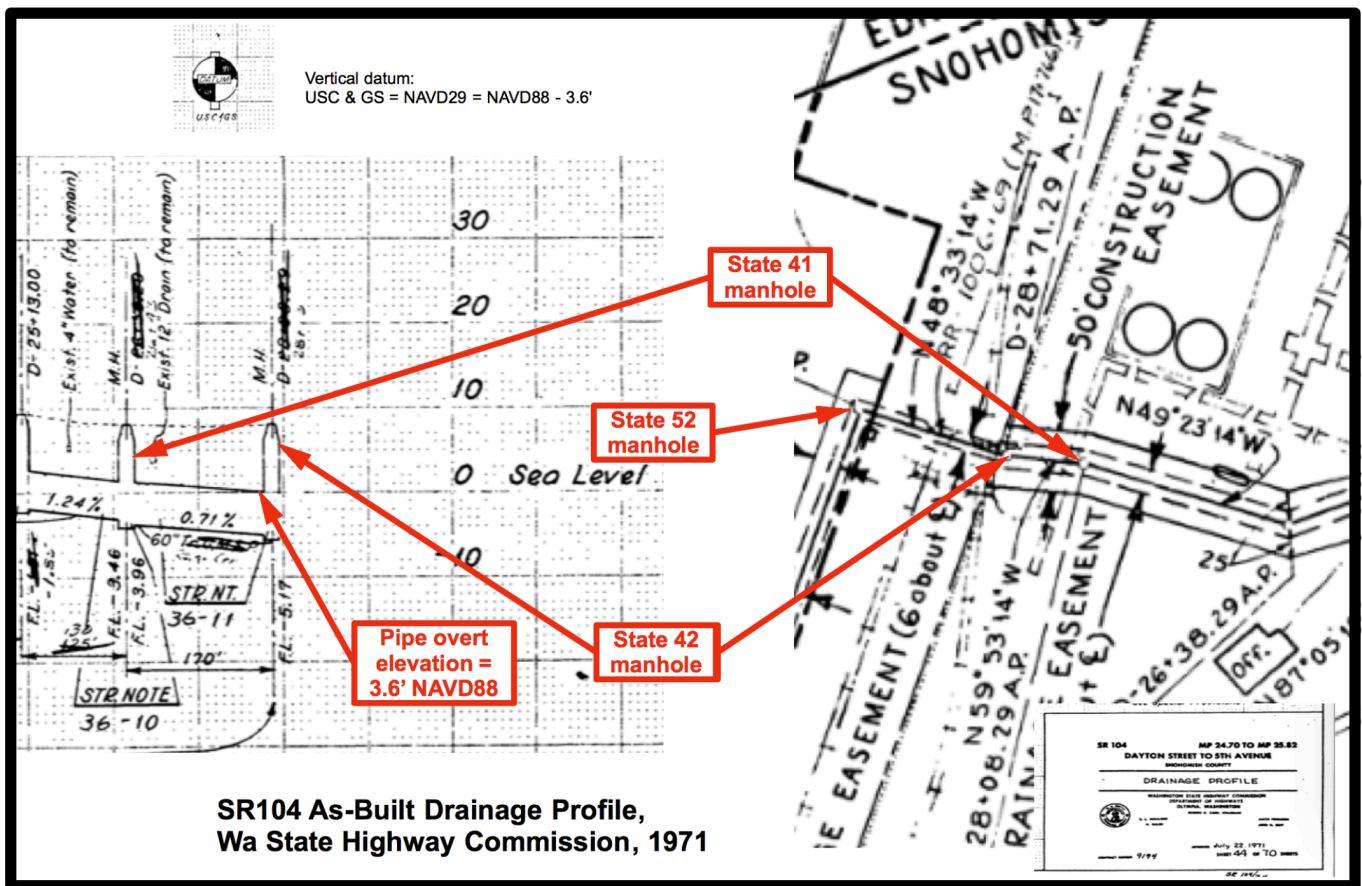


Figure 3. SR104 as-built drawing

The drawing above from the Washington State Highway Commission, precursor to the WSDOT (Washington State Department of Transportation), shows both the vertical profile and plan views of the pipeline.

The vertical elevation of the stormdrain at the State 42 manhole (near the railroad tracks) is 3.6' NAVD88 (North American Vertical Datum 1988 – the standard vertical elevation reference that is not the same as the NOAA tidal reference) according to this drawing.

If correct, this elevation is lower than that of the bottom of the proposed reconnection channel under the railroad tracks (4.3' NAVD88). The pipeline would not need to be removed to allow reconnection. Mean sea level in Edmonds is now 4.1' (NAVD88) and will be increasing with rising sea levels. Water exchange with these railroad channel and SR104 derived elevations would be occurring over an average of half of each day.

Part reconnection channel excavation is completed at the tidal basin.



Figure 4. State 42 manhole in the tidal basin

The top of the State 42 manhole seen above is at about 8' (NAVD88). The depth of remainder of the tidal basin excavation is unknown but may be close to the depth needed to pass flow regularly between the Sound and the Marsh.

