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Final Conceptual Site Model

Former Unocal Edmonds Bulk Fuel Terminal
11720 Unoco Road
Edmonds, Washington

June 7, 2013

ARCADIS

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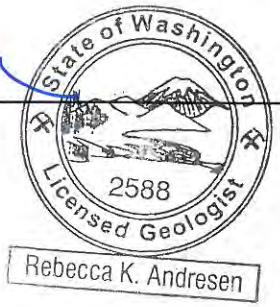

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11720 Unoco Road
Edmonds, Washington

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Chevron Environmental Management Company

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1. Introduction

On behalf of Chevron Environmental Management Company (Chevron), ARCADIS U.S., Inc. (ARCADIS) is pleased to submit this Conceptual Site Model (CSM) for the Former Unocal Edmonds Bulk Fuel Terminal (Site), located at 11720 Unoco Road, Edmonds, Washington **(Figure 1)**. This Report is being submitted under Agreed Order (No.DE 4460) which requires the Union Oil Company of California (Unocal), a wholly owned indirect subsidiary of the Chevron Corporation, to conduct an interim action to remediate soil, groundwater and sediments, and to monitor groundwater in the Lower Yard. This CSM has been prepared to document the Site's history, extent of remaining impacts, and to compile data to evaluate the nature and extent of any chemical constituents potentially presenting a risk to human health or the environment. This report will also support completion of a Feasibility Study (FS) for the Site.

This CSM summarizes information from historical Site documents including facility history reports, subsurface investigations, groundwater investigations, interim action activities, and feasibility studies, as referenced in Section 14. Specific data and documents often referred to in this report are the final compliance soil samples collected in 2007/2008 during remedial excavation activities and documented in the *Phase I Remedial Implementation As-Built Report* (ARCADIS, 2009) and the *FINAL-Phase II Remedial Implementation As-Built Report* (ARCADIS, 2010a), as well as the 2008 site investigation work that was conducted in the vicinity of the Washington State Department of Transportation (WSDOT) stormwater line and the former asphalt warehouse (ARCADIS, 2010b) and the 2011 site investigation work that incorporated a tidal study, pumping tests and investigated soil conditions in the vicinity of Detention Pond No.2 (DB-2) (ARCADIS, 2012a). Please refer to the historical documents for the historical data, tables, figures, and laboratory reports. This report also presents a summary of the investigation activities conducted as part of the *Revised Feasibility Study Work Plan* (ARCADIS, 2012b) in August of 2012 which included additional groundwater monitoring well installation, additional groundwater sampling and sediment sampling.

Previous remediation actions conducted between 2001 and 2008 have addressed potential impacts in the Upper Yard, Lower Yard and in the sediments of Willow Creek. An evaluation of the location, concentrations and distributions of remaining hydrocarbon impacts in the Lower Yard at the Site was conducted using the 2012 investigation results and historical data. There are minimal remaining impacts to soil and groundwater in the Lower Yard. The CSM was developed by evaluating fate and transport of these remaining impacts and potential receptors and exposure pathways.

1.1 Report Organization

This CSM includes (together with this introduction, related tables and figures, and appendices) the following sections:

- Section 2 – Site Description: Describes the three areas of the Site.
- Section 3 – Site History: Summarizes historical facilities, operations, and releases.
- Section 4 – Lower Yard Regulatory and Ownership History: Summarizes historical property ownership and regulatory actions including the Agreed Orders.
- Section 5 – Geology and Hydrogeology: Describes geology, groundwater flow, and surface water groundwater interaction.
- Section 6 – Historical Site Investigations: Summarizes results of historical site investigations, completed prior to cleanup actions.
- Section 7 – Previous Cleanup Actions: Describes the 2002-2003 Upper Yard Interim Action and the 2001, 2003, and 2007-2008 Lower Yard Interim Actions.
- Section 8 – Recent Site Investigations: Summarizes results of the 2008 and 2011 Lower Yard site investigations.
- Section 9 – 2012 Lower Yard Site Investigation: Describes the 2012 Lower Yard site investigation activities and results, which included monitoring well installation and sediment sampling.
- Section 10 – Remaining Impacts: Summarizes remaining petroleum impacts to groundwater and soil at the Lower Yard.
- Section 11 – Conceptual Site Model: Provides evaluation of fate and transport, potential receptors, and potential exposure pathways.
- Section 12 – Conclusion: Provides conclusions from the CSM development.
- Section 13 – Next Steps: Describes future work and documents.

- Section 14 – References: Provides references for the Report.

2. Site Description

As defined in the Agreed Order, the Site consists of three areas, the Upper Yard, Lower Yard and the Willow Creek Fish Hatchery (fish hatchery). Each area is currently a separate property but was once owned by Unocal. The Upper and Lower Yards were areas of operation for the former terminal. Although the fish hatchery was included in the Agreed Order, it was not used for operations or storage at the facility and is currently owned by the City of Edmonds. The Upper Yard was remediated to cleanup standards in 2003 (see Section 7) and is now the location of a condominium complex. As part of the Agreed Order (see Section 4), monitoring is ongoing at the Lower Yard, which is the focus of this CSM. Background information for the Upper Yard, Lower Yard, and fish hatchery is provided below.

2.1 Upper Yard

The Upper Yard is approximately 25 acres in area, located to the south of the Lower Yard. East of the Upper Yard is the fish hatchery and State Route 104. Beyond State Route 104 are residential and commercial areas in the town of Edmonds, Washington. South of the Upper Yard is a large residential area in the town of Woodway, Washington. To the west of the Upper Yard are the Puget Sound and a public park. The elevation of the Upper Yard is approximately 90 to 100 feet above mean sea level (amsl). The Upper Yard elevation is approximately 75 to 80 feet higher than the majority of the Lower Yard.

Unocal sold the Upper Yard to Point Edwards, LLC in October 2003. Currently the Upper Yard contains the Point Edwards Condominium complex (Point Edwards) including several high-occupancy residential buildings, administrative buildings, parking areas, landscaping areas, a stormwater retention pond and an outdoor walking path. Point Edwards is fully developed including underground and overhead utilities and a stormwater system. The Upper Yard area is zoned master plan 1 (MP1) which allows for residential and commercial uses.

The northern boundary of the Upper Yard is a steep decline in elevation into the Lower Yard. The slope from the Upper Yard to the Lower Yard is covered by immature growth of vegetation planted by the Point Edwards, LLC, during construction of the Point Edwards development. The Upper Yard is shown on **Figure 2**.

Remediation of the Upper Yard began in 2001. In 2003, upon the completion of remedial actions described in Section 7.1, the Washington State Department of Ecology (Ecology) issued a letter indicating that the Upper Yard Interim Action had met direct contact for soil cleanup criteria as specified in the Interim Action Report (Ecology, 2003). However, the Upper Yard is included within the Site as defined in the current Agreed Order.

2.2 Lower Yard

The Lower Yard is approximately 22 acres in area, located north of the Upper Yard. The western boundary of the Lower Yard is the BNSF Railway (BNSF) property, and the northwestern boundary is Willow Creek and the BNSF railway. Further west of the Lower Yard is the Port of Edmonds Marina and Puget Sound. North and northeast of the Lower Yard are the Edmonds Marsh (also known as the Union Oil Marsh) and Willow Creek. East of the Lower Yard is the Edmonds Marsh and Willow Creek, and southeast is the Willow Creek Fish Hatchery. At its nearest point (the southwest corner of the Lower Yard), the Lower Yard boundary is approximately 160 feet from the Puget Sound shoreline.

The surface elevation of the Lower Yard ranges from approximately 10 to 35 feet amsl based on vertical datum N.A.V.D. 88. The southeastern most portion of the Site, on Unoco Road near the Lower Yard entrance is approximately 35 feet amsl. Unoco Road continues along the southern boundary of the Site, drops in elevation to approximately 16 feet amsl in the southcentral portion of the Site. On the south side of the upper portion of Unoco Road there is a large paved area along the property boundary.

The majority of the Lower Yard area at the Site ranges between approximately 10 and 19 feet amsl and is relatively flat. The Lower Yard is currently a vacant property with no permanent aboveground structures. A temporary storage shed is located along Unoco Road in the central portion of the Lower Yard. The ground surface is compact dirt, gravel and natural vegetative cover. The Lower Yard is currently zoned master plan 2 (MP2) which would allow for use as mixed general residential and commercial uses.

Two stormwater detention basins (Detention Basin No.1 (DB-1) and DB-2) are located in the east/northeast Lower Yard and west/northwest Lower Yard (DB-1), while DB-2 is located between the west/northwest Lower Yard and central Lower Yard. A stormwater system consisting of 12 storm drains collects surface water runoff and discharges

collected stormwater directly into DB-2 via gravity flow. DB-2 serves as a stormwater collection area from which Lower Yard stormwater is discharged into Willow Creek under Industrial Stormwater General Permit No. SO3-002953C. DB-1 acts as a retention pond for overflow from DB-2 during storm events. DB-1 is bounded to the northwest, northeast, and southeast by a manmade berm. The berm runs along the eastern property boundary, adjacent to Willow Creek. DB-1 and DB-2 form depressions approximately 6 feet and 4 feet deep, respectively. DB-1 is an un-lined pond with one above-ground pump and a piping system to the DB-2 outfall on the bank of Willow Creek. DB-2 has an impermeable liner, and two submersible pumps and a piping system to the DB-2 outfall.

Willow Creek runs along the northern portion of the western boundary and the entirety of the eastern boundary of the Lower Yard. Willow Creek is approximately 10 feet wide and is underlain by silt and sand material. The creek banks on the Site property boundary are steeply sloped and vegetated with native and non-native vegetation. Water depths in Willow Creek vary from 0 to 4 feet deep, depending on season and tidal cycles (ARCADIS, 2012a).

A WSDOT-owned stormwater line with a changing diameter and construction crosses beneath the Lower Yard and discharges to Puget Sound, at a reported depth of 9 to 12 feet below ground surface (bgs) to the top of the pipe. The stormwater line generally runs along the northern edge of Lower Unoco Road and trends west across the Lower Yard to the tidal basin leading to Puget Sound. This line was installed between 1972 and 1975 and is a major stormwater drainage structure for State Route 104. In addition, the stormdrain line connecting the Point Edwards stormwater retention pond and the tidal basin leading to Puget Sound runs parallel to the WSDOT stormwater line across the Lower Yard, This line is made of corrugated metal and is located approximately 3 to 5 feet bgs. The Lower Yard is shown on **Figure 2** and the areas of the Lower Yard discussed in this report are outlined on **Figure 3**.

2.3 Willow Creek Fish Hatchery

The southeast portion of the Site, near the entrance to the Lower yard, was leased by Unocal to the Edmonds Chapter of Trout Unlimited in 1984. In 1985, an easement was issued by Unocal for development of the property as a fish hatchery. This property is now owned by the City of Edmonds. The property was formerly known as the Deer Creek Fish Hatchery and is currently known as the Willow Creek Fish Hatchery.

The Willow Creek Fish Hatchery currently consists of a building approximately 50 feet long and 20 feet wide, a circular fish rearing pond approximately 40 feet in diameter, and a small pump house. The remainder of the developed property is composed of a compact gravel driveway and grass and landscaped areas. Surface water runoff from the property drains directly into Willow Creek.

This area was not used by Unocal and remained undeveloped until 1985 when the fish hatchery was constructed. Review of historic information performed for development of the Remedial Investigation Work Plan (EMCON, 1995) indicated field investigations of the fish hatchery property were not warranted.

3. Site History

3.1 Lower Yard Creation

Prior to 1923, when the main facility structures were constructed (as discussed below) the area of the Lower Yard was tidal marshland. In order to provide usable working and building surfaces, backfill material was placed over the marsh, presumably beginning in the early 1920's. As seen in aerial photos of the Site (EMCON, 1994), in 1947 only the southwest Lower Yard area was developed and contained structures and facilities. The central, eastern, northeastern and southeast portions of the Lower Yard were undeveloped marshland at this time. By 1955 backfilled areas, structures and facilities had expanded to the central area of the Lower Yard. The northeastern and southeastern portions of the Lower Yard were still undeveloped marshland at this time. By 1965 the Lower Yard was filled and developed in all areas, as it remained for the duration of facility operations. The southeast Lower Yard appears to have remained undeveloped. Aerial photographs of the Site from 1947 to 1967 are included as **Appendix A**.

3.2 Historical Facilities and Operations

Historical operations at the Site conducted by Unocal included the storage and distribution of petroleum products, and the production, storage and distribution of asphalt products. Facilities at the Site included a loading/unloading dock in Puget Sound, railcar unloading areas, an aboveground tank farm, piping systems, an air-blown asphalt plant, asphalt warehouse, laboratory, truck loading racks, oil/water separators, underground storage tanks (USTs), and storm drain and sewer systems (EMCON, 1994).

A series of aboveground and underground pipelines, valves and manifolds were used at the Site to move product between areas of receipt, storage, blending, packaging and distribution in both the Upper and Lower Yards. All product pipes and valves were made of steel and ranged in diameter from 1.5-inches to 12-inches. Product at the Site was received and distributed via barge, ship, tanker, railcar, truck, drums and cartons.

Major Site operations and facilities are included in this report, for detailed operations and historic activities refer to the *Background History Report, UNOCAL Edmonds Bulk Fuel Terminal (EMCON, 1994).* Historical facility operations areas and structures discussed in this section are presented on **Figure 4**.

3.2.1 Former Upper Yard Facilities

Construction of the Upper Yard began in 1923 along with the main terminal structures and the loading dock. The Upper Yard consisted of 23 aboveground storage tanks (ASTs), two USTs, above-grade piping, a garage and a warehouse. Above-grade piping carried petroleum materials up the hill from the loading dock in the Lower Yard, to the ASTs in the Upper Yard. The ASTs ranged in size from 9,726 gallons to 3,491,754 gallons. Primarily, the ASTs in the Upper Yard were used for storage and blending of products.

The Upper Yard tanks were contained within soil berms coated with emulsified asphalt. With exception of the bermed areas and paved roads, the Upper Yard had a gravel surface. Precipitation infiltrated the gravel and stormwater was collected in catch basins which drained to the oil/water separator in the Lower Yard (EMCON, 1994).

3.2.2 Lower Yard Facilities

3.2.2.1 Former Loading Dock and Pier

Unocal owned and operated a 275-foot dock and 860-foot pier extending westward into Puget Sound from the southwest corner of the Lower Yard. The piping from the pier passed over the BNSF railroad line via a trestle at the end of the pier. The dock, pier, and trestle were constructed in 1923. The dock facilities included a system of pipes and valves, including ten 2-inch diameter to 12-inch diameter steel pipes. Pipelines from the dock ran above-ground to the shoreline manifold area, in the southwest corner of the Lower Yard. The piping then ran southeast up the hillside to the southwest portion of the Upper Yard as well as northeast along the toe of the hillside to the north central portions of the Upper Yard. The dock loading area received daily deliveries of gasoline, fuel oils and crude oils from tanker ships in Puget Sound (EMCON, 1994).

3.2.2.2 Former Railcar Unloading Areas

Two railcar loading/unloading areas were located in the southwest Lower Yard of the Site. The southern railcar loading/unloading area was constructed in the early 1930's. The time of construction of the northern railcar unloading area is unknown. Railcar service to the Lower Yard was discontinued in the 1960's and the unloading areas were dismantled in 1974 (EMCON, 1994).

The southern loading/unloading area was approximately 40 feet wide by 310 feet long and located along the property boundary in the southwest Lower Yard. This loading/unloading area consisted of two railroad spurs parallel to the BNSF railroad with loading/unloading racks parallel to the railroad spurs. The northern loading/unloading area was located immediately south of the Tidal Basin and was approximately 10 feet wide by 70 feet long (EMCON, 1994). Railcar tankers were loaded and unloaded in these areas on a regular basis for approximately 30 years.

3.2.2.3 Former Air-blown Asphalt Plant

The air-blown asphalt plant was constructed in approximately 1953 and covered a large portion of the west/northwest Lower Yard, adjacent to DB-1 and the former slops pond area (described in Section 3.2.2.5). Various grades of air-blown asphalt were produced in this facility including crack pouring compound, sub-sealing compound and canal lining asphalt. The plant was designed to produce up to 100 tons per day and the asphalt products were packaged into 100-pound cartons or steel drums. Materials used in the manufacturing of air-blown asphalt included tank bottom material from the facilities' existing crude distillation column and flux oil shipped to the Site by tanker or rail.

3.2.2.4 Former Asphalt Warehouse

The asphalt warehouse was a steel framed building built in 1953, along with the asphalt plant. The dimensions of the warehouse were 80 feet by 280 feet and it was located in the central Lower Yard, parallel to the southern edge of DB-1. Operations in the asphalt warehouse consisted of packaging asphalt from the air-blown asphalt plant. Asphalt was pumped from cooling tanks into a 6-inch diameter pipe that ran in a trench down the centerline of the building. The asphalt was then pumped into containers using a loading arm. These containers were then loaded and distributed via truck and trailer.