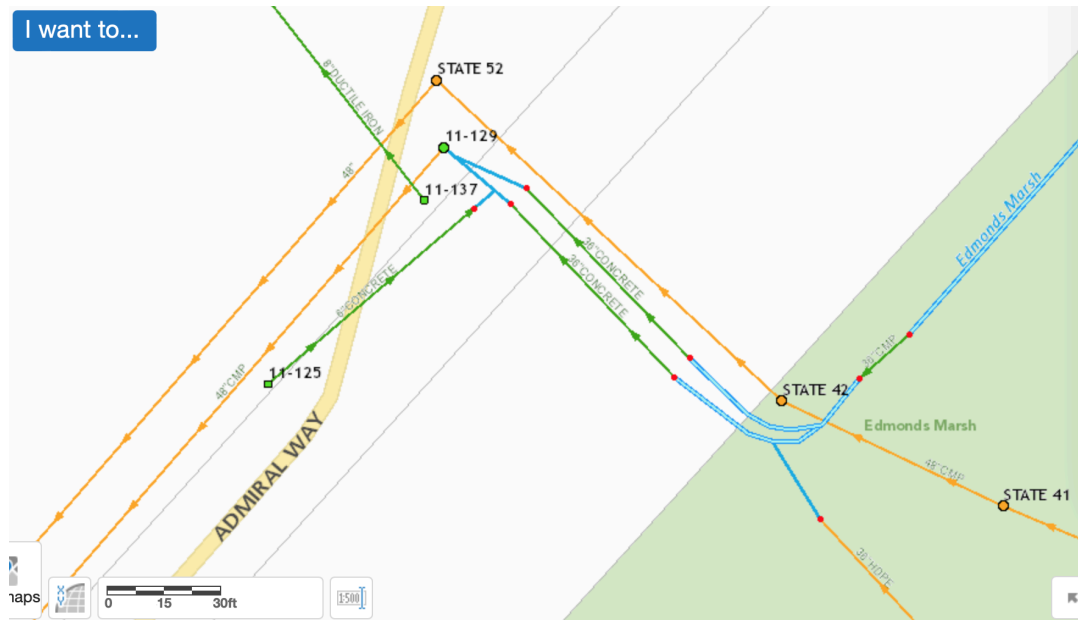


Figure 5. Tidal basin piping detail (City of Edmonds GIS)

The SR104 stormdrain, Point Edwards stormdrain, and Marsh flow pipeline detail in the area of the Tidal Pool are shown above. The Tidal Pool surrounds the State 42 manhole.

4. Point Edwards Stormdrain

The Point Edwards stormdrain extends from the Point Edwards retention pond to the tidal basin. It was installed in 2003, after the 2001 excavation (see the next section) was done in this area.

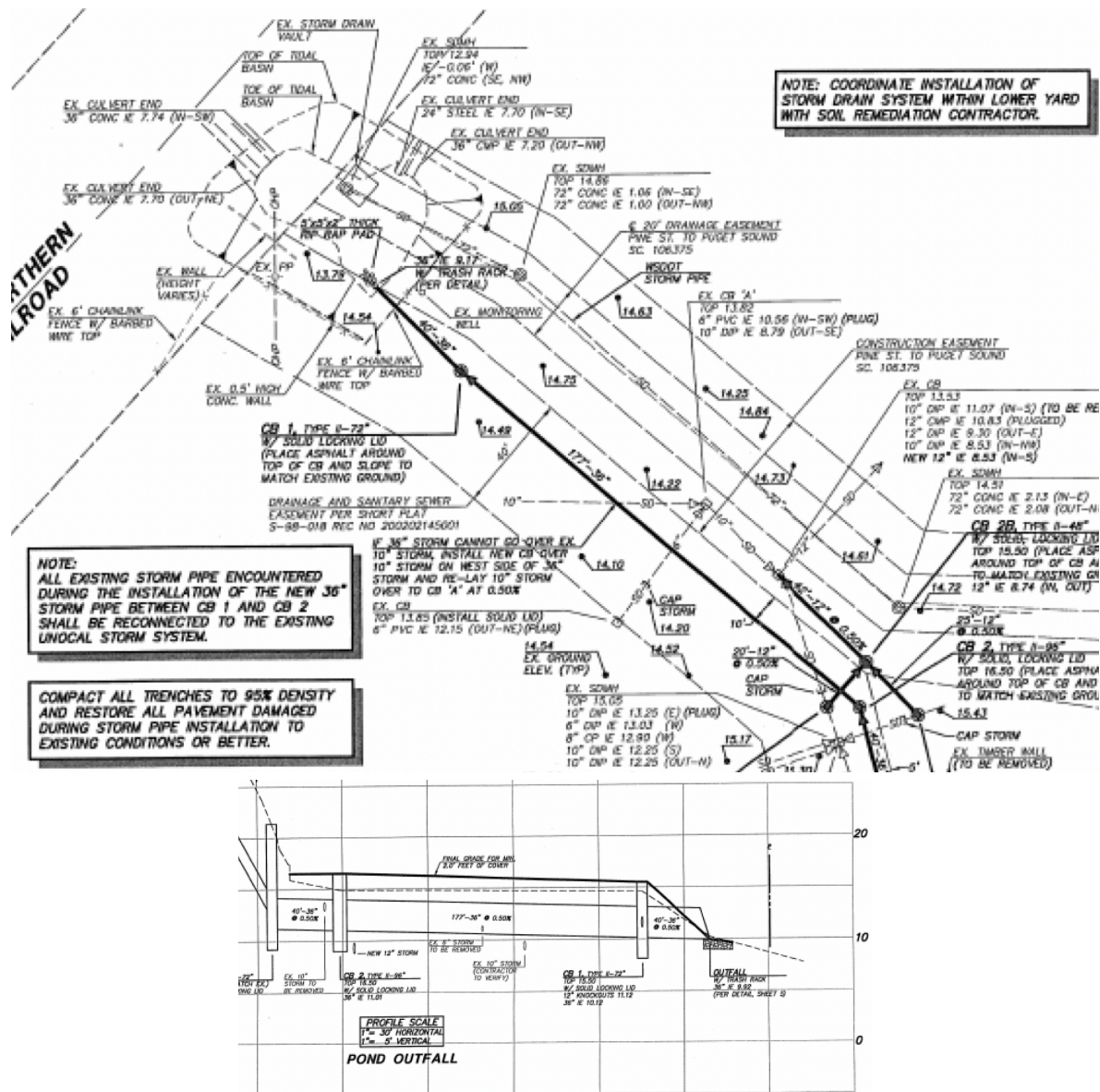


Figure 6. Point Edwards stormdrain

The 36" corrugated ABS plastic pipe parallels and is approximately 35' south of the SR104 stormdrain in the Lower Yard. It was installed 3–5' below ground surface, much shallower than the SR104 stormdrain.