3.2.2.5 Detention Basin No.1 and No. 2

DB-1 is located in the East/Northeast Lower Yard and is approximately 200 feet by 600 feet in size. DB-1 was constructed in 1952 and the original layout was an L-shape with a leg extending south along the northeastern property boundary. DB-1 was constructed by dredging sediment from the northeastern and northwestern Site perimeters, creating a drainage channel (Willow Creek) to carry the flow from a small creeks draining surface water from upland areas in the City of Edmonds.

In the late 1960's, DB-1 was modified by partitioning off the southern leg; creating an impoundment area to contain refinery and asphalt sludges and runoff (EMCON, 1994). The impoundment area became known as the "slops pond". In 1974, the slops pond was backfilled and DB-2 was constructed. DB-2 is fully lined with PVC liner material and contains outfall pumps that discharge to Willow Creek (EMCON, 1994).

3.2.2.6 Former Truck Loading Racks

Two truck loading racks were located in the Lower Yard. A two-lane gasoline and diesel loading rack was located in the central Lower Yard and a single lane loading rack was located in the southwest Lower Yard along the toe of the slope leading to the Upper Yard. It is unclear when the loading racks were constructed, but in approximately 1977 they were modified from top loading racks to bottom loading racks. This reportedly minimized the potential for accidental releases and product loss during truck loading. Spill containment controls at each rack consisted of a concrete pad, concrete curbs and strip drains that led to a 10,000-gallon UST separator tank (EMCON, 1994).

3.2.2.7 Former Oil/Water Separators

Two oil/water separators were located in the Lower Yard, approximately 150 feet south of DB-2. The separators were used to remove oil from the Site's wastewater prior to its discharge into Willow Creek.

The main oil/water separator was built around 1950, and was a concrete vault approximately 45 feet long, 18 feet wide, and 11 feet deep. It had an open top at ground surface, with baffles and skimmers to remove oil product as waste water passed through the vault. Product removed from the oil/water separator was pumped into one of the ASTs in the Lower Yard. All of the Upper and Lower Yard stormwater drains flowed to the main oil/water separator since its construction in 1950. Prior to 1950, wastewater treatment and disposal practices at the Site were not documented.

The secondary oil/water separator was located immediately northwest of the main oil/water separator. The secondary separator was made of steel, consisted of a series of four cells and contained a full length float skimmer. This unit was installed in approximately 1974 when DB-2 was constructed and was used for additional treatment of wastewater in order to meet National Pollutants Discharge Elimination System (NPDES) discharge standards (EMCON, 1994).

3.2.2.8 Former Underground Storage Tanks

Ten USTs were in operation at the Site. UST capacity varied from 200 to 10,000 gallons and the tanks were installed at various times from the pre-1950s to 1985.

Nine of the USTs were located throughout the Lower Yard and one was located in the Upper Yard. All of the USTs were made of welded steel with the exception of the delivery truck slops tank installed in 1985, which was made of fiberglass.

The UST located in the Upper Yard was removed in 1984 and its installation date and intended use are unknown. Three of the USTs in the Lower Yard were located near the facilities garage and were used for fueling Site trucks and equipment. One UST in the Lower Yard contained diesel fuel and was used to fuel the onsite boiler. One of the Lower Yard USTs contained fuel additive that was mixed during truck loading at the two truck loading racks. One of the Lower Yard USTs was a delivery truck petroleum slops tank where delivery lines from ingoing and outgoing trucks were drained. Two of the Lower Yard USTs collected truck loading rack overflow, spillage and rainwater from the strip drains at each of the truck loading racks. Two of the Lower Yard USTs served as vapor recovery tanks which collected condensed vapor from the vapor recovery system.

3.2.3 Historical Releases

Facility operations began in the early 1920's with the construction of the Unocal pier and main facilities of the Upper and Lower Yard. Although no spills were documented during this time, data collected during the 2007/2008 Interim Action excavations indicated that soil impacts were present at depths deeper than Site groundwater fluctuations. Specifically, impacts were found in layers of beach and marsh deposits below 1929 Fill materials, suggesting that releases potentially occurred in either the undeveloped marshland areas of the Lower Yard prior to backfill placement, from the early 1920's to the 1950's, or were transported vertically through the saturated zone by a fluctuating groundwater table over time.

From 1954 to 1990, there were a number of documented spills totaling approximately 155,000 gallons at the Site. Spilled quantities ranged from a few gallons to 80,000 gallons and involved fuel oils, heavy oils, gasoline, off-specification asphalt and diesel products. Periodic product releases (approximately 0.2 to 2 gallons) reportedly occurred from valves, flanges and pumps in the Upper and Lower Yards throughout

the history of the Site. Records or documentation of these smaller releases are not available.

4. Lower Yard Regulatory and Ownership History

4.1 Agreed Order No. DE 92TC-N328

In 2001, Unocal entered into an Agreed Order (No. DE92TC-N328) with Ecology. Under this Agreed Order, interim actions were conducted in the Lower Yard during 2001 and 2003, as discussed in Section 7.2.1 and 7.2.2. This Agreed Order was later superseded by the current Agreed Order (No. DE4460) as discussed in Section 4.3.

4.2 Property Transfer

In January 2005, WSDOT and Unocal signed an Agreement of Sale of Real Property and Escrow Instructions (Agreement). Ecology is not a party to this agreement. The Agreement, and the two amendments to the Agreement, set forth the conditions precedent to the transfer of the property. Unocal's first step was the preparation of a Proposed Interim Action Report. This report outlined the Capital Remediation Work Unocal is to perform, and was submitted to Ecology as the Interim Action Report - Work Plan for 2007 Lower Yard Interim Action. This document is included in the 2007 Agreed Order (discussed below).

Once the interim action work is performed, the Agreement calls for a Proposed Remediation Plan. This plan is to take the form of the FS, and will identify a set of remedial alternatives and monitoring work. The FS may also include additional Capital Remediation Work. Once the FS is approved, a Cleanup Action Plan (CAP) is prepared. The CAP may require capital remediation work. If capital remediation work is required, the capital remediation work has been completed and its performance has been verified by compliance monitoring, the Agreement between Unocal and WSDOT calls for Ecology to provide a written acknowledgement that Unocal has completed the capital remediation work. The Agreement between Unocal and WSDOT states that Ecology's acknowledgment is deemed conclusive evidence that Unocal has satisfied its obligations to perform the Capital Remediation Work called for under the Agreement. If there is any discrepancy between this description of the Agreement between WSDOT and Unocal and the Agreement itself, the language of the Agreement governs.

4.3 Agreed Order No. DE 4460

In July 2007, Unocal entered into an Agreed Order (No.DE 4460) with Ecology to conduct an interim remedial action at the Lower Yard. This Agreed Order superseded

Agreed Order No. DE92TC-N328. The Agreed Order required Unocal to conduct an interim action to remediate soil, groundwater and sediments, and to monitor groundwater in the Lower Yard. The purpose of the interim action was to reduce potential threats to human health and the environment, to provide for completion of the FS for the Lower Yard and to gather information to design additional cleanup actions, if necessary. The specific objectives of the interim action included:

- Remediation of the petroleum hydrocarbon-impacted soil within the Lower Yard that contains petroleum hydrocarbon concentrations greater than the soil remediation levels (RELs) or soil cleanup levels (CULs) based on direct contact
- Removal of light non-aqueous phase liquid (LNAPL)
- Extraction of groundwater that is in contact with LNAPL
- Removal of soil with arsenic concentrations in excess of the soil CUL based on natural background
- Removal of the sediment in the drainage ditch (Willow Creek) at locations near the Site's two stormwater outfalls that failed toxicity tests in 2003
- Obtaining the data necessary to determine if the remaining soil concentrations are sources of LNAPL on the groundwater table
- Obtaining the data necessary to determine if the remaining soil concentrations will cause an exceedance of the groundwater CULs at the groundwater points of compliance (POCs)
- Obtaining the data necessary to determine if the petroleum hydrocarbon concentrations in the groundwater beneath the Lower Yard will naturally attenuate to below the CULs at the groundwater POCs

The 2007 Agreed Order Interim Actions were conducted in two phases in 2007 and 2008, as described in Section 7.2.3.

4.3.1 Cleanup Standards and Indicator Hazardous Substances

The Agreed Order and subsequent Interim Actions were based on the understanding that the planned use for the Lower Yard was a multi-modal transportation terminal. Based on this understanding, a Model Toxics Control Act (MTCA) Method B approach was used for determining cleanup standards for the Lower Yard. The Interim Action Work Plan (IAWP) (SLR Inc., 2007) identified four Indicator Hazardous Substances (IHSs) in the Lower Yard based on the history and previous investigations conducted at the Site. IHSs for soil were developed based on direct contact and leaching pathways, and are:

- Total total petroleum hydrocarbons (TPH): sum of gasoline-range organics (GRO), diesel-range organics (DRO) and heavy-oil range organics (HO)
- benzene
- carlenogenic poly-aromatic hydrocarbons (cPAHS) (adjusted for toxicity)
- Arsenic (direct contact only).

Groundwater IHSs were also developed in order to protect surface water and sediment in Willow Creek. Arsenic was eliminated as a groundwater/surface water IHS because arsenic concentrations in groundwater were determined to be caused by geochemical conditions associated with naturally occurring organic carbon sources in the soil beneath the Lower Yard, and arsenic concentrations in surface water samples collected in Willow Creek reflected background concentrations (SLR, Inc., 2007). Current groundwater IHSs are:

- TPH (sum of GRO, DRO, HO)
- benzene
- cPAHs (adjusted for toxicity).

4.3.2 Cleanup Levels and Remediation Levels

As defined in the IAWP, a CUL is the concentration of an IHS that must be met to protect human health and the environment. A REL is a concentration of an IHS that is higher than a CUL that defines an area of the Site where a particular cleanup action

component will be used. The site-specific soil concentrations for TPH and benzene are considered RELs rather than CULs because they are based on a direct contact pathway and do not consider the leaching pathway or residual saturation. At the conclusion of the interim action, an empirical demonstration was expected to show that soil concentrations of TPH and benzene are protective of groundwater, in which case the soil RELs for these IHSs would become soil CULs. The soil concentration for total cPAHs is the minimum CUL for all endpoints evaluated (direct contact), so it is considered a CUL rather than a REL.

The groundwater and surface water CUL concentrations as defined in the IAWP are based on MTCA Method A CULs for TPH and water quality criteria for benzene and cPAHs. They are not expected to change as a result of remedial activities, so they are considered CULs rather than RELs. There are no MTCA CULs for total TPH. Therefore, as per the IAR Section 5.3, MTCA Method A CULs for TPH were derived by setting a hazard index (HI) for all three TPH constituents to 1 and adjusting the compositions of each TPH constituent for each sample, on an individual basis. As of July 2012, CULs for groundwater were derived in this manner using the following calculation:

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 (µg/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 (µg/L)

%HO = Sample-specific percentage of HO in groundwater, expressed as a decimal (i.e., 0.33 is used for 33%)

Soil CULs and RELs are based on direct contact and the assumption that an empirical demonstration will be shown after interim actions are completed that soil concentrations greater than CULs are not impacting groundwater, and therefore are protective of groundwater. Groundwater CULs are designed to protect surface water and sediment in Willow Creek at locations adjacent to the Lower Yard. The CULs and RELs for soil and groundwater are provided in the tables below:

Table 1: Soil Cleanup Levels and Remediation Levels

Indicator Hazardous Substance	Soil Cleanup Level or Remediation Level[1]
Total TPH	2,975
Benzene	18
Total cPAHs[2]	0.14
Arsenic	20

Notes:
[1]Concentrations in milligrams per kilogram (mg/kg).
[2]Total cPAHs adjusted for toxicity based on WAC 173-340-708(8).

Table 2: Surface Water and Groundwater Cleanup Levels

Indicator Hazardous Substance	Surface Water and Groundwater Cleanup Level[1]
Total TPH[2]	$TPH_{SWCUL} = \frac{25}{0.05 - 0.01875 f_G}$ mg/L
Benzene	51
Total cPAHs[3]	0.018

Notes:
[1]Concentrations in micrograms per liter (µg/L).
[2] Total TPH calculated on a sample-specific basis, where f_G is the decimal fraction GRO.
[3]Total cPAHs adjusted for toxicity based on WAC 173-340-708(8).

Due to the historical relative difference in proportions of GRO, DRO and HO in differing areas of the Lower Yard, separate CULs for groundwater were developed for the eastern and western portion of the Lower Yard. However, upon completion of the 2007/2008 Interim Action excavations, this demarcation method became inadequate because the relative differences of the GRO, DRO and HO proportions did not follow the line separating the eastern and western Lower Yard as defined in the IAWP. After the June 2012 sampling event, CULs were calculated for each sample collected from each well since the current groundwater monitoring program began in 2008.

4.3.3 Points of Compliance

Points of compliance for groundwater CULs are the points where groundwater discharges to surface water. The points where groundwater discharges to surface water are monitored by 23 compliance monitoring wells along the downgradient (western, northwestern, northeastern and eastern) perimeter of the Lower Yard. POC monitoring wells are located from the southwestern corner to the northern corner of DB-1, to the southeastern corner of the Lower Yard. Groundwater CULs are required to be met at POC monitoring well locations. The Lower Yard POC monitoring wells are listed below:

LM-2	MW-8R	MW-20R	MW-101	MW-104	MW-108
MW-109	MW-129R	MW-135	MW-136	MW-139R	MW-147
MW-149R	MW-150	MW-500	MW-501	MW-510	MW-518
MW-522	MW-523	MW-524	MW-529	MW-530	

Soil POCs are all soils within the top 15 feet of soil in the Lower Yard. CULs for benzene and cPAH and the REL for TPH must be met within the top 15 feet of soil and if groundwater concentrations at the POC locations for groundwater discharging to surface water are met, then soils in the saturated zone with concentrations exceeding CULs and/or RELs will be proven protective of groundwater.

5. Geology and Hydrogeology

5.1 Upper Yard

5.1.1 Stratigraphy

The Upper Yard consists primarily of fill material from ground surface to approximately 10 feet bgs. Upon completion of remedial excavation activities in 2001 (Section 7.1), the Upper Yard was left without backfilling excavation areas. Portions of the Upper Yard were later cut and filled during construction of the Point Edwards complex.

Beneath the backfill is native material consisting primarily of silt and silty sand. In general, there is a silt layer overlaying a sandier layer which contains frequent interbedded silt layers (EMCON, 1996). The upper silt layer ranges from approximately 30 to 100 feet in thickness, and the underlying sand layer ranges from 30 to 70 feet in thickness. Interbedded silt has been identified ranging from approximately 5 to 30 feet in thickness within the sand layer (EMCON, 1996). Due to the variation in topography, the silt layer is absent on the slope of the Upper Yard leading north to the Lower Yard. The unit of native material that makes up the Upper Yard is considered to be transitional layers of alluvial/lacustrine preglacial deposits as mapped by Minard (Minard, J.P., 1983) (EMCON, 1996).

Beneath the transitional silt and sand layers in the Upper Yard lies the Whidbey Formation unit that is described in Section 5.2.1 below.

5.1.2 Groundwater

Historical groundwater gauging data (collected from October 1994 to August 1996) indicate that groundwater depths at the Upper Yard ranged from approximately 17 to 142 feet below top of casing (btoc) (EMCON, 1996). Groundwater elevations ranged from approximately 9.5 to 12 feet amsl. No groundwater monitoring wells are currently located in the Upper Yard, and groundwater water levels are no longer measured.

5.2 Lower Yard

5.2.1 Stratigraphy

Five hydrostratigraphic units have been identified in the Lower Yard and are discussed in detail below:

- *2008 Fill*. The 2007-2008 Interim Action excavations were backfilled to 6 to 12 inches above the observed groundwater table in the open excavations with poorly graded coarse gravels (⅜ to 1 inch) with little to no fines. Backfill material above the coarse gravel to ground surface was a mixture of very fine to medium sand, trace silt, and fine to medium gravel materials.

- *1929 Fill*. This unit consists of silty sands with gravel and sandy silts with gravel. During the 2007-2008 Interim Action excavations, subsurface materials encountered from ground surface to a depth of 8 to 15 feet bgs were mostly fill material placed circa 1929 or later, during the creation of the Lower Yard facility.

- *Marsh Deposits*. In many areas of the Lower Yard, beneath the 1929 Fill, there is a layer ranging from 1 foot to 15 feet thick composed of silt and sandy silt with large amounts of organic matter such as peat, and wood debris. This layer is encountered at depths ranging from 8 to 14 feet bgs, directly below the 1929 Fill material, and is interpreted to be representative of the former marsh horizon beneath the Lower Yard. This layer is typically demarcated by a 6 to 12 inch thick layer of decomposing vegetation.

- *Beach Deposits*. Below the 1929 Fill and Marsh Deposits, a poorly graded sand formation of very fine to medium sand with fine gravel is present, containing organic material such as driftwood and seashells. This layer is interpreted to be representative of the former beach environment in the area prior to creation of the Lower Yard.

- *Whidbey Formation*. This material is a poorly graded sand layer consisting of very fine to medium sand with fine gravel and is distinct from the overlying materials in the Lower Yard. It is present to the maximum explored depth of 41.8 feet bgs by Unocal. This unit contains interbedded sand with silt, and interbedded silt and sandy silt are also present. The interbeds range in thickness from less than 1 inch to several feet, and appear to be laterally discontinuous. This unit is interpreted to be alluvium, and is likely part of the Whidbey Formation.

The current uppermost stratigraphic unit of the Lower Yard consists primarily of 2008 Fill. All of the 2007/2008 Interim Actions excavations were extended to reach Beach Deposits, Marsh Deposits or Whidbey Formation materials. Remaining un-excavated areas are most likely 1929 Fill material, underlain by the hydrostratigraphic units described above. Cross sections of the Lower Yard are presented as **Figures 5**

through 9. Elevations of the 2008 gravel backfill material in all of the 2007/2008 excavation areas are shown on **Figures 10 and 11**.

5.2.2 Groundwater Flow

Groundwater elevation data from June 2012 were contoured and are presented on **Figure 12**. The groundwater contours in the southeast Lower Yard indicate an area of localized groundwater mounding which is discussed further in Section 5.2.2.1. Quarterly water level data from October 2008 to June 2012 were evaluated to assess the long term hydraulic gradient and overall groundwater flow direction in the Lower Yard. Groundwater elevations over this time period range from approximately 2 feet amsl to 15 feet amsl and generally decrease from south to north-northwest primarily towards Puget Sound and towards Edmonds Marsh (east) as well. Depth to water values range from approximately 0.6 feet btoc to 27 feet btoc. In general, the greatest depth to water values are measured near the entrance to the Lower Yard (on the upper portion of Unoco Road) and in the vicinity of the central portion of the Site, decreasing with proximity to Puget Sound (to the north) and Edmonds Marsh (southeastern portion of the Lower Yard). Using the quarterly data to calculate a site-wide gradient (Devlin, 2003) the analysis indicates the overall, average gradient is 0.002 ft/ft towards the west-northwest, as shown on the rose diagram on **Figure 13**. This evaluation did not include the newly installed monitoring wells (installed in June 2012), MW-500, MW-501, or the “P” series piezometers.

The 2011 Site investigation activities included evaluation of potential tidal influence on groundwater and surface water (ARCADIS 2012a). As described in Section 5.2.3 below, the results indicate that tidal variations in water levels in the Puget Sound exert an influence on groundwater elevations at the perimeter of the Site.

Groundwater flow in the southeast portion of the Lower Yard is also influenced by the 2007/2008 excavation and subsequent 2008 Fill. After the 2008 Fill was in place and monitoring wells were installed, groundwater elevations at wells MW-500 and MW-501 were observed to be approximately 5 to 7 feet higher than surrounding wells. Further investigation in the area indicated that water levels at piezometers screened partially in the 2008 Fill and underlying 1929 Fill also exhibit these higher groundwater elevations. This is discussed in more detail in Section 5.2.2.1.

Horizontal gradients in the surficial materials of the Lower Yard measured during tidal study activities conducted in 2011 ranged in magnitude from 0.0053 to 0.0058 feet/foot

(ft/ft) with an overall direction towards the west-northwest towards the Puget Sound (ARCADIS, 2012a).

Results of the hydraulic conductivity testing conducted during the 2011 Site investigation indicated that hydraulic conductivity varies throughout the Lower Yard, and corresponds to the heterogeneity of the subsurface materials. The 1929 Fill is of much lower permeability than the 2008 Fill material. Wells completed in the 2008 Fill have relatively higher hydraulic conductivity values than those completed in the 1929 Fill (ARCADIS, 2012a). Hydraulic conductivity testing results from 2011 Site investigation activities ranged from 0.06 feet/day to 345 feet/day, with hydraulic conductivity values at wells completed in the 1929 Fill ranging from 0.2 to 15 feet/day and hydraulic conductivity values at wells completed in the 2008 Fill ranging from 2.5 to 345 feet/day (ARCADIS, 2012a).

A review of the 2011 Site Investigation Report (ARCADIS 2012a) indicated incorrect hydraulic conductivity values reported in Table G-1 (Appendix G) for some of the wells. The analysis for the wells was appropriate; however, a lookup function in the summary table incorrectly referenced the values in the cells. Therefore a revised summary table is submitted herein as **Table 4**. Additionally, in the 2011 Site Investigation Report, it was noted that the step test data from LM-2 were analyzed which is correct, but a valid result could not be obtained from the analysis. Therefore the value estimated at LM-2 was only from the slug testing.

A summary of hydraulic conductivity from all hydraulic testing activities including step drawdown tests, short duration hydraulic conductivity tests, long duration hydraulic conductivity test, and slug tests is presented below along with the screened interval lithology.

Table 3: Summary of Hydraulic Conductivity Results (Table G-1 from 2011 Site Investigation Report (ARCADIS, 2012))

Tested Well	Minimum Estimated Hydraulic Conductivity (ft/day)	Maximum Estimated Hydraulic Conductivity (ft/day)	Arithmetic Mean Hydraulic Conductivity (ft/day)	Well Screen Interval (Geologic Material)
LM-2	0.3	0.4	0.3	1929 Fill
MW-104	4.7	15	10	1929 Fill

MW-129R	0.2	0.5	0.3	1929 Fill
MW-149R	2.5	2.5	2.5	2008 Fill
MW-500	0.06	0.2	0.1	2008 Fill/1929 Fill
MW-518	5.8	10	8	2008 Fill
MW-8R	186	345	259	2008 Fill

5.2.2.1 Southeast Lower Yard Groundwater Mounding

Groundwater elevations in monitoring wells MW-500 and MW-501 are generally several feet higher (5 to 7 feet) than elevations at surrounding wells. Wells MW-500 and MW-501 are partially installed in 2008 Fill, but are also partially screened in the underlying 1929 Fill material.

In July 2009, in an effort to understand the higher groundwater elevations, eight piezometers were installed in the southeast Lower Yard in the vicinity of monitoring wells MW-500 and MW-501. The piezometers were installed in pairs, with each piezometer approximately 1 to 2 feet from each other. One piezometer of each pair was installed as a deep well (ranging from 25 to 22 feet bgs) and one as a shallow well (ranging from 12 to 13 feet bgs). The deep piezometers are constructed with 5 feet of well screen and the shallow piezometers are constructed with 10 feet of well screen. A summary of the piezometers and wells MW-500 and 501 is presented in table below.

Table 5: Southeast Lower Yard Well Screen Interval Summary

Well ID	Classification	Well Screen Interval (Geologic Material)
P-1	Shallow	2008 Fill/1929 Fill
P-2	Deep	1929 Fill
P-3	Shallow	2008 Fill
P-4	Deep	1929 Fill
P-5	Shallow	2008 Fill
P-6	Shallow	2008 Fill/1929 Fill
P-7	Deep	1929 Fill/Whidbey Formation
P-8	Deep	1929 Fill/Whidbey Formation

MW-500	Shallow (Monitoring Well)	2008 Fill/1929 Fill
MW-501	Shallow (Monitoring Well)	2008 Fill/1929 Fill

All shallow piezometers, which are installed in either the 2008 Fill or both 2008 Fill and 1929 Fill, have groundwater elevations consistent with groundwater elevations observed in monitoring wells MW-500 and MW-501. The groundwater elevations at the shallow piezometers are also several feet higher than the corresponding deeper piezometers, which are installed in the 1929 Fill or both the 1929 Fill and the Whidbey Formation.

2008 Fill material is a higher permeability material than the 1929 Fill which underlies and surrounds the 2007/2008 excavation areas in the southeast Lower Yard. The 2008 Fill appears to have created a distinct zone in which shallow groundwater responds more rapidly to recharge than the surrounding and underlying 1929 Fill. Movement of groundwater from the 2007/2008 excavation area (both laterally and vertically) is restricted due to the presence of the lower permeability 1929 Fill. Additionally, surface water runoff from the bluff along the Upper Yard may also be a contributing part of recharge to this portion of the Site. As a result, water levels in the vicinity of the 2007/2008 excavation area indicate a limited area of groundwater mounding due to the differential permeabilities. Cross sections of the southeast Lower Yard with groundwater elevation data are shown on **Figures 8 and 9**. Groundwater elevation contours and data from the most recent gauging event conducted in June, 2012, are presented on **Figure 12**.

5.2.3 Surface Water – Groundwater Interaction

The 2011 Site Investigation included a study to evaluate the potential interaction between Puget Sound, groundwater at the Lower Yard, and surface water in Willow Creek. The results were included in the Site Investigation Report (ARCADIS, 2012a) and are summarized below.

Based on the tidal study, the Lower Yard perimeter wells (located within approximately 62 feet of the property boundary) are tidally influenced. Shallow monitoring wells with observable response to tidal influence indicated a range in amplitude from 0.07 foot to 1.15 feet. Deeper monitoring well MW-122 completed in the Whidbey Formation indicated a range in amplitude from 0.02 to 0.33 foot (ARCADIS, 2012a). Additionally, an incorrect range in elevations during the tidal study was reported in the 2011 Site Investigation Report (ARCADIS, 2012a) and was based on data from the

malfunctioning transducer that was first installed at MW-122. The correct range in elevations during the monitored period was from 8.60 feet amsl to 8.93 feet amsl. Please note that the graph for MW-122 provided in the 2011 Site Investigation Report was correctly reported. Wells monitored during the tidal study indicate higher tidal efficiency factors, or the ratio of the change in water level in a groundwater well compared to the change in water level in tidally affected water body, along the northwest boundary wells adjacent to the Puget Sound versus southeast boundary wells that are adjacent to the marsh. Results indicate that the average tidal efficiency varied between approximately 0.003 (LM-2 and MW-515) and 0.09 (MW-149R). The average tidal efficiency of all the wells studied was 0.03. The values are relatively low, likely due to the low permeability and heterogeneity of material at the Site. The relatively low tidal efficiency values observed at Site monitoring wells indicates that groundwater levels at the Site are not significantly influenced by tidal changes in the Puget Sound (ARCADIS, 2012a).

A comparison of groundwater elevations to Puget Sound water elevations measured during the 2011 tidal study indicates that the short term groundwater flow direction varies with the tidal stage. At most of the observed perimeter locations, during high tide, the Puget Sound water elevation is higher than groundwater elevations in the Lower Yard, indicating an inward flow direction. At low tide the opposite is true, and the flow direction is such that groundwater flows towards the Puget Sound. The exceptions to this are at MW-122, MW-500 and MW-501. At these locations, during the tidal study, elevations were higher than the Puget Sound except at the “high” high tide stage (ARCADIS, 2012a).

Data collected during the 2011 tidal study from transducers installed at staff gauges in Willow Creek indicate that Willow Creek is tidally influenced. At locations where the Willow Creek was monitored with transducers, the flow direction is such that at high tide, the Puget Sound elevation is greater than surface water elevations in Willow Creek, and at low tide Willow Creek elevations are greater than those in the Puget Sound. Puget Sound flows into Edmonds Marsh at high tide and Edmonds Marsh drains into the Puget Sound at low tide. This is consistent with the observations of groundwater elevation compared to Puget Sound elevations.

Salinity was also measured in Willow Creek during the tidal study. Salinity variations were observed to correlate the tidal stage at staff gauges with observable tidal influence. As observed during 2011 tidal study activities, flow during high tide in the Puget Sound flow is directed towards Willow Creek and salinity concentrations in Willow Creek increase. During low tide in Puget Sound, the flow direction reverses and

flows from Willow Creek toward the Puget Sound while salinity concentrations decrease. During some tidal cycles during the 2011 tidal study monitored period, surface water elevations in Willow Creek were greater than those in Puget Sound during both low and low high tides. Staff gauge D-6R (located in DB-1) did not indicate any observable tidal influence indicating that DB-1 has very little to no connection to Puget Sound. Staff gauges with an observable response to tidal influence indicated a range in amplitude from 0.02 foot to 3.73 feet. Fluctuations in surface water elevations in Willow Creek ranged from 3.06 feet amsl to 8.76 feet amsl (ARCADIS, 2012a).

Based on the water level data and salinity collected during the 2011 tidal study, not only does the flow direction vary with tide, but water from the Puget Sound is mixing with water in Willow Creek and to a lesser extent with groundwater. This is indicated by the water level response to tidal fluctuations and also the varying salinity concentrations observed at the staff gauge locations. This is also occurring at the tidally influenced monitoring wells; however, the magnitude of responses to tidal fluctuations and salinity concentrations are less at the wells than observed in Willow Creek. Willow Creek is directly hydraulically connected to Puget Sound through a culvert running under the Port of Edmonds which also likely contributes to the greater tidal response and higher salinity concentrations. Therefore, based on groundwater elevations, surface water elevations and salinity changes, the data from the tidal study indicate that groundwater flow is directed to surface water over the long term, but there are also local, transient flow direction changes as a result of tidal stage fluctuations in the Puget Sound where surface water is directed to groundwater. This unique hydraulic and hydrogeologic setting creates a mixing zone along the western boundary where groundwater, fresh water, and saline sea water interact, at times stagnating and ultimately reversing groundwater gradient at the western boundary of the Site.

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6. Historical Site Investigations

Historical site investigations indicated that in general, the areas of petroleum hydrocarbon-impacted soil at the Site coincided with historical Site operations. Impacts in the Upper Yard were found in the vicinity of AST basins, stormdrain lines, product piping lines and facility operations areas. In the Lower Yard, impacts were generally found in the vicinity of the asphalt plant, railcar loading racks, truck loading racks, and fuel storage and distribution areas. Areas of the Lower Yard containing soils impacted with metals, specifically arsenic, were found in places where tanks and pipes had been sandblasted with arsenic-containing sandblast grit. Impacts were found in the southeast Lower Yard although historical facility activities were not conducted in this area. During 2007/2008 Interim Action excavation activities, it was discovered that the southeast Lower Yard was used as a disposal area for impacted soils, construction debris, and other waste materials. The results of historical investigations, which were conducted prior to the interim actions, are summarized in the following sections.

6.1 Upper Yard

Remedial investigations conducted between October 1994 and August 1996 provided the basis for the Upper Yard interim action cleanup work, conducted in 2002 and 2003. Due to groundwater depths of 30 to 140 feet bgs and very dense soils underlying the Upper Yard, groundwater was not included in the remedial investigations. The below section describes the soil conditions in the Upper Yard prior to the interim action.

6.1.1 Surface Soil

Elevated metals concentrations were found in surface soil (0 to 0.5 feet bgs) under pipe runs and manifolds, in isolated grit stockpiles and in some tank basins. These metals concentrations were likely due to the use of metals-containing sandblast grit used to clean piping and tanks. Antimony, arsenic, chromium, copper, lead, zinc and cadmium were detected in surface soils at concentrations up to 130,200 milligrams per kilogram (mg/kg) (MFA Inc., 2001). Total Petroleum Hydrocarbon (TPH) impacts were found in surface soils in the Upper Yard, where total petroleum hydrocarbons – diesel range organics (DRO) and total petroleum hydrocarbons – heavy oil range organics (HO) were detected at maximum concentrations of 10,000 mg/kg and 6,500 mg/kg, respectively. Total petroleum hydrocarbons – gasoline range organics (GRO), carcinogenic polyaromatic hydrocarbons (cPAHs) and BTEX constituents (benzene, toluene, ethylbenzene and total xylenes) contained detectable concentrations in less than half of the surface soil samples collected. Concentrations and analytical data

reported in this section were taken from the *Interim Action Report, Unocal Edmonds Terminal, Maul Foster and Alongi, Inc. (MFA, 2001)*. Detailed information regarding analytical data was not available.

6.1.2 Subsurface Soil

Elevated concentrations of TPH constituents were generally found at depths from 0 to 5 feet bgs; the consistent presence of dense fine-grained soil found in the Upper Yard at this depth prevented any significant downward migration of contaminants (MFA Inc., 2001). GRO, DRO and HO were detected in less than one third of the subsurface (0.5 to 15 feet bgs) samples collected during remedial investigations, with maximum concentrations of 550 mg/kg, 24,000 mg/kg and 5,300 mg/kg, respectively. The highest concentrations of TPH were found within tank basins and along stormdrain lines (MFA Inc., 2001).

6.2 Lower Yard

The below section describes the soil and groundwater conditions in the Lower Yard prior to the 2007/2008 Interim Actions.

6.2.1 Soil

Prior to 2007/2008 Interim Action excavation activities, soils containing TPH greater than 5,000 mg/kg, at depths from ground surface to greater than 6 feet bgs, were found throughout the majority of the Lower Yard. Interim Actions in 2001 and 2003 removed impacted soil within some of these areas. However, excavated soils from onsite were used as backfill and contained elevated concentrations of TPH (SLR Inc., 2007) and the excavated areas remained impacted. The 2001 and 2003 Interim Action excavations are discussed in detail in Section 7.2.