5. Excavations

Several excavations of contaminated soil have occurred over and around the SR104 stormdrain. These excavations were not complete, contaminated fill has been left in place, mostly in the area near the Point Edwards hillside.

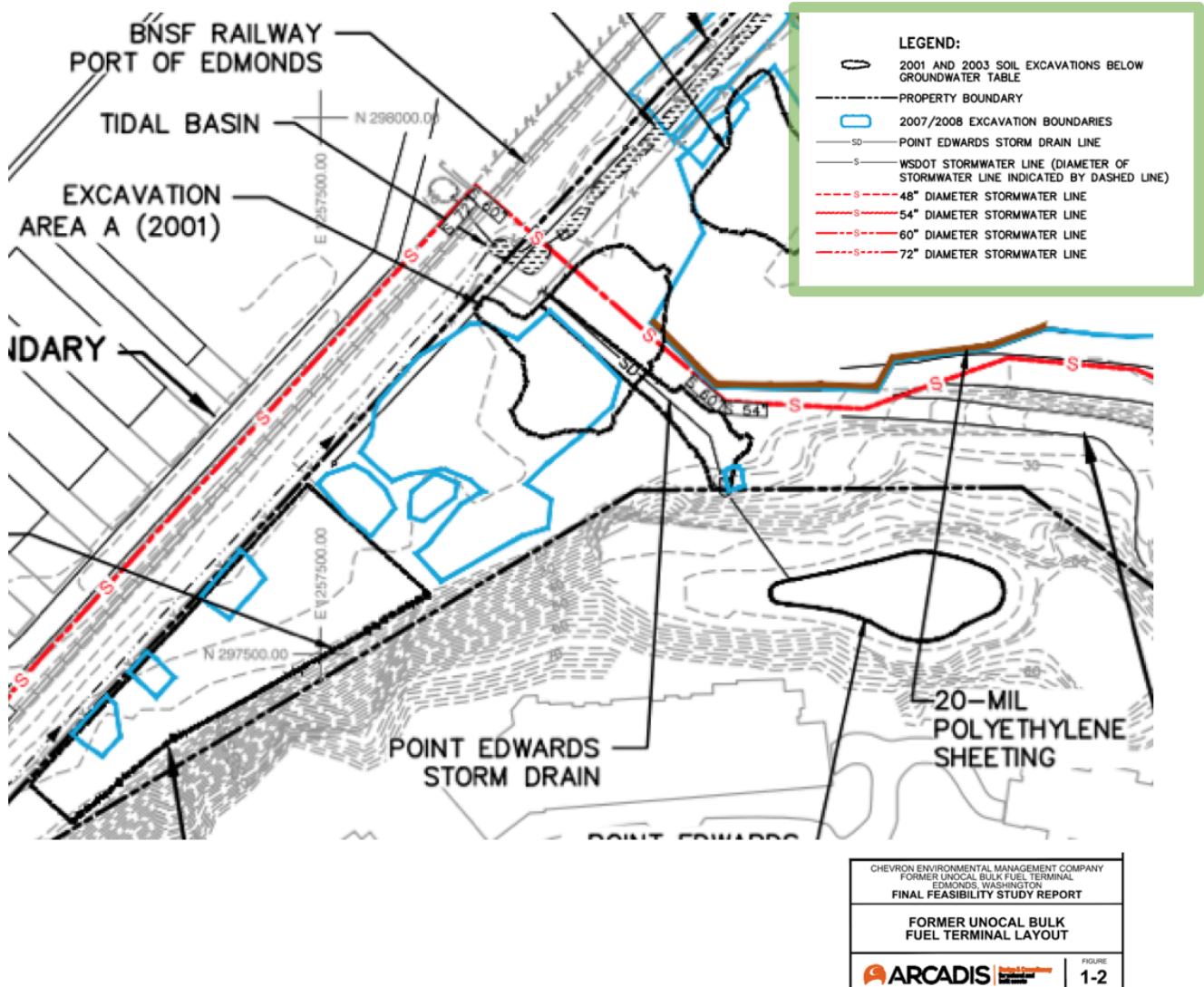


Figure 7. Excavations

The figure above shows the extent of these excavations. The black oval shape in the middle of the figure is the 2001 excavation (Excavation A) over the top of the SR104 stormdrain and the blue lines in and around that oval show where the 2007 excavations occurred.

5.1. 2001 Excavation

Excavation A extended 9' below ground surface to the top of the SR104 stormdrain. 4,502 cubic yards were removed and of that amount 848 cubic yards were banked and returned to the excavation. This banked soil was returned if it met the 5,000 mg/kg TPH (Total Petroleum Hydrocarbon) standard. The current cleanup standard is 300 mg/kg TPH, a much lower value.