Areas of remaining impacted soil included the central and south-central Lower Yard areas (the former location of the asphalt plant and northern truck loading rack area), the northwestern property boundary adjacent to Willow Creek (asphalt plant area), the southwest property boundary adjacent to the BNSF right-of-way (the former railcar loading areas and southern truck loading rack) and the southeast Lower Yard. Areas with elevated concentrations of TPH in the Lower Yard also included 2001 Interim Action excavation areas B, C and D, and under the stormwater excavation, adjacent to excavation area A (Figure 2).

Maximum concentrations of TPH were found at depths from 0 to 3 feet bgs in the north-central Lower Yard (31,600 mg/kg), from 3 to 6 feet bgs in the south-central Lower Yard (147,230 mg/kg), and at depths greater than 6 feet bgs in the southeast Lower Yard (18,852 mg/kg). TPH impacts were most laterally extensive at depths from 3 to 6 feet bgs, throughout the Lower Yard (SLR Inc., 2007).

Benzene and cPAHs were also present in Lower Yard soils, typically in the same areas as TPH impacts. Maximum concentrations of benzene and cPAHs in Lower Yard soils were 78 mg/kg and 1.56 mg/kg, respectively (SLR Inc., 2007). Arsenic impacts to surface soil were identified in soil in the Lower Yard, due to the sandblasting of the piping and manifold entering the Lower Yard from the Unocal Pier. After completing the 2003 interim action, arsenic was only detected in the southwest corner of the southwest Lower Yard. Concentrations of arsenic in this area were detected up to 1,900 mg/kg and were excavated during the 2007/2008 Interim Action excavations.

6.2.2 Groundwater and Light Nonaqueous Phase Liquid

Prior to the 2007/2008 excavation, a groundwater sampling event was conducted at the Lower Yard in September 2006 (SLR Inc., 2006). Dissolved phase TPH impacts were present in the majority of the Lower Yard at concentrations greater than 500 µg/L. Four distinct areas of LNAPL were interpreted to be present. These areas were in the 2001 Excavation A area (adjacent to the tidal basin), southeast of Excavation B (in the central Lower Yard), Excavation D in the west/northwestern area (south of DB-2) and in the central portion of the Lower Yard between DB-1 and Lower Unoco Road. Dissolved phase impacts were not found in the southwest or southeast Lower Yard, or north of DB-1 (SLR Inc., 2007). The areas of LNAPL and dissolved concentration contours interpreted from data collected during the 2006 groundwater sampling event are shown on **Figure 14**. The 2007/2008 excavations better defined the extent of these LNAPL areas.

6.2.3 Sediment

In 2003, sediment samples were collected from 16 locations (US-01 through US-16) in all areas of Willow Creek. These samples were analyzed using a suite of chemical analyses and bulk chemistry analyses. Due to elevated TPH concentrations, bioassay toxicity testing was conducted on sediment samples from six of the locations. Sediment collected from three of the locations failed one or more of the toxicity tests (SLR Inc., 2005). Two of the sample locations were located near the Lower Yard outfalls into Willow Creek adjacent to DB-2 and the oil/water separator, and in one location

adjacent to the southeast Lower Yard. Locations of the sediment sampling locations are shown on **Figure 15**.

7. Previous Cleanup Actions

Cleanups and site investigations have been ongoing at the Site since1986. In 2001, Unocal entered into Agreed Order No. DE-92TC-N328, which was superseded by 2007 Agreed Order No. DE 4460, as discussed in Section 4. In accordance with the Agreed Order, Unocal conducted Interim Action Cleanup activities at both the Upper and Lower Yards, as described below.

7.1 Upper Yard Interim Action

The Upper Yard Interim Action was conducted between July 2002 and May 2003, in accordance with the Agreed Order No. DE92TC-N328, and consisted of the excavation of petroleum-impacted soil, metals-impacted surface soil, and asphalt/polyurethane coating material. Approximately 113,034 tons of petroleum impacted soil, 7,320 tons of metals impacted soil and 4,021 tons of asphalt/polyurethane coated material were excavated and removed from the Upper Yard (MFA, 2003).

MTCA Method B CULs were used for petroleum-impacted soils in the Upper Yard which were 200 mg/kg for GRO, 460 mg/kg for DRO and a combined 2,959 mg/kg for TPH in all ranges (GRO, DRO, and HO). A total of 842 confirmation samples were collected along the floors and sidewalls of the excavation areas. Confirmation samples containing concentrations exceeding the Method B CULs triggered additional excavation. At the final extent of each excavation area, no confirmation samples exceeded the Method B CULs for TPH (MFA, 2003).

A MTCA Method B CUL of 20 mg/kg for arsenic was used in metals-impacted surface soils excavation areas of the Upper Yard. A total of 500 metals confirmation samples were collected, which met the Method B CUL for arsenic. The single exceeding sample contained an arsenic concentration of 48.1 mg/kg, which was associated with naturally occurring arsenic in the native soil. In 2003, twenty-one soil samples were collected to a maximum depth of 4 feet bgs and confirmed that arsenic is naturally present in the Upper Yard ramp area, where the concentration exceeds the Method B CUL. Details of the Upper Yard Interim Action are reported in the Upper Yard Interim Action As-Built Report, Volume 1, MFA, 2003 (MFA, 2003).

Ecology accepted the Upper Yard Interim Action as having met cleanup criteria in the 2001 Agreed Order in September 2003 (Ecology, 2003). No additional cleanup or monitoring activities have been conducted in the Upper Yard since this date.

7.2 Lower Yard Interim Actions

7.2.1 2001 Excavation

In 2001, Unocal entered into an Agreed Order (No. DE92TC-N328) with Ecology. Unocal conducted Interim Action in the Lower Yard to remove LNAPL and petroleum-saturated soil and groundwater from four areas of the Lower Yard. These areas were in the vicinity of the former railcar loading rack (Excavation A), in the vicinity of the former asphalt plant (Excavation B), in the north-central area in the vicinity of the former slops pond (Excavations C and D) (**Figure 2**). The results of the 2001 Interim Action are summarized in Lower Yard Interim Action As-built Report, Unocal Edmonds Terminal (MFA, 2002).

Each excavation extended laterally until LNAPL-saturated soils were no longer observed on the excavation sidewalls, or until structural concerns would not allow further excavation. The excavation areas were left open for approximately one month to allow any LNAPL to enter the excavations and be recovered. Final excavation depths ranged between 6.5 and 10.5 feet bgs (MFA, 2002).

Soil samples were collected from the sidewalls of each excavation although no CULs or minimum concentration criteria were required to be met. Excavated material from above the top of the smear zone was stockpiled and sampled for laboratory analysis. Stockpiles with soil concentrations of Total TPH less than 5,000 mg/kg were used as backfill material above the top of the smear zone (MFA, 2002).

The 2001 Interim Action resulted in the excavation and removal of 10,764 tons of LNAPL-saturated soils and 76,237 gallons of LNAPL and groundwater from these four areas of the Lower Yard (**Figure 2**).

7.2.2 2003 Excavation

Additional Interim Actions were conducted in 2003 under Agreed Order No. DE92TC-N328, including soil excavations in the Southwest Lower Yard, Detention Basin No.1, Metals Area 3 (located adjacent to the Southwest Lower Yard Excavation Area) and the Stormdrain Line Area (MFA, 2004). The Interim Action excavations conducted in the Southwest Lower Yard, Detention Basin No. 1 and Metals Area 3 were implemented to reduce potential threats to human health and the environment, and to provide additional information for the feasibility study and design of the final cleanup action (MFA, 2004). The Stormdrain Line Excavation was conducted to facilitate

installation of a new stormwater outfall for the Point Edwards condominium complex (**Figure 2**).

Depths of each excavation area were approximately 6 feet bgs in the DB-1 Excavation, approximately 7.5 feet bgs (up to 1.5 feet below the groundwater table) in the Southwest Lower Yard Excavation Area, approximately 1 foot bgs in the Metals Area 3 Excavation, and approximately 8.5 feet bgs in the storm drain line excavation (MFA, 2004).

The lateral extents of the excavations were determined by a REL for Total TPH (GRO, DRO and HO) of 3,000 mg/kg and an arsenic CUL of 20 mg/kg. Soil samples were collected along the sidewalls and floors of each excavation area, with exception of those areas that extended below the groundwater table, where floor samples were not collected (the Southwest Lower Yard Excavation Area). Floor samples were later collected during Phase I Interim Actions in 2007. Laboratory analysis of soil samples at the extents of the excavations indicated that soils containing concentrations greater than CULs were left in place in two locations in the DB-1 Excavation Area, in five locations in the Southwest Lower Yard Excavation Area, and in two locations in the Stormdrain Line Excavation Area. These locations would be addressed during subsequent remedial excavations in 2007 and 2008. The Stormdrain Line Excavation was conducted to facilitate installation of a new stormwater outfall for the Point Edwards Condominium complex, and was not specifically intended as a remedial action. Therefore, no further excavation was planned at that time. Locations of soils left in place in this area during the Stormdrain Line Excavation can be found in the *2003 Lower Yard Interim Action As-Built Report, Detention Basin No.1, Southwest Lower Yard, Metals Area 3, and Storm Drain Line Excavations, Unocal Edmonds Terminal, Edmonds WA, (MFA 2004)*.

During the 2003 Interim Action excavations, 39,130 tons of soil were excavated from DB-1, the southwest Lower Yard, Metals Area 3 and the Stormdrain Line Area, and approximately 1,861,520 gallons of groundwater were extracted from the DB-1 and southwest Lower Yard Areas and treated onsite. The results of the 2003 Interim Action are summarized in the 2003 Lower Yard Interim Action As-Built Report, Detention Basin No. 1, Southwest Lower Yard, Metals Area 3, and Storm Drain Line Excavations (MFA, 2004).

7.2.3 2007/2008 Excavation

The 2007/2008 Interim Action excavation activities were conducted in two phases from July 2007 to April 2008 (Phase I), and July 2008 to October 2008 (Phase II), in accordance with Agreed Order No. DE 4460. Phase I Interim Action work consisted of the removal of 108,000 tons of petroleum impacted soil for offsite disposal, and the removal of approximately 9,700 gallons of LNAPL from the groundwater surface in open excavations. During Phase I excavation activities, 438 confirmation soil samples were collected from the floors and sidewalls of the excavation areas for TPH analysis. CULs/RELs were met in 430 of 438 confirmation samples, and eight of the confirmation samples contained concentrations of IHSs exceeding applicable CULs/ RELs. Soils in the area where those samples were taken were not over-excavated during Phase I activities in order to preserve the integrity of onsite structures or due to Site constraints (ARCADIS, 2009). Soils in the areas of two of these samples were later over-excavated during Phase II activities; however, six of the locations were not over-excavated because of Site constraints. One sample location in the southwest Lower Yard (EX-B18-VV-1-6SW) contained a total TPH concentration of 4,980 mg/kg, exceeding the REL of 2,975 mg/kg. Soils in the area of this sample were not over-excavated because of its location on the property boundary between the Lower Yard and BNSF right-of-way. Soil was removed up to the property boundary, but excavation activities were ceased in order to maintain the integrity of the BNSF rail line. The remaining five soil sample locations containing IHS concentrations greater than Site CULs/RELs are located adjacent to, and north of the WSDOT stormwater line which is located in the south portion of the Central Lower Yard, along lower Unoco Road. The remaining five soil sample locations exceeding the Site REL for total TPH of 2,975 mg/kg and/or CUL for cPAHs of 0.14 mg/kg are: samples EX-B11-U-SSW-5 (0.159 mg/kg, cPAH), EX-Q2-Q-14-6 (3,060 mg/kg, total TPH), EX-A2-O-15-SSW-6 (7,540 mg/kg, total TPH), EX-A2-N-16-SSW-6 (7,550 mg/kg, total TPH) and EX-B20-M-17-SSW-6 (0.166 mg/kg cPAH and 15,700 mg/kg, total TPH). These sample locations were not over-excavated in order to preserve the integrity of the WSDOT stormwater line.

At the completion of Phase I excavation activities, the excavation sidewall along the WSDOT stormwater line was demarcated with 20 thousandths of an inch (20-mil) thick plastic sheeting prior to backfilling. This sheeting extends from the ground surface (13.5 feet amsl) to approximately 7.5 feet amsl. Groundwater elevations in the vicinity of the sheeting, as measured at MW-511 and MW-512, have ranged from 5.5 to 9.14 feet amsl over the course of the current groundwater monitoring program.

In April 2008, 65 confirmation soil borings were completed in the southwest Lower Yard to confirm that the soils on the floor of the 2003 excavation discussed in Section 7.2.2 meet the CULs/RELs. Sixty-three of the 65 borings did not contain concentrations of the IHSs in excess of the CULs/RELs. The two borings which contained soil in excess of the CULs/RELs were completed in a previously unexcavated area of the southwest Lower Yard where the former pipeline trestle existed. These two borings (SB-63 and SB-64) were later over excavated during Phase II excavation activities. Subsequent over-excavation confirmation soil samples contained concentrations of Site IHSs less than applicable Site CULs and RELs. As part of Phase I activities, arsenic impacted soils were excavated and removed from the southwest Lower Yard, beneath the former Unocal railroad trestle. This area contained arsenic impacted soil associated with sandblasting of the pipelines prior to their removal, and was the only remaining metals-impacted area at the Site. This area was excavated to 2.5 feet bgs, where confirmation samples were collected containing concentrations of arsenic less than the arsenic CUL of 20 mg/kg.

During Phase I construction activities, approximately 9,700 gallons of LNAPL were recovered and removed from the Site, and approximately 2 million gallons of groundwater were extracted, treated onsite, and discharged under a NPDES Permit to Willow Creek. The complete results of the 2007/2008 Phase I Interim Actions are summarized in Phase I Remedial Implementation As-Built Report, Unocal Edmonds Bulk Fuel Terminal Lower Yard (ARCADIS, 2009).

Phase II Interim Action work was performed between July and October 2008 and consisted of the removal of 14,825 tons of petroleum impacted soil for offsite disposal, removal of 131 gallons of LNAPL, removal and treatment of approximately 520,000 gallons of groundwater, and the removal of 2,000 tons of sediment from Willow Creek. The excavation areas of Phase II were based on areas of the Lower Yard that could not be excavated during Phase I and areas where impacts were discovered during 2008 investigation activities (as discussed in Section 8.1). These areas included the northwest perimeter of the Site adjacent to Willow Creek where three soil samples containing concentrations of IHSs greater than Site CULs/RELs were left in place during Phase I activities, the southeast Lower Yard, and impacted soils in the Former Asphalt Warehouse Area (ARCADIS, 2010a).

During Phase II, 71 confirmation soil samples were collected from the floors and sidewalls of the excavation areas. Seventy confirmation soil samples met the Site CULs/RELs, and a single confirmation sample (EX-B1-F-44-4, See Figure 18) contained concentrations of cPAHs (0.212 mg/kg) exceeding Site CULs. Soils in the

area of this sample were not over-excavated during Phase II due to a calculation error in the field. The location of this sample is in the southeast Lower Yard. Approximately 850 tons of concrete and metal debris were excavated from the southeast Lower Yard including piling footings, large concrete blocks, scrap metal, steel I-beams, sheet metal, metal wiring and lumber debris. Also encountered in this area were approximately 18 steel drums and drum remnants, some of which were filled or coated with tar-like substances. Much of this excavation area contained large quantities of tar-like substances intermixed with the soil and debris.

Phase II construction activities also included the removal of 2,000 tons of impacted sediments, and subsequent restoration of approximately 420 feet of Willow Creek. The sediment removal in Willow Creek was based on 2003 toxicity testing during which three sampling locations in Willow Creek failed toxicity tests. Two of these locations (US-05 and US-07) were located near the Lower Yard's stormwater outfalls #001 and #002. Both locations were excavated during the sediment removal portion of the Phase II 2007/2008 excavation activities. The complete results of the 2007/2008 Phase II Interim Actions are summarized in Phase II Remedial Implementation As-Built Report, Unocal Edmonds Bulk Fuel Terminal Lower Yard (ARCADIS, 2010a).

During Phase I and Phase II of the 2007/2008 excavation activities, a total of 512 confirmation soil samples were collected from sample locations at the final extent of the excavation areas. Results from confirmation soil samples are as follows:

- Concentrations of all TPH constituents (GRO, DRO and HO) were less than laboratory detection limits in 261 of these samples.

- Total TPH concentrations were less than half of the TPH REL of 2,975 mg/kg in 227 of the samples and greater than one-half of the REL in 17 of the samples.

- Concentrations of total TPH exceeded the REL in five samples, with concentrations in two samples greater than the REL but less than two times the REL (EX-A2-Q-14-6 [3,060 mg/kg] and EX-B18-VV-1-6SW [4,980 mg/kg]), and concentrations in three samples exceeding two times the REL (EX-A2-O-15-SSW-6 [7,540 mg/kg], EX-A2-N-16-SSW-6 [7,550 mg/kg] and EX-B20-M-17-SSW-6 [15,700 mg/kg]).