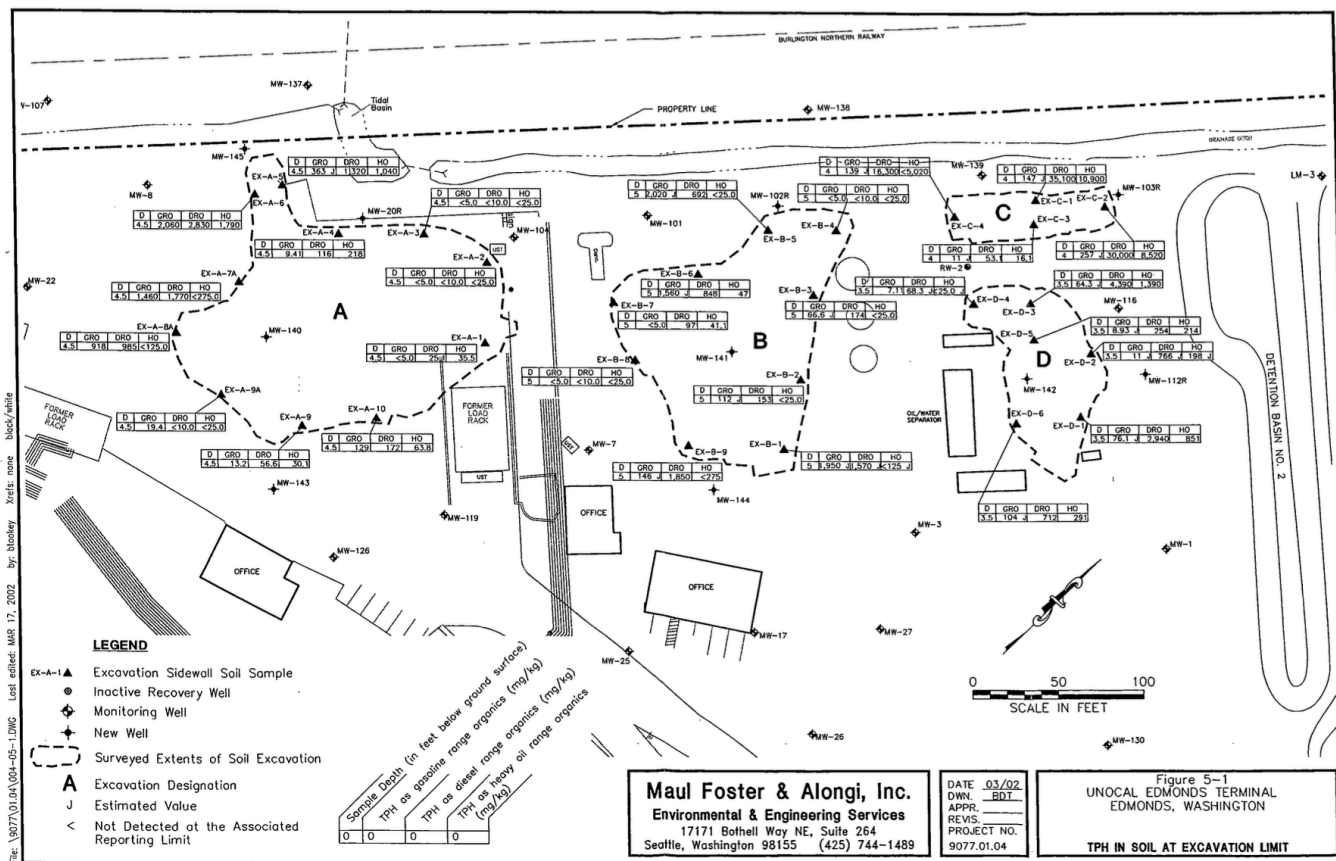


Figure 8. 2001 Excavation (MFA, 2001)

The following descriptions of the excavation are from MFA, 2001:

"Excavations extended laterally until product-saturated soil was not observed in the sidewalls or until structural concerns for site equipment made it prudent to cease excavation." (p3-2)

"The soil excavated at depths above 4 feet bgs was stockpiled on site, sampled, and analyzed for TPH constituents. Soil stockpiles were placed on impermeable liners, and covered and secured. Berms were constructed around the stockpiles to prevent run-on and run-off. Following laboratory analysis to confirm TPH concentrations were less than 5,000 mg/kg, stockpiled soil was returned to the excavation from which it was removed (e.g., soil removed from Excavation C was returned to Excavation C)." (p3-2)

"When product was no longer observed on the groundwater in the excavations or when weather or schedule considerations made it prudent to do so, excavations were backfilled. Each excavation was backfilled with clean, imported 2"-4" quarry spalls and 3/8-inch washed rock up to the seasonal high groundwater elevation (approximately 4 feet b s) . A geotextile fabric was installed over the quarry spalls to provide separation between the quarry spalls and the remaining backfill material. Above the 3/8-inch washed rock, each excavation was backfilled with clean imported gravel, stockpiled soil from that excavation, and then clean imported gravel to the surface." (p3-4)

"Between September 18 and 21, soil was excavated from Excavation Area A exposing the 72-inch Washington State Department of Transportation (WSDOT) storm drain line and large manhole structure located within Excavation Area A."

5.2. 2007 Excavations

In 2007 other excavations were carried out near the SR104 stormdrain. Those areas are shown in green to the north and south of Excavation Area A (the dashed oval line) in the figure below.