- Two additional samples exceeded the CUL for cPAHs adjusted for toxicity with concentrations that are greater than the CUL but less than two times the CUL (EX-B11-U-10-SSW-5 [0.159 mg/kg] and EX-B1-F-44-4 [0.212 mg/kg].

- Grid sampling on a 25-foot spacing of the floors and sidewalls confirmed the lateral and vertical extend of soil impacts had been addressed in all but two distinct areas of the Lower Yard (DB-2 and WSDOT stormwater line area).

The 2007/2008 Interim Action excavation areas included areas from the 2003 excavations that exceeded the TPH CUL and were not over-excavated in 2003 including sample STRM2WALLE (4,913.3 mg/kg). However samples STRM-4WALLE (2) (15,388 mg/kg), and STRM-6FLOOR (17,439 mg/kg) were not over excavated.

8. Recent Site Investigations

8.1 2008 Lower Yard Site Investigation

In 2008, additional soil investigation activities were conducted to collect data and evaluate the nature and extent of limited remaining petroleum impacts in discrete areas of the Lower Yard, including the areas to the south and southwest of the WSDOT stormwater line and the Former Asphalt Warehouse Area, near monitoring well MW-129R. Fourteen soil borings were advanced to the south and southwest of the WSDOT stormwater line, five of which contained soil with concentrations of TPH and/or cPAHs exceeding Site CULs/RELs. Three of these boring locations are located in between the WSDOT stormwater line and the Point Edwards stormdrain line, in the south-central portion of the Lower Yard. One of the borings is located to the southwest of Point Edwards stormdrain line and one is located south of the WSDOT line where Upper and Lower Unoco Road meet. Three soil borings collected in the Former Asphalt Warehouse Area, in the east-central portion of the Lower Yard, contained soils with concentrations of TPH and/or cPAHs exceeding Site CULs/RELs. Soils in the area of the soil borings located near the asphalt warehouse were subsequently excavated during Phase II excavation activities. The complete results of the 2008 investigation activities are summarized in 2008 Additional Site Investigation and Groundwater Monitoring Report, Former Unocal Edmonds Bulk Fuel Terminal (Lower Yard) (ARCADIS, 2010b).

8.2 2011 Lower Yard Site Investigation

In 2011, Site investigation activities were conducted in the Lower Yard including a tidal study, hydraulic conductivity testing and soil boring advancement in the limited area of impact in the vicinity of DB-2. Tidal study data were collected from 17 locations in Site monitoring wells and staff gauges in Willow Creek to evaluate the potential influence of Puget Sound and Willow Creek on Site surface water and groundwater gradients, and groundwater chemistry. Hydraulic conductivity pumping tests including step tests, short-duration tests and one long term test were conducted in ten Site monitoring wells.

Soil investigation activities included the advancement of 17 soil borings in the vicinity of DB-2, monitoring well MW-510, and Willow Creek, and the installation of nine piezometers in these same areas. These areas were investigated to assess the recurring, but minimal amount of LNAPL present in monitoring well MW-510. LNAPL was not encountered in nine of the 17 borings, and was only encountered in eight of the 17 soil borings at the time of installation as either residual or free-phase LNAPL.

Free-phase LNAPL subsequently appeared in two of the piezometers. Soils containing concentrations of Site IHSs exceeding their respective CULs and/or RELs were encountered in 11 of the soil borings. Details of the 2011 Site investigation activities are summarized in the 2011 Site Investigation Completion Report (ARCADIS, 2012a).

9. 2012 Lower Yard Site Investigation

In order to address stakeholder concerns regarding the limited amount of impacts in three specific areas of the Lower Yard, site investigation activities were conducted between June 14 and June 26, and on July 30, 2012, as outlined in the *Revised Feasibility Study Work Plan* (ARCADIS, 2012b). A total of eight monitoring wells were installed adjacent to the WSDOT stormwater line, in the southeast Lower Yard and on the southeast bank of Willow Creek (**Figure 16**). In addition, three sediment samples were collected in Willow Creek, as shown on **Figure 15**.

9.1 Monitoring Well Installation

Monitoring wells MW-525 and MW-526 were installed approximately 10 feet to the north of the WSDOT stormwater line in the southern portion of the Site. These locations were selected based on soil concentrations in soil samples collected from the sidewalls of the 2007/2008 Interim Action excavations in this area. These wells were installed in unexcavated 1929 Fill material, through the polyethylene sheeting that remains from the 2007/2008 Interim Action excavations. Wells MW-525 and MW-526 will be used to monitor for the possible presence of LNAPL and dissolved phase TPH concentrations in groundwater in the unexcavated soils in this area. In addition, groundwater elevation data from these wells will be used to determine the effects on groundwater flow directions from the 2007/2008 polyethylene sheeting.

Monitoring wells MW-531 and MW-532 were installed to the south and southwest of the WSDOT stormwater line, in unexcavated 1929 Fill material in between the WSDOT stormwater line and the Point Edwards stormdrain line. The well to the south (MW-532) was installed to assess the groundwater conditions in the area of soil boring SB-66 from the 2008 Site Investigation activities (ARCADIS, 2010b) which contained soil impacts greater than Site CULs/RELs. The well to the southwest (MW-531) was installed to assess groundwater conditions at the end of the 2007/2008 polyethylene sheeting.

Monitoring wells MW-527 and MW-528 were installed in the southeast Lower Yard, upgradient from monitoring wells MW-135 and MW-136, respectively, and in the vicinity of the single confirmation soil sample which contained cPAH concentrations in excess of the CUL. These wells were installed in unexcavated material to the south and upgradient of 2007/2008 Interim Action excavation area B-1. These wells were installed to evaluate the potential for a continuing source of dissolved phase TPH levels in groundwater in monitoring wells MW-135 and MW-136.

Monitoring wells MW-529 and MW-530 were installed on the southeast bank of Willow Creek, directly downgradient of well MW-510 and well LM-2, respectively. These wells were installed to monitor the potential for contaminant migration in groundwater offsite into Willow Creek.

9.1.1 Monitoring Well Construction and Development

The monitoring wells were advanced using a hollow stem auger drill rig. Monitoring wells MW-529 and MW-530, installed on the southeast bank of Willow Creek, were installed using a hand auger due to logistical issues associated with heavy equipment mobilizing to and operating along the creek bank.

Monitoring wells MW-525, MW-526, MW-531, and MW-532 were installed to a depth of approximately 13 feet bgs (0 foot amsl), in order to have a total depth and screened interval consistent with the other Site monitoring wells. Monitoring wells MW-527 and MW-528 were installed to an approximate depth of 17 feet bgs (0 foot amsl), in order to have a screened interval consistent with wells MW-135 and MW-136. Monitoring wells MW-529 and MW-530 were installed to a depth of approximately 8 feet bgs (-1 foot amsl) in order to have a screened interval consistent with LM-2 and MW-510, and also to facilitate construction with an appropriate well seal.

Wells MW-525 through MW-528, MW-531 and MW-532 were constructed with 10 feet of Schedule 40, 2-inch PVC with 0.020-inch slotted well screen, and three feet of Schedule 40, 2-inch PVC riser. Each well has a sand pack of 10/20 silica sand from the total depth of the well to at least one foot above the screened interval. Above each sand pack is at least a 6-inch seal of hydrated bentonite, and at least 1.5 feet of concrete with a flush mount traffic-rated well monument and locking well cap.

Monitoring wells MW-529 and MW-530 were constructed of 1-inch Schedule 40 PVC pipe with five feet of pre-constructed 0.01-inch slotted screen and sandpack, and approximately seven feet of 1-inch Schedule 40 PVC riser. Well casings for MW-529 and MW-530 extend approximately 4 feet above ground surface. The sand packs are comprised of 2/12 silica sand and extend from 6-inches above the screened interval to the total depth of the well. Above the sandpack is a 6-inch layer of hydrated bentonite, a 2-foot layer of concrete, stick up well monuments and locking well caps. Boring logs and drilling logs are included in **Appendix B**.

After installation, each monitoring well was developed via surge and purge methods using bailers. A disposable bailer was surged along the entire length of the well screen

and a minimum of 10 pore volumes of water were removed from each well. The monitoring wells were surveyed by OTAK Surveying of Kirkland, Washington for horizontal location and vertical elevation of the well casing.

9.1.2 Lithology

Lithology encountered during the 2012 monitoring well installations was consistent with previous Site investigations and the current understanding of hydrostratigraphic units in the Lower Yard.

During the installation of monitoring well MW-525, 2008 Fill material was encountered to a depth of 3 feet bgs, where the 2007/2008 polyethylene sheeting was encountered and drilled through. Beneath the sheeting, 1929 Fill was encountered to a depth of 8.5 feet bgs. From 8.5 to 13 feet bgs beach deposit material was encountered. Groundwater was encountered at a depth of 8 feet bgs during the installation of monitoring well MW-525.

During the installation of monitoring well MW-526, 2008 Fill material was encountered to a depth of 1 foot bgs, where the 2007/2008 polyethylene sheeting was encountered and drilled through. Beneath the sheeting, Whidbey Formation material was encountered to a depth of 13 feet bgs. This material is considered to be Whidbey formation material due to its brown color, lack of gravel and lack of organic debris. Groundwater was encountered at a depth of 6 feet bgs during the installation of monitoring well MW-526. Whidbey formation material was also encountered in this area during the installation of MW-502 and MW-511 in 2008.

During the installation of monitoring well MW-527, 2008 Fill material was encountered to a depth of 8.5 feet bgs. From 8.5 to 13 feet bgs, 1929 Fill material was encountered. From 13 to 17 feet bgs, marsh deposit material was encountered. Groundwater was encountered at a depth of 12.5 feet bgs during the installation of monitoring well MW-527.

During the installation of monitoring well MW-528, 2008 Fill material was encountered to a depth of 14 feet bgs. From 14 to 16.5 feet bgs beach deposit material was encountered, and from 16.5 to 17 feet bgs, marsh deposit material was encountered. Groundwater was encountered at a depth of 11 feet bgs during the installation of monitoring well MW-528.

During the installation of monitoring well MW-529, silt material from the 2007/2008 sediment excavation backfill was encountered to a depth of 1 foot bgs. From 1 to 8 feet bgs poorly graded, grey, sand material was encountered.

During the installation of monitoring well MW-530, poorly graded, grey, sand material was encountered from 0 to 7.5 feet bgs.

During the installation of monitoring well MW-531, surficial fill material from 2007/2008 Interim Action excavation activities was encountered to a depth of 4 feet bgs. From 4 to 6 feet bgs, fill material was encountered, presumably from 2001 excavation activities. From 6 to 13 feet bgs beach deposit and Whidbey Formation material was encountered. Groundwater was encountered at a depth of 10 feet bgs during the installation of monitoring well MW-531.

During the installation of monitoring well MW-532, surficial fill from the 2007/2008 Interim Action excavation activities was encountered to a depth of 2.5 feet bgs, where a 6-inch asphalt layer was encountered. This asphalt was a remnant of the Lower Yard facilities roads and was covered with fill during the 2007/2008 excavations for grading purposes and to construct haul roads during excavation activities. From 3 to 4.5 feet bgs asphalt subgrade bedding material was encountered. From 4.5 to 9 feet bgs, 1929 Fill material was encountered, and from 9 to 13 feet bgs, beach deposit and Whidbey Formation material was encountered.

9.1.3 Soil Sample Collection and Analysis

During soil boring installation, soils were classified using the Unified Soil Classification System (USCS) by an ARCADIS geologist. Field screening of soil samples was conducted with a photoionization detector (PID), as well as visual observations of impacted soil, visual observations for the presence of LNAPL or sheen, and/or odor. Depending on field screening indications, two to five soil samples were collected from each boring for laboratory analysis. No soil samples were collected from MW-529 or MW-530 for laboratory analysis, consistent with the planned work in the *Revised Feasibility Study Work Plan* (ARCADIS, 2012b). Samples collected for laboratory analysis were placed in laboratory-provided containers and stored in an ice-chilled cooler prior to delivery to Eurofins Lancaster Laboratories in Lancaster, Pennsylvania. PID readings, soil types, and other pertinent geologic data were recorded on the boring log and are presented in **Appendix B**.

Soil samples were submitted to a state certified laboratory and analyzed for the following constituents:

- BTEX by United States Environmental Protection Agency (USEPA) Method 8021B
- GRO by Ecology Method NWTPH-Gx
- DRO and HO by Ecology Method NWTPH-Dx (after silica gel cleanup)
  - Samples that contained concentrations of total TPH greater than the Site REL were also analyzed for cPAHs by USEPA Method 8270C

9.1.4 Soil Sample Analytical Results

A total of 22 soil samples were collected and submitted for laboratory analysis during the installation of six of the 2012 monitoring wells. Of the 22 soil samples submitted only two of these samples exceeded Site RELs/CULs for total TPH, benzene, and/or total cPAHs. No samples were collected during the installation of monitoring wells MW-529 and MW-530.

The sample collected during the installation of well MW-525 at a depth of 6 feet bgs (MW-525-6) contained concentrations of benzene at 34 mg/kg, total cPAHs adjusted for toxicity at 0.29 mg/kg and total TPH at 17,850 mg/kg, all of which exceeded their respective CULs/RELs. MW-525 is located adjacent to the WSDOT stormwater line and is shown on **Figure 16**. Soil samples collected from the deeper intervals in MW-525 exhibited detectable concentrations of some IHSs, but at concentrations below applicable CULSs/RELs. Soil samples collected from the other well installed adjacent to the WSDOT stormwater line (MW-526) did not have concentrations of IHSs exceeding the applicable CULs/RELs.

The sample collected during the installation of well MW-532 at a depth of 7 feet bgs (MW-532-7) contained a concentration of total TPH of 10,540 mg/kg, exceeding the Site REL. Samples collected during the installation of well MW-532 at depths of 6, 10 and 13.5 feet bgs, did not contain concentrations exceeding Site CULs or RELs. Monitoring well MW-532 was installed next to the Point Edwards stormdrain line, and is shown on **Figure 16**. Soil samples collected from the other well installed adjacent to the stormdrain line (MW-531) did not have concentrations of IHSs exceeding the applicable CULs/RELs.

No other soil samples collected during well installations contained concentrations of IHSs greater than Site CULs/RELs, including from the monitoring wells installed in the southeast lower yard. Analytical data for soil samples collected during this investigation are presented on **Table 6** and on **Figure 16.** Laboratory data reports are included as **Appendix C**.

9.1.5 Addition to Site Groundwater Monitoring Program

As discussed in the *Revised Feasibility Study Work Plan* (ARCADIS, 2012b), monitoring wells MW-525 through MW-532 were added to the quarterly groundwater monitoring well sampling schedule currently in place at the Lower Yard. Wells MW-525 through MW-528, MW-531 and MW-532 will be sampled in accordance with the interior monitoring well sampling schedule. Wells MW-529 and MW-530 will be sampled in accordance with the point of compliance monitoring well sampling schedule. Wells MW-525 through MW-532 were sampled during the second quarter 2012 groundwater monitoring event in June 2012.

9.2 Sediment Sampling

Three sediment samples were collected from Willow Creek on July 30, 2012, to assess sediment toxicity conditions in the vicinity of 2003 sediment sampling location US-15, as described in the *Revised Feasibility Study Work Plan* (ARCADIS, 2012b). Sediment sampling procedures and results are discussed in the sections below.

9.2.1 Sediment Sampling Methods and Analysis

Sediment sampling was conducted in a manner consistent with the 2003 sediment sampling event. A minimum of three grab samples were collected at each sediment sampling location and were combined to form a composite sample. Sediment was collected using a stainless steel spoon and was combined in stainless steel bowls. Each sample was composited until it was homogeneous in color and texture. Each sample was then transferred directly into laboratory provided containers. Samples were then packed on ice and shipped to Eurofins Lancaster Laboratories in Lancaster, Pennsylvania for chemical analysis and to Block Environmental Services for potential bioassay analysis. Samples were collected in accordance with the Standard Operating Procedure (SOP): Sediment Sampling dated July 29, 2003. The SOP is included in **Appendix D.**

To remain consistent with the 2003 sediment sampling event, the sediment samples were analyzed for chemical analysis described below:

- Benzene, toluene, ethylbenzene and xylenes by USEPA Method 8260
- GRO by Ecology Method NWTPH-Gx
- DRO and HO by Ecology Method NWTPH-Dx (after silica gel cleanup)
- cPAHs by USEPA Method 8270C
- Total metals (lead, zinc, copper and arsenic) by USEPA 6000/7000
- Ammonia by EPA Method 350.1M
- Grain size distribution by ASTM Method D422
- Total organic carbon (TOC) by Method SW846 9060

Sediment samples were also collected and submitted to Block Environmental Services for bioassay testing, if deemed necessary by Ecology upon review of the sediment chemistry analysis listed above.