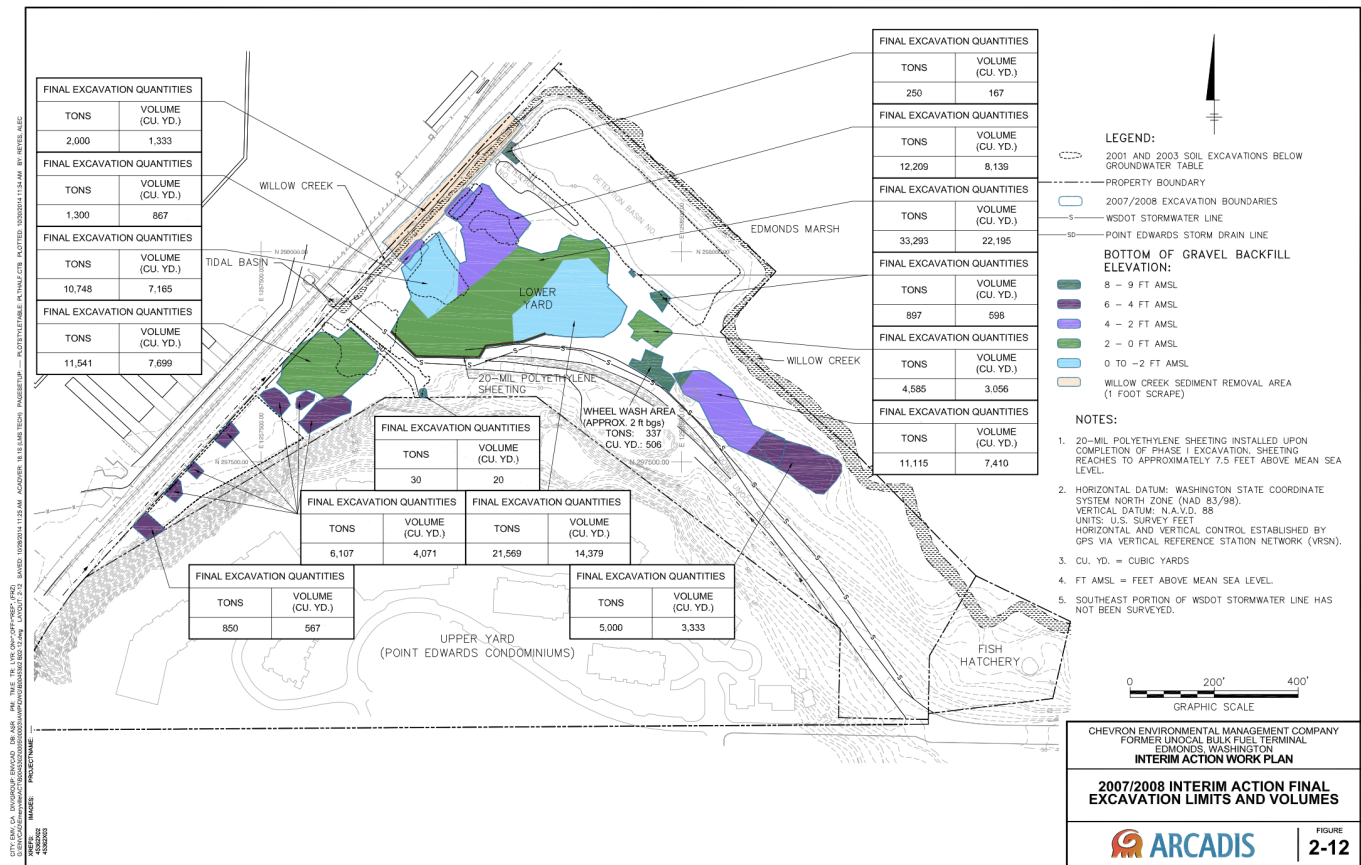


Figure 9. Excavation quantities

The excavations extended to the original beach deposits and removed all the fill. These excavations did not extend to the stormdrains. The figure below is a cross section of the excavation to the south of the pipelines.

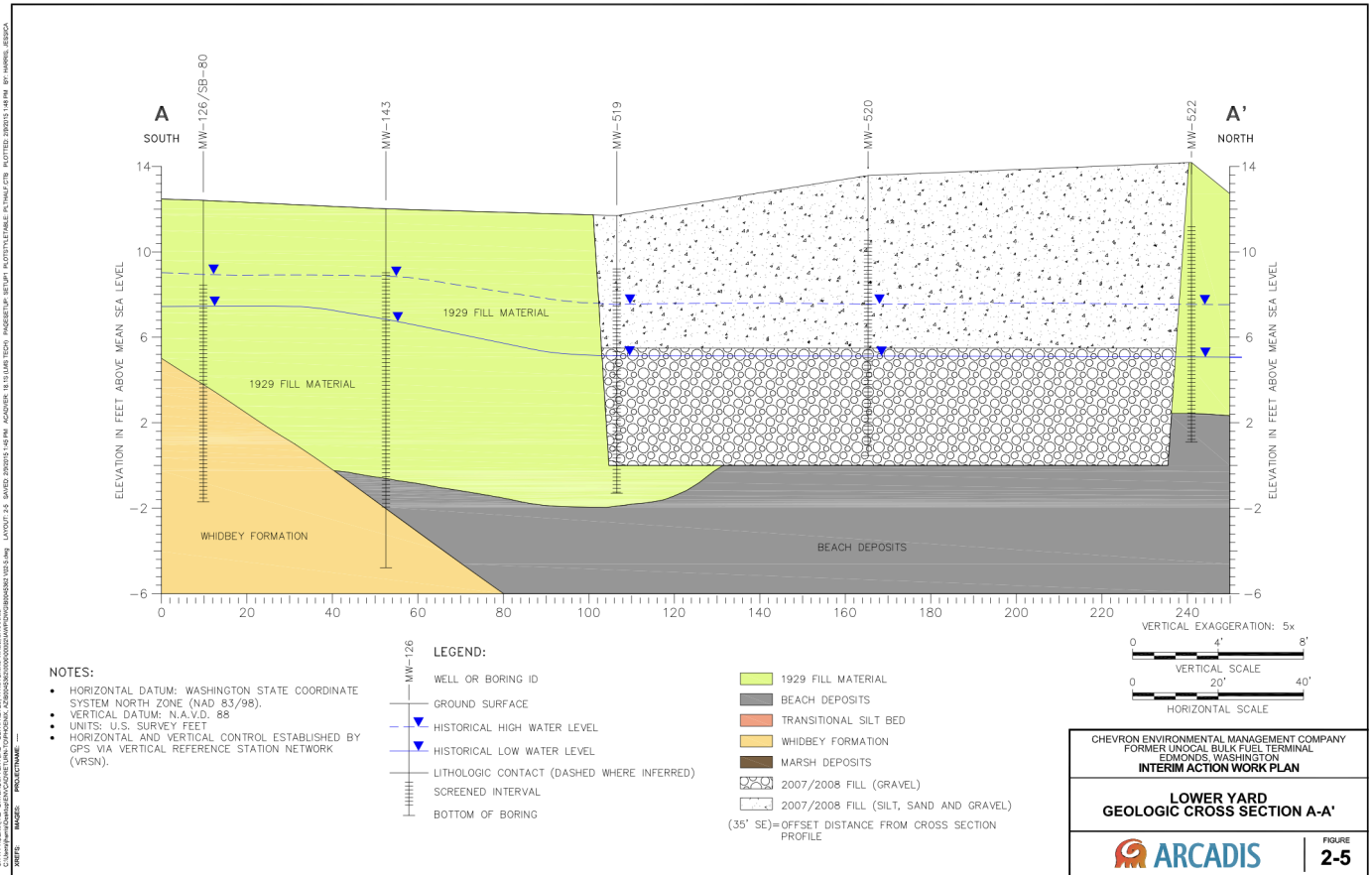
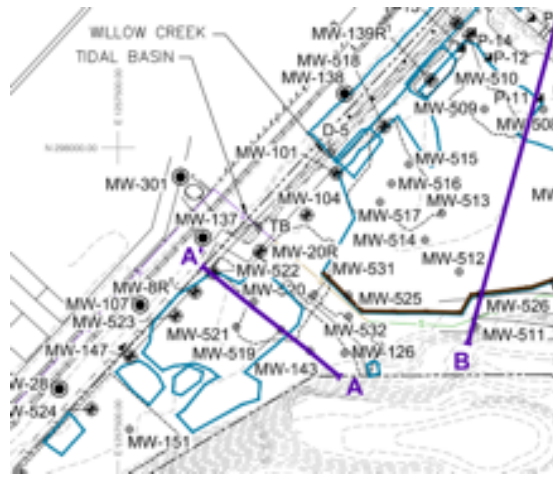
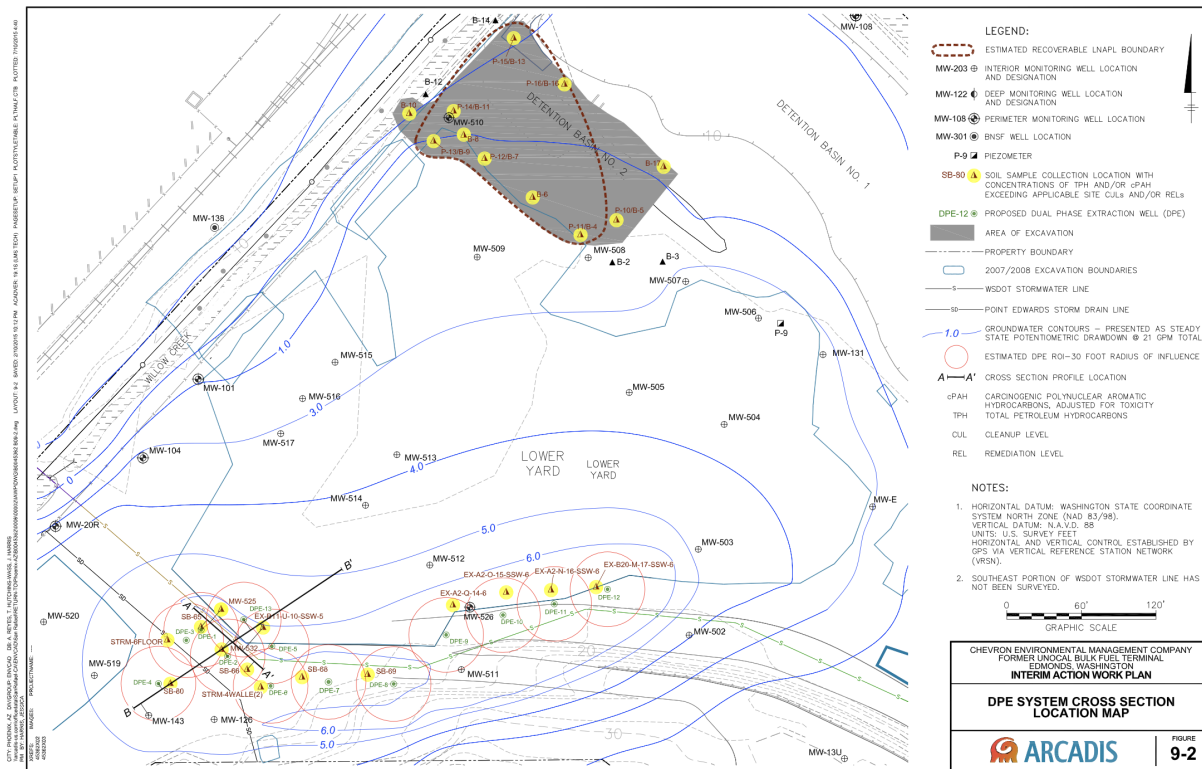
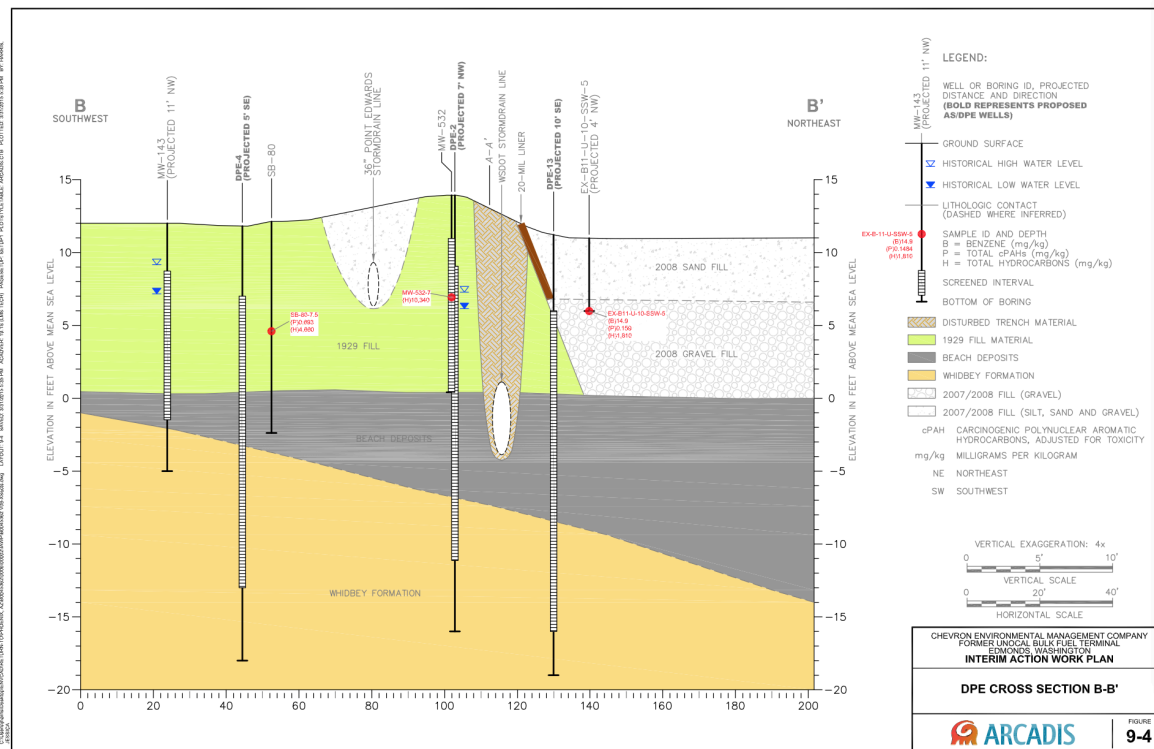