9.2.2 Sediment Sampling Analytical Results

Chemical analytical results of the sediment samples were evaluated to determine if bioassays should be performed on the samples. This determination was made by comparing the results to the Washington State Sediment Management Standards (SMS), Chapter 173-204 of the Washington Administrative Code (WAC) Sediment Quality Standards (SQS) and Cleanup Screening Levels (CSL). Given the salinity of the surface water in the vicinity of the sediment samples, sediment was assumed to be marine sediment, and thus the marine SQS and CSLs were used to evaluate the data.

SQS and/or CSL values do not exist for BTEX, GRO, DRO, HO or total TPH, so they were not compared to screening values. As PAHs are the primary compounds in diesel and heavy oil range petroleum hydrocarbons that cause toxicity in marine benthic invertebrates, PAH results were compared to the SMS. Thus, evaluating the PAH data provides an evaluation of the potentially toxic components of potential petroleum hydrocarbon constituents in the sediment samples.

The SQS and CSLs for PAHs are organic carbon (OC) normalized. Many organic chemicals in sediment or water preferentially partitions into the organic material in sediment, thus the toxicity of organic chemicals appear to be correlated to the concentration of those chemicals in the organic carbon fraction of the sediments (Ecology, 1993). Per Ecology guidance, when OC normalizing data, sediment samples with TOC between 0.2 to 4% should be OC normalized. When the TOC is below 0.2%, it may be possible for background concentrations of organic chemicals to exceed the SQS when OC normalized. When the TOC is greater than 4%, the OC normalized values may be inappropriately low. In instances of low or high TOC (lower than 0.2% and higher than 4%), Ecology guidance recommends comparing the data to the Lowest Apparent Effect Threshold (LAET) (PSDDA, 1996) rather than OC normalizing the data and comparing it to SQS (Ecology, 1993). OC normalization is performed on a sample by sample basis, because TOC concentrations vary at different locations (Ecology, 1993). This TOC variation holds true for the 2012 sediment sampling event, with sample TOC concentrations ranging from 2 to 7%.

The OC normalization equation is:

$$\frac{mg}{kg}OC = \frac{\frac{mg}{kg}dry\ weight}{\frac{kg\ TOC}{kg}dry\ weight}$$

Where mg/kg OC = milligrams of the chemical per kilogram of organic carbon

mg/kg dry weight = milligrams of the chemical per kilogram of dry weight sample

kg TOC/kg dry weight = percent total organic carbon in dry weight sample expressed as a decimal. For example, if the TOC is 2%, 0.02 would be used in the calculation

The sediment sample collected from sample location US-100 and its duplicate sample (DUP-1) contained 2% TOC, therefore, the PAH results were OC normalized and compared to the SMS SQS and CSL (WAC 173-204). All PAH constituents were less than the applicable SMS SQS and CSLs. The metal results for these samples were compared to the SMS SQS and CSL using the dry weight results, none of which were detected at concentrations exceeding these levels. Concentrations of BTEX in these samples were not detected greater than laboratory detection limits. Concentrations of GRO, DRO and HO in the parent sample US-100, and GRO in the duplicate sample

DUP-1, were not detected greater than the laboratory detection limits. Concentrations of DRO and HO were detected at 11 mg/kg and 59 mg/kg in the duplicate sample, respectively. Sample results for all analyses of US-100 and DUP-1 were less than the SMS SQS and CSLs.

Sediment samples collected from sample locations US-101 and US-102 contained TOC concentrations greater than 4%. The PAH data for these samples were evaluated on a dry weight basis and compared to the LAET (PSDDA, 1996). The LAET is the lowest concentration of acceptable toxicity thresholds for echinoderm, microtox, and oyster apparent effects toxicity testing (PSDDA, 1996). Concentrations of all PAH constituents were less than the applicable LAETs. The metal results for these samples were also compared to the LAETs, using a dry weight basis, none of which were exceeded.

Based on the evaluation of the data, which showed that all results for the 2012 sediment samples were below the SMS SQS and CSL or LAET, a recommendation was made to Ecology that bioassay testing was not necessary on the 2012 sediment samples. On August 9, 2012, Ecology concurred that bioassay testing of these samples was not needed and that further cleanup of Willow Creek was not needed.

The sediment samples were also analyzed for ammonia-nitrogen in anticipation for use in evaluating bioassay testing results. Because it was determined that bioassay testing was not required, the ammonia-nitrogen results were not assessed in this evaluation.

Analytical data for sediment samples are presented in **Table 7** and on **Figure 15.** Laboratory analytical data reports are included as **Appendix E**.

10. Remaining Impacts

Remaining impacts at the Site are present in limited areas of the Lower Yard. As the result of Interim Action Excavation activities and confirmation sampling, multiple Site investigations and groundwater monitoring activities, each area of the Lower Yard containing soils, groundwater or sediments with concentrations of Site IHSs greater than applicable CULs/RELs is believed to have been fully delineated. Each area containing soil, groundwater or sediment impacts is discussed below. Areas of the Lower Yard with remaining impacts are shown on **Figures 17 and 18.** Analytical data for the remaining impacted soil samples collected at the Site are presented on **Figure 18a.**

10.1 Soil

10.1.1 WSDOT Stormwater Line

The WSDOT-owned stormwater line runs across the Lower Yard along Lower Unoco Road and out to Puget Sound. During the 2007/2008 Interim Action excavation activities, impacted soils were encountered adjacent to the stormwater line. Five soil samples collected on the excavation sidewalls adjacent to the WSDOT line in the south-central portion of the Site contained concentrations exceeding Site CULs and/or RELs (ARCADIS, 2009). These soil samples were located directly north of the WSDOT line at depths between 4 and 6 feet bgs with concentrations of total TPH ranging from 3,060 to 15,700 mg/kg. One of these samples exceeded the CUL for cPAHs (0.14 mg/kg) with a concentration of 0.159 mg/kg. Soils along the stormwater line, including those with CUL/REL exceedences, were unable to be excavated without compromising the integrity of the line. Polyethylene sheeting was left in place to demarcate the excavation limits adjacent to the WSDOT line. The sheeting extends from ground surface to approximately 6 feet bgs (7.5 feet above mean sea level) and is located along Lower Unoco Road as shown on **Figure 2** (ARCADIS, 2009).

In 2008, 14 soil borings were installed along the south and southwest side of the WSDOT line. Soil samples from five of these borings adjacent to the WSDOT stormwater line contained concentrations of IHSs that exceeded Site RELs and/or CULs. The location of these borings are to the south and southwest of the WSDOT line, at the end of Upper and Lower Unoco Road and in the area between the WSDOT line and monitoring well MW-143. Soil samples containing IHS concentrations exceeding Site CULs and/or RELs were collected between 4 and 8 feet bgs in this area with total TPH concentrations ranging from 3,720 to 16,900 mg/kg (ARCADIS, 2010b).

In 2012, four monitoring wells were installed adjacent to the WSDOT stormwater line. Soil samples collected during the installation of two of the monitoring wells exceeded Site CULs and/or RELs at depths of 6 and 7 feet bgs with concentrations of total TPH ranging from 10,540 to 17,850 mg/kg. Soil samples collected from these wells at greater depths did not contain concentrations exceeding Site CULs and/or RELs, as discussed in Section 9.1.4. Both of these monitoring wells were installed in an area of known remaining soil impacts left in place during 2007/2008 excavation activities and verified during 2008 Site investigation activities.

In total, there are eleven sample locations in two distinct areas adjacent to the WSDOT stormwater line (to the north and south/southwest) that contain soils with

concentrations of IHSs greater than Site CULs and/or RELs. The depths of these remaining impacts occur between 4 and 8 feet bgs. The impacted soils are adjacent to the WSDOT stormwater line and cover an area of approximately 0.31 acres, of the 22 total acres of the Lower Yard. The areas of limited remaining impacts are shown on **Figure 18**.

10.1.2 Detention Basin No.2 Area

In 2011, soil investigation activities were conducted in the unexcavated areas surrounding DB-2, including the installation of 17 soil borings and eight piezometers. Free-phase and/or residual LNAPL was encountered in eight of the soil borings, located south of DB-2, along the northern-most 2007/2008 Interim Action excavation area, surrounding monitoring well MW-510 and in one location north of DB-2, adjacent to the southwest corner of DB-1. Free-phase or residual LNAPL was encountered in these borings at depths from 7 to 12 feet bgs (ARCADIS, 2011).

Soil samples containing concentrations of IHSs exceeding Site CULs and/or RELs were located south of DB-2, along the northern-most 2007/2008 Interim Action excavation area, surrounding monitoring well MW-510, adjacent to the southwest corner of DB-1, on the berm separating DB-1 and DB-2 and also in one location on the bank of Willow Creek at a depth of 0.5 to 1 feet bgs. Soils containing concentrations of IHSs exceeding CULs and/or RELs were encountered in 11 of the 17 soil borings, from depths from 4 feet to 14 feet bgs, with concentrations ranging from 4,413 to 220,400 mg/kg. The area surrounding DB-2, where impacted soils were encountered covers approximately 0.43 acres of the 22 total acres of the Lower Yard. Boring locations from the DB-2 investigation area are shown on **Figure 16**.

10.1.3 Monitoring Well MW-129R, Southwest Lower Yard, Southeast Lower Yard, and Point Edwards Stormdrain Line

During the installation of monitoring well MW-129R, a soil sample was collected at a depth of 7 feet bgs that contained a concentration of total TPH at 3,010 mg/kg, exceeding the Site REL of 2,975 mg/kg (ARCADIS, 2010b). See **Figure 18**.

During Phase I of the 2007/2008 Interim Action Investigation one soil sample in the Southwest Lower Yard, sample EX-B18-VV-1-6SW, had a total TPH concentration of 4,980 mg/kg at a depth of 6 feet bgs. This concentration exceeds the Site REL for total TPH of 2975 mg/kg. This area could not be over-excavated due to the proximity of the BNSF Railroad right-of-way. See **Figure 18**. During Phase II of the 2007/2008 Interim

Action Investigation one soil sample in the southeast Lower Yard, sample EX-BI-F-44-4, had a cPAH concentration of 0.212 mg/kg at a depth of 4 feet bgs. This concentration exceeds the site CUL for cPAH of 0.14 mg/kg. See **Figure 18**.

During 2008 Site investigation activities a soil boring was installed southwest of the Point Edwards stormdrain line. The soil sample collected from SB-80 at a depth of 7.5 feet bgs contained concentrations of TPH and cPAHs greater than Site CULs and RELs. Concentrations of TPH and cPAHs were detected at 4,660 mg/kg and 0.693 mg/kg, respectively, compared to the total TPH REL of 2,975 mg/kg and the cPAH CUL of 0.14 mg/kg. The soil sample collected at 11 feet bgs in this boring did not contain concentrations of TPH or cPAHs greater than Site CULs and/or RELs. The total depth explored in this boring was 14.5 bgs (ARCADIS, 2010b).

10.2 Groundwater

The CSM presented in the IAWP (SLR Inc., 2007) concluded that groundwater beneath the Site discharges to the surface water and sediment in Willow Creek. As a result, groundwater CULs were established in the Work Plan based on the protection of surface water. According to the Agreed Order, the groundwater CULs are required to be met only at the POC monitoring wells, which are located along the downgradient perimeter of the Site where groundwater discharges to surface water. Data collected from the interior monitoring well locations are not used for compliance; rather, the dissolved concentration data collected at interior monitoring well locations are used in evaluating groundwater concentration trends at the Site and overall plume stability.

10.2.1 Groundwater Concentration Trends

As of June 2012, there are 23 POC groundwater monitoring wells that are sampled on a quarterly basis and 29 interior monitoring wells sampled on a semi-annual basis. Two POC wells (MW-529 and MW-530) and ten interior monitoring wells (MW-126, MW-13U, MW-134X, MW-203, MW-525 through MW-528, MW-531 and MW-532) have only been sampled during the June 2012 event and are not included in this trend analysis. The most recent groundwater monitoring event that included all POC and interior wells took place in June 2012, with the exception of monitoring well MW-510, where LNAPL was observed. Monitoring well MW-525 was the only well that contained concentrations of dissolved petroleum hydrocarbon constituents that exceeded CULs. June 2012 groundwater sampling analytical results are presented on **Figure 19**.

To evaluate the status of the isolated pockets of dissolved-phase hydrocarbons at the Site, a statistical analysis of groundwater total TPH and benzene concentration trends was completed using a linear regression trend test for data collected at site monitoring wells from October 2008 through June 2012. The linear regression analysis, using natural log (ln) normalized concentration data, was conducted to evaluate trend direction and statistical significance, and to estimate attenuation rates for locations with decreasing concentration trends (USEPA, 2002).

Linear regression trend analysis was conducted for total TPH using data from 39 Site monitoring wells, sampled prior to June 2012, without measurable LNAPL. Trend analysis was also conducted for benzene at MW-20R, the only location where benzene has exceeded the CUL (51 µg/L) since October 2008. Statistical analysis was not undertaken for cPAH concentrations, as they have been consistently below laboratory detection limits at all locations. Total TPH was calculated by summing the concentrations of GRO, DRO, and HO; where concentrations did not exceed method reporting limits, half of the reporting limit was used in calculating total TPH. The CUL for total TPH in groundwater is calculated based on the relative proportions of GRO, DRO and HO, and thus differs at each monitoring location and with each monitoring event, as described in Section 4.3.2. For purposes of the linear regression analysis, and to estimate attenuation rates and approximate time to achieve cleanup goals, an average CUL value was used as the cleanup goal for each monitoring location based on the individual CUL values calculated for each monitoring event from 2008 through 2012.

The results of the linear regression analysis are summarized in **Table 8** with the analyses included as **Appendix F**. Trends were not evaluated at monitoring locations where greater than 50 percent of the results are less than laboratory detection limits; however, the data for these locations are also included in **Table 8**. The correlation coefficient, R^2, is a measure of how well the linear regression trend line fits the Site data; values close to one are considered to be a good fit, while values close to zero are considered to be a poor fit. The p-value of the correlation provides a measure of the significance of the slope. Correlations were accepted as significant at the 90 percent (%) confidence level, indicated by a p-value of 0.10 or less. The trend direction was defined as decreasing if the slope of the trend line is negative, and increasing if the slope of the trend line is positive. Attenuation rates and approximate time to achieve the CULs were calculated for wells with statistically significant decreasing concentration trends.

Twenty-one POC monitoring wells were evaluated for linear regression trend analysis. The results are presented in **Table 8** and may be summarized as follows:

- Twelve of the 21 locations show statistically significant decreasing concentrations of total TPH in groundwater (MW-101, MW-135, MW-136, MW-147, MW-150, MW-20R, MW-500, MW-501, MW-518, MW-522, MW-523 and MW-8R).

- None of the 21 POC monitoring wells that were analyzed and that did not contain LNAPL exceeded the average total TPH CULs in June 2012.

- The total TPH trend at MW-510 was not evaluated due to the presence of LNAPL at this monitoring location since October 2010.

- The total TPH trends at wells MW-108, MW-109, and MW-524 were not evaluated with respect to statistical significance due to greater than 50% non-detect results from 2008 through 2012. However, groundwater samples from these wells have remained less than the average CULs since the beginning of the current monitoring period in 2008.

- LM-2, MW-104, MW-129R, MW-139R, and MW-149R do not indicate statistically significant total TPH trends; however, the June 2012 results at all of these locations were less than the average CULs. In addition total TPH at MW-139R has been less than average CULs since September 2011, and total TPH at MW-149R has been less than the average CULs since March 2011.

- Benzene at MW-20R does not show a statistically significant trend; however, the concentration has been less than the average CUL since April 2009.

Nineteen interior monitoring wells were evaluated for linear regression trend analysis. The results are presented in **Table 8** and may be summarized as follows:

- Seventeen of the 23 locations show statistically significant decreasing concentrations of total TPH in groundwater (MW-143, MW-502 through MW-508, MW-512 through MW-517, and MW-519 through MW-521). Results from eleven of the 17 wells have not exceeded TPH CULs since the beginning of the current monitoring period in 2008.

- The total TPH trends at MW-509 and MW-511 were not evaluated with respect to statistical significance due to greater than 50% non-detect results from 2008 through 2012 at each of these locations; however, all have remained less than the average CULs since 2008.

In general, linear regression analysis indicates decreasing trends in total TPH and benzene concentrations at all locations evaluated, with the exception MW-510, where LNAPL is historically present. The trends at POC monitoring wells LM-2, MW-104, MW-129R, MW-139R, and MW-149R were not statistically significant, although all of these wells were less than TPH CULs in June 2012.

In addition, geochemical parameters monitored at the Site in December 2011 indicate anaerobic and reducing groundwater conditions, conducive to anaerobic biodegradation of petroleum hydrocarbon constituents. Relatively low dissolved oxygen and nitrate concentrations (typically less than 1 milligrams per liter [mg/L]), along with detections of ferrous iron, suggest at least mildly reducing conditions, and sufficient concentrations of sulfate are present to support sulfate reduction biodegradation reactions in Site groundwater. Methane detections indicate strongly reducing conditions at many locations and suggest that methanogenic biodegradation reactions may also be contributing to attenuation of petroleum hydrocarbon impacts.

10.2.1.1 Light Nonaqueous Phase Liquid

LNAPL is currently present at three locations in the Lower Yard. Monitoring well MW-510 and piezometers P-12 and P-13 have contained measurable (>0.01 foot) of LNAPL, and are located within 15 feet of one another.

Monitoring well MW-510 has had measurable amounts of LNAPL present since October 2009, with the exception of the June 2011 and December 2011 sampling events. Monitoring well MW-510 was installed in October 2008. Piezometer P-12 had LNAPL present in September 2011 and June 2012, and piezometer P-13 had LNAPL present from September 2011 to the present. Piezometers P-12 and P-13 were installed in August 2011.

LNAPL thicknesses in well MW-510 have ranged from 0.13 foot in January 2010, to 0.01 foot in October 2009 and March 2011. The detections of measurable LNAPL in P-12 was at a thickness of 0.01 foot in September 2011, and 0.09 foot in June 2012. LNAPL thicknesses in P-13 have ranged from 0.23 foot in December 2011 to 0.01 foot in October 2011 and 0.10 foot in March 2012.

LNAPL in monitoring well MW-510, piezometer P-12, and piezometer P-13 is black in color, has a high viscosity, and is difficult to recover with a bailer. During each monitoring event, an oil/water interface probe is used to measure depth to LNAPL and depth to water. Bailers are used to confirm the presence of LNAPL after each groundwater measurement in monitoring well MW-510 and piezometers P-12 and P-13. In an attempt to recover LNAPL, absorbent socks have been installed in well MW-510 between monitoring events since March 2011. LNAPL has been effectively delineated in the DB-2 area due to the absence of LNAPL in piezometers installed within 10 feet of well MW-510 (ARCADIS, 2012a).

11. Conceptual Site Model

The overall CSM has been presented in the previous sections regarding site history, geology and hydrogeology, and results of site investigation work. Based on the information presented above, a CSM to evaluate the risk to potential receptors was prepared for the Site. The CSM identifies the potential sources of chemicals, routes and mechanisms of transport, impacted media, and complete exposure pathways. A potentially complete exposure pathway is a pathway by which a constituent travels from a source to a human or ecological receptor and consists of a source, a transport or retention mechanism, a receptor, and an exposure route.

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11.1 Remaining Sources and Impact Characterization

Extensive remediation has been conducted at the Site and as described in Section 7.1, Ecology has agreed that interim actions in the Upper Yard achieved cleanup criteria (Ecology 2003). In addition, based on recent sediment sampling which indicated that all results for the 2012 sediment samples were below the SMS SQS and CSL or LAET, Ecology has agreed that further action is not required for Willow Creek sediments (see Section 9.2.2). However, the potential for discharge of groundwater to the surface water of Willow Creek has not been addressed. Therefore, the CSM focuses on remaining limited impacts in the Lower Yard and potential surface water exposures in Willow Creek.

As discussed in Section 10, remaining limited impacts are present in areas of the Lower Yard, primarily associated with petroleum hydrocarbons and LNAPL in subsurface soil and groundwater.

11.2 Fate and Transport of Contaminants

Petroleum components in soil can exist in four different phases: adsorbed to soil particles, dissolved in soil pore water, as vapors in soil pore air, and as LNAPL or residual product in the soil pore spaces.

As rain falls on the ground surface and infiltrates the subsurface, residual contaminants in surface soils dissolve in the rainwater and percolate through the subsurface soils. Some of the contaminants remain in the subsurface soils, in the phases listed previously, and some eventually reach the groundwater. Portions of the volatile

components of petroleum in soils and groundwater could volatilize into the soil pore spaces and move upward to ambient air and indoor air.

Petroleum contaminants in groundwater can exist in three phases: a dissolved phase, LNAPL and adsorbed to the soil particles in the aquifer. LNAPL refers to the fact that the petroleum is less dense than water, so it remains near the top of the aquifer. Groundwater beneath the southeastern, eastern, and northwestern portions of the Lower Yard flows toward Willow Creek; groundwater beneath the southwestern Lower Yard flows toward Puget Sound; and groundwater beneath the central and north-central areas flow toward DB-1. Based on occasional exceedances of surface water criteria in wells close to the Creek, it is conservatively assumed that Site-related contaminants may be affecting surface water. However, petroleum hydrocarbons are not typically expected to enter the aquatic food chain (EPA 2009).

11.3 Potential Receptors

Potential human and ecological receptors are described below.

11.3.1 Human Receptors

The Lower Yard is currently vacant; however, current human receptors that might be exposed to surface water in Willow Creek are limited to the unlikely occurrence of a trespasser, environmental consultants and subcontractors. In order for trespassers to come into contact with surface water from Willow Creek they would need to enter the Site without authorization through either the Lower Yard, across Edmonds Marsh or the BNSF rail line. The unlikely trespasser and current environmental consultants and subcontractors may be exposed to surface water in Willow Creek.

The Lower Yard may be developed in the future. Potential future human receptors include construction workers exposed during redevelopment activities, as well as potential residents or commercial workers.

11.3.2 Ecological Receptors

The Lower Yard, which is approximately 22 acres in area, was a former industrial Site that has recently been subject to intensive remedial activity, including excavation, backfilling, and grading. Except for recent overgrowth of native and invasive vegetation, there is limited vegetation with the exception of a border of mature trees along the eastern perimeter of the Site. In addition the eastern, northeastern and

northwestern parts of the Lower Yard are adjacent to Willow Creek, a tidally influenced creek feeding into Puget Sound. Based on this information potential ecological receptor groups include plants, soil and aquatic invertebrates (e.g., earthworms and benthic invertebrates), terrestrial mammals, birds and potentially small forage fish.

11.4 Potential Exposure Pathways

11.4.1 Exposures to Human Receptors

11.4.1.1 Current Exposures

The human receptors currently present at the Lower Yard are limited to trespassers, and onsite environmental consultants and subcontractors. The Site specific CULs and RELs established in the IAWP were based on standard Method B CULs for direct contact. The Method B CULs for direct contact are designed to protect residents from daily exposure, and assume daily exposure of children present at the Lower Yard, 365 days a year, for 6 years. Because children are more highly exposed on a body weight basis than adults, the soil CULs and RELs are adequately protective of adult onsite environmental consultants and subcontractors. Currently, public access to Willow Creek is not allowed, and exposure to the public would be limited to trespassers. As discussed in Section 11.3.1, exposure to the public would be very unlikely due to the restricted access to Willow Creek, and even in contact with surface water in Willow Creek the exposure to COCs would be limited. The Method B surface water CULs established for the Site are designed to protect people eating contaminated seafood, which is considered a much more significant exposure route than incidental contact. Furthermore, because petroleum hydrocarbons are not expected to enter the aquatic food chain, as described in Section 11.4.2, ingestion of fish or other aquatic biota (e.g., crayfish) was not considered a complete exposure pathway. Environmental consultants and subcontractors currently working at the Site are further protected from exposures by personal protective equipment.

Inhalation of windblown dust is not explicitly addressed in Method B CULs, but they are sufficiently protective of that pathway considering that windblown dust is considered a limited exposure pathway for the Site IHSs.

Due to the Lower Yard's proximity to the Puget Sound, groundwater at the Site contains salinity levels making it unsuitable for ingestion or as a potable water source; therefore ingestion is not a potential exposure route.

11.4.1.2 Potential Future Exposures

The Lower Yard may be redeveloped in the future. If that occurs, construction workers may be exposed to Site soils and LNAPL via incidental ingestion, dermal contact and inhalation of dust for short periods while excavating, trenching, or conducting other construction activities in the vicinity of DB-2 and the WSDOT stormwater line. Future commercial workers and residents may be exposed to soil via incidental ingestion, dermal contact and inhalation of dust while working in buildings onsite. However, as stated above, the Site specific CULs and RELs established in the IAWP were based on standard Method B CULs for direct contact. The Method B CULs for direct contact are designed to protect residents from daily exposure, and assume daily exposure of children present at the Lower Yard, 365 days a year, for 6 years. Because children are more highly exposed on a body weight basis than adults, the soil CULs and RELs are adequately protective of adult construction workers. Also, if the Site is redeveloped, commercial workers and residents are not expected to be exposed to surface and subsurface soils because the surface will be covered by buildings and pavement.

Inhalation of windblown dust is not explicitly addressed in Method B CULs, but they are sufficiently protective of that pathway considering that windblown dust is considered a limited exposure pathway for the Site IHSs.

If people were to use Willow Creek recreationally in the future, they could come into direct contact with surface water, and they could potentially eat contaminated fish or shellfish. As stated above, Method B surface water CULs are designated to protect people eating contaminated seafood. Although, again, Method B surface water CULs do not implicitly address direct contact with surface water, ingestion of seafood is considered a much more significant exposure route.

Due to the Lower Yard's proximity to the Puget Sound, groundwater at the Site contains salinity levels making it unsuitable for ingestion or as a potable water source; therefore ingestion is not a potential exposure route.

A human exposure pathways diagram is provided as **Figure 20**. Soil RELs and CULs that have been used to date are believed protective for current and future exposure scenarios. This will be verified by additional assessment of RELs and CULs during preparation of the Feasibility Study.

11.4.2 Exposures to Ecological Receptors

Ecological receptors onsite and in the surrounding environment can be directly or indirectly exposed to remaining impacts if a complete exposure pathway exists. A potential exposure pathway is considered complete if it contains the following five elements:

- A constituent source
- A release mechanism to the environment
- A transport medium
- Receptor contact at the exposure point
- An exposure route

Important features that need to be considered when evaluating exposure pathway completeness include the following:

- Chemical concentrations in different media and their respective locations
- Physical and chemical properties of the chemicals of concern
- Locations of habitats and other environmentally sensitive areas.

As noted above, the remaining limited impacts at the Site are limited to subsurface soils in two discrete areas of the Site, with elevated concentrations present only at depths greater than 4 feet bgs. Subsurface soils at this depth do not represent a complete exposure pathway because they are below the area in which most biological activity occurs. Therefore, no complete exposure pathways associated with soil were identified.

Similarly, direct exposure to groundwater represents an incomplete exposure pathway, unless the groundwater directly discharges to surface water. Because of the potential that Site groundwater may be discharging to the surface water of Willow Creek, aquatic receptors such as fish and water column invertebrates may be directly exposed to surface water via ingestion and direct contact/uptake. Method B surface water CULs are protective of aquatic receptors living in Willow Creek. Furthermore, direct contact

with surface water to upper-trophic level wildlife through ingestion is not likely to occur given the brackish nature of the stream. Also, the tidal nature of the creek and the stormwater inputs to the creek will result in significant exchange (i.e., mixing) between discharging groundwater, tidal water, and stormwater. Depending on the net flow in this mixing zone, groundwater seeping into the creek will be quickly mixed with other water in the creek, reducing the concentration in the discharging groundwater; therefore decreasing the exposure further. As previously noted, sediment analytical results from Willow Creek indicate that the sediments in Willow Creek do not contain contaminants in excess of the SMS SQS, and most POC wells directly adjacent to Willow Creek are currently in compliance with surface water CULs. Based on this information, exposure to surface water is considered the only potentially complete pathway for ecological receptors, albeit a minimal exposure risk.

12. Conclusion

Remediation efforts conducted to date have addressed potential impacts in the Upper Yard, the sediments of Willow Creek, and the majority of the Lower Yard. Currently in the Lower Yard, there are minimal remaining impacts to soil and groundwater. Specifically, soil impacts remain in two main areas; adjacent to DB-2 and MW-510, and to the north and south/southwest of the WSDOT stormwater line. The delineation of these, and all other areas, is supported by hundreds of confirmation soil samples collected during 2007/2008 Interim Actions and subsequent Site assessments. In the DB-2 area, LNAPL has been detected in monitoring well MW-510 since October 2010. However during the most recent groundwater sampling event in June 2012, the newly installed monitoring well (MW-529) located approximately 20 feet downgradient of MW-510, did not contain dissolved concentrations of TPH greater than laboratory detection limits, suggesting that Site groundwater is not impacting surface water at this location.

Two new interior monitoring wells were installed in the impacted soil areas adjacent to the WSDOT stormwater line. During the June 2012 groundwater sampling event one of the wells (MW-536) did not contain concentrations of dissolved TPH greater than the TPH CUL, demonstrating that the soil exceedences in this area are not adversely impacting groundwater. The other new interior monitoring well installed in the impacted soils north of the WSDOT stormwater line (MW-525) contained concentrations of dissolved TPH greater than the TPH CUL during the June 2012 sampling event. However, POC wells downgradient of MW-525 (MW-101, MW-104 and MW-20R) did not exceed the TPH CULs during the June 2012 groundwater sampling event. Wells MW-101 and MW-20R have shown statistically significant decreasing trends in TPH concentrations since the beginning of the current groundwater monitoring period in

October 2008, and MW-104 shows a decreasing trend but is not statistically significant. These trends suggest that groundwater concentrations are attenuating before reaching POC wells and that the groundwater concentrations will continue to decrease.

Soil RELs and CULs are adequately protective for workers and other human receptors currently visiting the Site. They are also adequately protective for future construction workers, commercial workers, and residents. Method B surface water CULs and effective cleanup of sediments in Willow Creek are adequately protective for the hypothetical pathway of trespassers and recreational use in Willow Creek. Based on the limited remaining impacts and the Method B CULs, the potential exposure pathways are minimal, and are described below:

- Environmental consultants, subcontractors, and future construction works to subsurface soil and groundwater in two limited areas of the Lower Yard
- Unlikely trespassers and current site workers exposed to surface water, although potential exposure through surface water would be minimal
- Commercial workers, and residential users in two limited areas of the Lower Yard (future only)
- Aquatic receptors exposed to surface water, although minimal.

Remediation efforts at the Site have been ongoing since 2001. During that time impacts to the Upper Yard, the sediments of Willow Creek and the majority of the Lower Yard have been addressed. Currently, impacts are limited to discrete areas representing approximately 0.74 acres of the 22 acre Lower Yard, specifically located near DB-2 and the WSDOT stormwater line. The discrete areas are well delineated by confirmation soil samples collected during 2007/ 2008 confirmation soil samples, which were collected on a 20 to 25-foot grid sampling program, and/or additional Site investigation soil borings.

13. Next Steps

As presented in the *Revised Feasibility Study Work Plan* (ARCADIS, 2012b), it is assumed that there will be one round of comments and revisions for the CSM, and 30 days for final comments from Ecology. Once the CSM is reviewed and approved ARCADIS will begin re-evaluating the current CULs/RELs. A CUL/REL evaluation document will be submitted in March 2013. ARCADIS anticipates conducting a stakeholder meeting in April to discuss the CUL/REL document, as well as to discuss the remedial alternatives that will be screened for further assessment in the FS. ARCADIS will prepare a FS Screening Technologies document which presents what final alternatives will be analyzed in the FS. Once the appropriate technologies have been screened, ARCADIS anticipates that at least one technology will require that a groundwater capture model be prepared. The modeling process will consist of condensing the 2011 Site Investigation Report and CSM report into a summary. A robust CSM is essential to reducing uncertainty in numerical groundwater flow models. The CSM will be streamlined in a slide presentation and will be the basis for the numerical model. If any significant data gaps are identified that may impact the modeling objectives, a separate work scope will be prepared and submitted for preparation of a data gaps work plan and proposed field work. After preparing a revised CSM in presentation format, the modeling team will evaluate the model domain, layers, preliminary hydraulic conductivity distribution and translation of physical boundaries into numerical boundaries.

The primary objectives of the groundwater flow modeling are to:

- Mathematically simulate groundwater flow rates and patterns at and near the site specifically in the shallow fill material.

- Mathematically simulate potential groundwater interactions with surface water in the tidally-influenced Puget Sound and adjacent wetlands and Willow Creek.

- Perform predictive analyses to evaluate the effectiveness of the proposed remedial alternatives in the FS.

ARCADIS proposes to use the MODFLOW (McDonald and Harbaugh, 1988) code to simulate groundwater flow and potential groundwater-surface water interactions at the Site and surrounding areas along the Puget Sound. MODFLOW is widely used in both academia and industry and has the flexibility to handle the boundary conditions found at the Site. Also, MODFLOW can simulate various external stresses such as tidal

influences along streams or rivers, groundwater extraction wells, distributed recharge, and drains. The influence of groundwater extraction wells can be assessed using MODPATH (Pollock, 1989) and/or MODALL (Potter et al., 2006) codes which are integrated into MODFLOW. MODPATH is a particle tracking routine that can evaluate advective groundwater transport using the flow field developed by MODFLOW. MODALL is a capture zone analysis program also compatible with MODFLOW.

The groundwater flow model will be constructed and calibrated to simulate steady-state groundwater flow conditions in the 2008 fill, Pre-1929 fill, and alluvium deposits (eg. native material that underlies the fill). The base of the model may be set at the bottom of the alluvium (native material); however, final model design will be determined during the conceptualization process. Similarly, the number of model layers will be determined after reviewing the site hydrostratigraphy and refining the CSM. Puget Sound will likely be simulated by using the MODFLOW constant head or river packages. Horizontal grid cell spacing in the model will be determined based on the size of the area of interest, the total area of the model domain, the degree of accuracy and precision needed, and the remedial alternatives under consideration.