Figure 10. Excavation Cross Section AA'

The excavation to the north of the stormdrains included a polyethylene liner (figure below) between the work area and the contaminated 1929 fill. The intention was to limit migration of contaminated to the north. Liners were not used to prevent eastward contamination migration.



The DPE wells are shown in the red circles above and well construction is shown below. A summary of the DPE system operation is in EMEA 2023.



The DPE extracted mobile contamination from groundwater but left hydrocarbons that are tightly attached to soil particles. Cleanup levels have not been met in the area of treatment.

7. Cleanup Results

Prior to 2017

Prior to installation of the DPE system, monitoring wells MW-510, MW-518, MW-522, MW-525, MW-526, and MW-532 exceeded cleanup levels for TPH. Also, MW-20R and MW-525 contained dissolved-phase benzene concentrations exceeding the cleanup level (Arcadis, 2021).

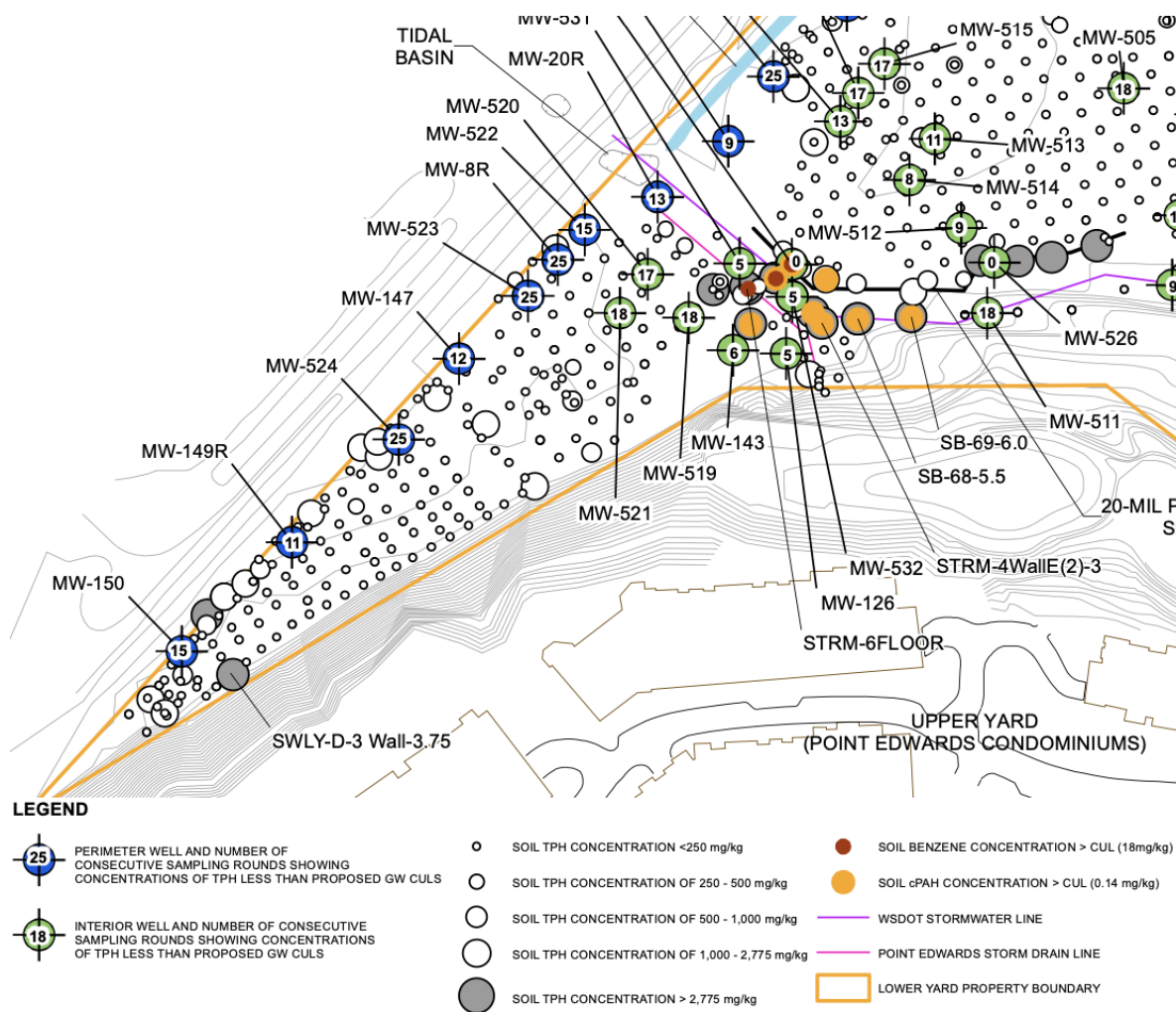


Figure 14. Contamination as of 2014 (Arcadis 2017)

After 2017

Following the 2017 excavation activities the only wells with groundwater concentrations above the cleanup levels were located within the areas remediated by the DPE system: MW-101, MW-129-R, MW-518, MW-526, and MW-E-R. No wells exceed the benzene limits (Arcadis, 2022).

The remaining impacts to soil at the Lower Yard are also limited to the WSDOT stormwater line and Point Edwards storm drain area within the Central Lower Yard (Arcadis, 2021).

All post-treatment vapor discharge concentrations, discharge flow, treatment temperatures, and NPDES permit conditions for water discharge met permit conditions during 2021.

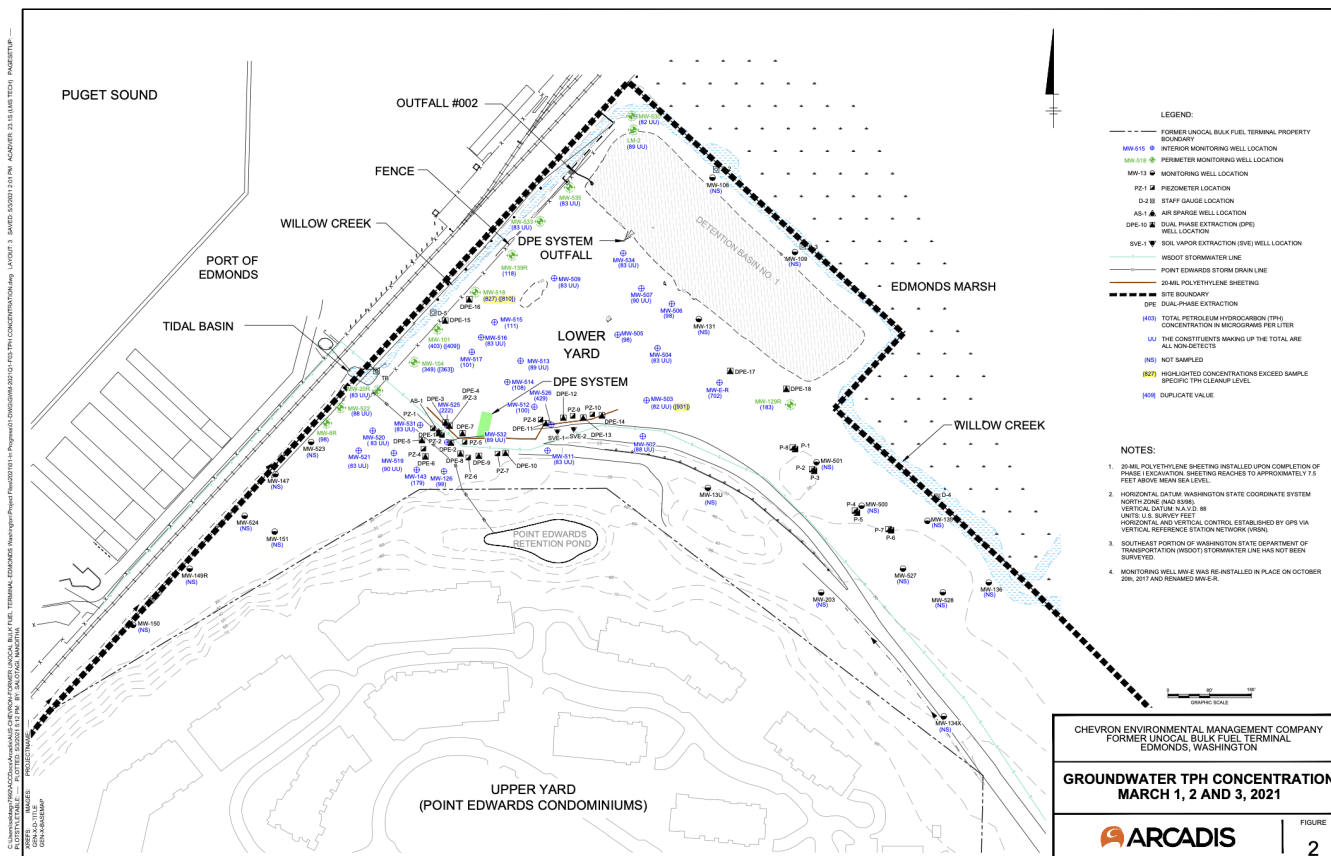


Figure 15. Groundwater TPH in 2021

MW 20-R is located in the path of the proposed reconnection channel and adjacent to the SR104. As of 2021 it had 35 consecutive sampling rounds showing TPH concentration and 22 benzene concentration levels below cleanup limits (Arcadis, 2021).

8. References

Arcadis (2016), Final Interim Action Work Plan, Former Unocal Edmonds Bulk Fuel Terminal Edmonds, Washington. July 19, 2016.

Arcadis (2017), Public Review Draft Final Feasibility Study Report, Former Unocal Edmonds Bulk Fuel Terminal Edmonds, Washington. June 16, 2017.

Arcadis (2021), Public Review Draft Cleanup Action Plan, Former Unocal Edmonds Bulk Fuel Terminal Edmonds, Washington. October 26, 2021.

Arcadis (2022), Groundwater Monitoring And Dual-Phase Extraction System Operation Report, Former Unocal Edmonds Bulk Fuel Terminal Edmonds, Washington. April 28, 2022.

City of Edmonds (2023), NFWF/NOAA Coastal Resiliency Grant.

EMEA (Edmonds Marsh Estuary Advocates) (2023), Unocal Cleanup Report.

Herrera (2010), Storm And Surface Water Management Comprehensive Plan, City of Edmonds, Prepared by Herrera Environmental Consultants, 10/14/2010.

MFA (Maul Foster & Alongi Inc.) (2002), Lower Yard Interim Action As-Built Report Unocal Edmonds Terminal Edmonds, Wa. Volume I, Prepared for Unocal Corporation, November 30, 2002.