The groundwater flow model will likely be calibrated to the net average hydraulic gradient under steady-state flow conditions. Additional data sets may also be used for steady-state calibration(s). Steady-state calibration is needed to evaluate long-term, average groundwater flow parameters such as pumping rates required to maintain capture. The calibration efforts will proceed by adjusting uncertain hydraulic properties and boundary conditions within reasonable ranges to achieve an acceptable match between measured and computed water levels. Acceptable limits where calibration parameters can vary may be determined from site specific measurements and a review of relevant literature, as appropriate.

Parameter estimates from on-site measurements and nearby regional information, as appropriate, will likely be used as a starting point for calibration. Area wide water-level measurements may be used in the flow model calibration. Sensitivity analyses may also be performed, if necessary, on the calibrated flow model to further evaluate model uncertainty. Sensitivity analyses may also be completed to evaluate groundwater flow conditions and remedial performance during extreme hydraulic conditions such as low-low tide, high-high tide, and peak storm events.

ARCADIS will determine the calibration "goodness-of-fit" by examining statistical properties of the model residuals and the consistency of model features and mass balance with the CSM. A residual is defined as the difference between measured water

levels or flows and those computed by the model at discrete points. The objective of calibration is to reduce the sum of squared residuals to a minimum with a mean residual close to zero and a residual standard deviation much less than the total change in head across the Site. Depending on model calibration results, inverse calibration techniques may be used to further improve goodness-of-fit. Inverse calibration modules for MODFLOW systematically adjust hydraulic parameters in the model until the best statistical match is obtained between measured and computed water levels.

The calibrated groundwater flow model will be used to evaluate remedial alternatives developed during the FS process and assist with decision-making regarding the remedial alternatives. The model will likely be used to help evaluate the effectiveness of the proposed remedies and assist the design team with decision-making. Remedial alternatives may consist of groundwater extraction wells, extraction trenches, vertical flow barriers, permeable reactive barriers, passive collection system, and/or combinations of these remedial components. Because all of these remedial elements involve potential changes in groundwater flow dynamics, the model will likely be used to predict potential changes in groundwater flow associated with the final remedial alternatives assembled in the FS and provide an assessment regarding feasibility and optimization.

Final model construction and calibration information will be presented in the modeling report that will be submitted in September 2013. MODFLOW files used to conduct the modeling will be included on a disk with the report.

These documents will be used to support the development of the FS, which is anticipated to be submitted by the end of 2013.

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Tables

TABLE 4
Summary of Aquifer Tests and Hydraulic Conductivity Estimates (May and September 2011)
Former Unocal Terminal
11720 Unoco Road
Edmonds, Washington

Well ID	Sandpack Top (ft bgs)	Top of Screen (ft bgs)	Bottom of Screen (ft bgs)	Well Casing Diameter (in)	Well Borehole Diameter (in)	Pumping Test Period (min)	Water Removed During Test (gal)	Initial Water-level (ft bmp)	Final Water-level (ft bmp)	Walton Method K[1] (ft/day)	Theis K [2] (ft/day)	Theis Agarwal K[3] (ft/day)	Bouwer-Rice K[4] (ft/day)	Dagan K[5] (ft/day)	Arithmetic Mean K (ft/day)	Lithology at Screen Interval	Notes
LM-2	2	2.5	8	2	*8*	27	2.7	1.47	3.27	NA	NA	NA	0.3	0.4	0.3	Sand w/ silt	*E*
MW-8R	2	3	13	2	8	74.5	320	7.70	8.32	186	NA	NA	NA	NA	186	Gravelly Sand	*B,C*
MW-8R	2	3	13	2	8	1441	7207	7.70	8.51	187	345	245	NA	NA	259	Gravelly Sand	*D*
MW-104	3.5	5	15	2	10	83	259	7.73	12.91	4.7	15	NA	NA	NA	10	Sand w/ trace silt	*B,C*
MW-129R	2	3	13	2	8	84	24.4	5.10	9.45	NA	0.5	NA	0.2	0.2	0.3	Sand	*B,C,E*
MW-149R	2	3	13.0	2	8	66	130	6.45	10.65	2.5	NA	NA	NA	NA	2.5	Sand & gravel w/ trace fines	*B,C*
MW-500	2	3	13	2	8	30	7.5	3.8	7.11	0.15	NA	NA	0.05	0.06	0.1	Silty Sand	*A,B,E*
MW-518	2	4	13.5	2	8	96	240	8.71	11.99	5.8	10	NA	NA	NA	8	Sand	*B,C*

Notes:
ft bgs - feet below the ground surface
in - inches
min - minutes
gal - gallons
ft bmp - feet below measuring point
ft/day - feet per day
K - hydraulic conductivity
NA - not analyzed (not suitable for analysis)
Red - assumed/estimated value
A = used step rate pump test data (initial step only) from May 12/13, 2011
B = used the steady state pump test data from the May 16/17, 2011
C = Walton method could not be adjusted for drawdown, approximate
D = Theis solutions used the 24 hour MW-8R pump test data from 5/19-20/2011. Note, the obervation well drawdown was not sufficient for accurate analyses
E = Slug tests (falling head) were peformed on the noted wells on September 19, 2011.

Solution notes:
[1] - Walton, W.C. 1962. Selected Analytical Methods for Well and Aquifer Evaluation, Illinois State Water Survey, Bulletin 19. (approximate)
[2] - Modified Theis Equation using AQTESOLV Professional V4.
[3] - Modified Theis Aagarwal Recovery Method using AQTESOLV Professional V4.
[4] - Bouwer and Rice Method using AQTESOLV Professional V4. (see Appendix G)
[5] - Dagan Method using AQTESOLV Professional V4. (see Appendix G)
Storativity could not be estimated. Thus, some additional errors were introduced in some of the solutions.
Due to the shorter test period and low data resolution, the solutions do not account for skin effects and only partially account for wellbore storage effects.

TABLE 6
Soil Sample Analytical Results - June 2012
Unocal Edmonds Bulk Fuel Terminal Lower Yard
11720 Unoco Road
Edmonds, Washington

Sample ID	Sample Depth (feet bgs)	Date Sampled	BTEX (mg/kg)				Total cPAHs Adjusted for Toxicity (mg/kg)	Diesel Range Organics (mg/kg)	Gasoline Range Organics (mg/kg)	Heavy Oil (Lube) (mg/kg)	Total TPH (mg/kg)
			B	T	E	X					
Site Soil Remediation Level (REL)/Cleanup Level (CUL) (mg/kg)			18	--	--	--	0.14	--	--	--	2,975
MW-525-4	4	06/14/12	3.5 W	0.19 W	0.18 W	0.51 W	N/A	270	13 U W	1,000	1,277
MW-525-6	6	06/14/12	34 T	4.9 T	220 T	1,200 T	0.29	5,700	12,000	300 U	17,850
MW-525-10.5	10.5	06/18/12	0.014	0.012	0.013	0.042	N/A	1,200	2.8	130 U	1,268
Dup-1	10.5	06/18/12	0.10	0.051	0.14	0.42	N/A	790	43	120 U	893
MW-525-12.5	12.5	06/18/12	1.7	0.84	2.6	9.0	N/A	290	380	25 U	683
MW-526-4	4	06/14/12	0.019 U T	0.0061 U T	0.0061 U T	0.028 T	N/A	17	11	11 U	34
MW-526-12.5	12.5	06/18/12	0.0061 U	0.0061 U	0.0061 U	0.018 U	N/A	3.6 U	1.2 U	12 U	8 UU
MW-527-8	8	06/14/12	0.02	0.0061 U	0.0061 U	0.018 U	N/A	170	2.4	180	352
MW-527-9	9	06/22/12	0.053 U W	0.053 U W	0.053 U W	0.16 U W	N/A	240	11 U W	390	636
MW-527-12	12	06/22/12	0.11 U W	0.11 U W	0.11 U W	0.32 U W	N/A	220	96	400	716
MW-527-13.5	13.5	06/22/12	0.11 U W	0.11 U W	0.11 U W	0.32 U W	N/A	990	21 U W	620	1,621
MW-527-17	17	06/22/12	0.068 U W	0.068 U W	0.068 U W	0.20 U W	N/A	3.8 U	14 U W	13 U	15 UU
Dup-2	17	06/22/12	0.070 U W	0.070 U W	0.070 U W	0.21 U W	N/A	3.9 U	14 U W	13 U	15 UU
MW-528-8	8	06/14/12	0.015	0.0055 U	0.0055 U	0.016	N/A	4.0	1.1 U	22	27
MW-528-15	15	06/22/12	0.025 U W	0.025 U W	0.025 U W	0.076 U W	N/A	190	70	180	440
MW-528-17	17	06/22/12	0.078	0.067	0.063	0.19	N/A	4.7 U	2.1 U	16 U	11 UU
MW-531-6	6	06/14/12	0.0084	0.0059 U	0.0059 U	0.021	N/A	130	20	160	310
MW-531-12	12	06/18/12	0.13	0.0056 U	0.10	0.068	N/A	11	14	23	48
MW-532-6	6	06/18/12	0.084 U	0.084 U	0.084 U	0.25 U	N/A	800	17 U W	690	1,499
MW-532-7	7	06/18/12	0.16 U T	0.11 T	0.026 U T	0.26 U T	0.04	5,000	340	5,200	10,540
MW-532-10	10	06/18/12	0.0079 U	0.0079 U	0.0079 U	0.024 U	N/A	4.4 U	1.6 U	15 U	11 UU
MW-532-13.5	13.5	06/18/12	0.0066 U	0.0066 U	0.0066 U	0.02	N/A	760	1.3 U	920	1,681

Notes:
BTEX analyzed by EPA Method 8021B.
cPAHs analyzed by EPA Method 8270 SIM.
Gasoline analyzed by method NWTPH-G.
Diesel and Heavy Oil (Lube) analyzed by method NWTPH-D Extended.
Total TPH calculated by summing the concentrations of gasoline, diesel and heavy oil. If one or more TPH constituents were reported as Non-Detect, half of the reporting limit value was added to the total.
cPAHs adjusted for toxicity according to WAC 173-340-708(8) and *Air Toxics Hot Spots Program Risk Assessment Guidelines, Part II Technical Support Document for Describing Available Cancer Potency Factors* . Office of Environmental Health Hazard Assessment, California EPA, May 2005. If one or more adjusted cPAH constituents were reported as Non-Detect, half of the reporting limt was used in calculations.
Highlighted cells indicate concentration exceeds REL or CUL.
NA = Indicates analysis not conducted.
BTEX = Benzene, toluene, ethylbenzene, and total xylenes
EPA = Environmental Protection Agency
mg/kg = Milligrams per kilogram
cPAHs = Carcinogenic polynuclear aromatic hydrocarbons
REL = Remediation level
CUL = Cleanup level
TPH = Total petroleum hydrocarbons

Lab Qualifiers	Definition
J	Indicates an estimated value.
T	Reporting limits were raised due to interference from the sample matrix.
U	The compound was analyzed for but not detected. The associated value is the compound quantitation limit.
UU	The constituents making up the total are all non-detects.
W	Reporting limits were raised due to sample foaming.

TABLE 7
Sediment Sample Analytical Results - June 2012
Unocal Edmonds Bulk Fuel Terminal Lower Yard
11720 Unoco Road
Edmonds, Washington

				Sample ID	US-100		DUP-1		US-101		US-102	
				Sample Date	7/30/2012		7/30/2012		7/30/2012		7/30/2012	
Chemical	**Units**	**SQS[1]**	**CSL[1]**	**LAET[2]**								
Volatile Organic Compounds												
Benzene	mg/kg	NA	NA	NA	0.002	U	0.001	U	0.004	U	0.003	U
Ethylbenzene	mg/kg	NA	NA	NE	0.004	U	0.003	U	0.009	U	0.005	U
Toluene	mg/kg	NA	NA	NA	0.004	U	0.003	U	0.009	U	0.005	U
Xylene (Total)	mg/kg	NA	NA	NE	0.004	U	0.003	U	0.009	U	0.005	U
Petroleum Hydrocarbons												
GRO	mg/kg	NA	NA	NA	45	U	41	U	140	U	100	U
DRO	mg/kg	NA	NA	NA	7.7	U	11		29		17	
HO	mg/kg	NA	NA	NA	26	U	59		170		110	
Metals												
Arsenic	mg/kg	57	93	130	8.53		6.87		29.1		20.2	
Copper	mg/kg	390	390	390	5.7		5.05		43.6		21.6	
Lead	mg/kg	450	530	430	11.2		10		107		60.6	
Zinc	mg/kg	410	960	460	51.5		41.4		319		144	
Conventionals												
TOC	mg/kg	NA	NA	NA	19200		18800		64700		65200	
TOC	%	NA	NA	NA	2		2		6		7	
Moisture	%	NA	NA	NA	60.8		60.2		83.6		77.5	
Ammonia-Nitrogen	mg/kg	NA	NA	NA	148		163		863		402	
PAHs[3]												
Acenaphthene	mg/kg	16	57	0.13	0.27	U	0.27	U	0.012	U	0.0089	U
Acenaphthylene	mg/kg	66	66	0.07	0.57		0.34		0.014		0.013	
Anthracene	mg/kg	220	1200	0.28	0.45		0.39		0.034		0.023	
Benzo(a)anthracene	mg/kg	110	270	0.96	0.63		0.64		0.16		0.061	
Benzo(a)pyrene	mg/kg	99	210	1.10	0.68		0.69		0.22		0.084	
Benzo(b)fluoranthene	mg/kg	NA	NA	NA	1.15		1.22		0.42		0.15	
Benzo(g,h,i)perylene	mg/kg	31	78	0.67	0.89		0.69		0.19		0.067	
Benzo(k)fluoranthene	mg/kg	NA	NA	NA	0.36		0.44		0.14		0.06	
Chrysene	mg/kg	110	460	0.95	0.94		1.01		0.28		0.11	
Dibenz(a,h)anthracene	mg/kg	12	33	0.23	0.27	U	0.27	U	0.042		0.015	
Fluoranthene	mg/kg	160	1200	1.30	2.40		2.29		0.46		0.21	
Fluorene	mg/kg	23	79	0.12	0.45		0.53		0.059		0.028	
Indeno(1,2,3-cd)pyrene	mg/kg	34	88	0.60	0.68		0.53		0.17		0.057	
Naphthalene	mg/kg	99	170	0.23	2.92		1.38		0.052		0.059	
Phenanthrene	mg/kg	100	480	0.66	2.29		1.91		0.18		0.11	
Pyrene	mg/kg	1000	1400	2.40	2.34		2.18		0.44		0.19	
Total LPAH[4]	mg/kg	370	780	1200	6.68		4.55		0.34		0.23	
Total HPAH[5]	mg/kg	960	5300	7900	10.05		9.69		2.52		1.00	

Notes:
PAH = Polycyclic aromatic hydrocarbons
LPAH = low molecular weight PAH
HPAH = high molecular weight PAH
SQS = Sediment Quality Standards
CSL = Cleanup Screening Levels
NA = Not applicable
NE= Not evaluated because these analytes do not have SQS or CSL.
U = Indicates the value was below the Method Detection Limit.

1. SQS and CSL from Chapter 173-204 WAC Sediment Management Standards. PAH results for US-100 and DUP-1 are organic carbon normalized.

2. LAET from Puget Sound Dredged Disposal Analysis. 1996. Progress Re-evaluation Puget Sound Apparent Effects Thresholds (AETs). LAET value is the lowest concentration of the echinoderm, microtox, and oyster AETs from Table 9.

3. Samples US-100 and DUP-1 required normalization as TOC fell in the range of 0.2 to 4%. PAH values were normalized by dividing the original concentration by the TOC percentage expressed as a decimal.

4. Total LPAH is the sum of naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, and anthracene. Non-detect values are treated as zero in the summation.

5. Total HPAH is the sum of fluoranthene, pyrene, benz(a)anthracene, chrysene, total benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3,-c,d)pyrene, dibenzo(a,h)anthracene, and benzo(g,h,i)perylene. Non-detect values are treated as zero in the

6. US-100 and DUP-1 were compared to SQS and CSL screening criteria and US-101 and US-102 were compared to LAET based on TOC concentrations and Ecology guidance (Washington Department of Ecology. 1992 and 1993. Organic Carbon Normalization of Sediment Data)

7. All results are reported on a dry weight basis except as indicated in footnote 3.

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Figures

REFERENCE: USGS QUADS., 7.5 MIN. SERIES (TOPOGRAPHIC) - EDMONDS EAST, WASH. AND EDMONDS WEST, WASH.

0 0.5 1.0

Approximate Scale: 1"=0.5 Miles

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL
EDMONDS, WASHINGTON

CONCEPTUAL SITE MODEL

SITE LOCATION MAP

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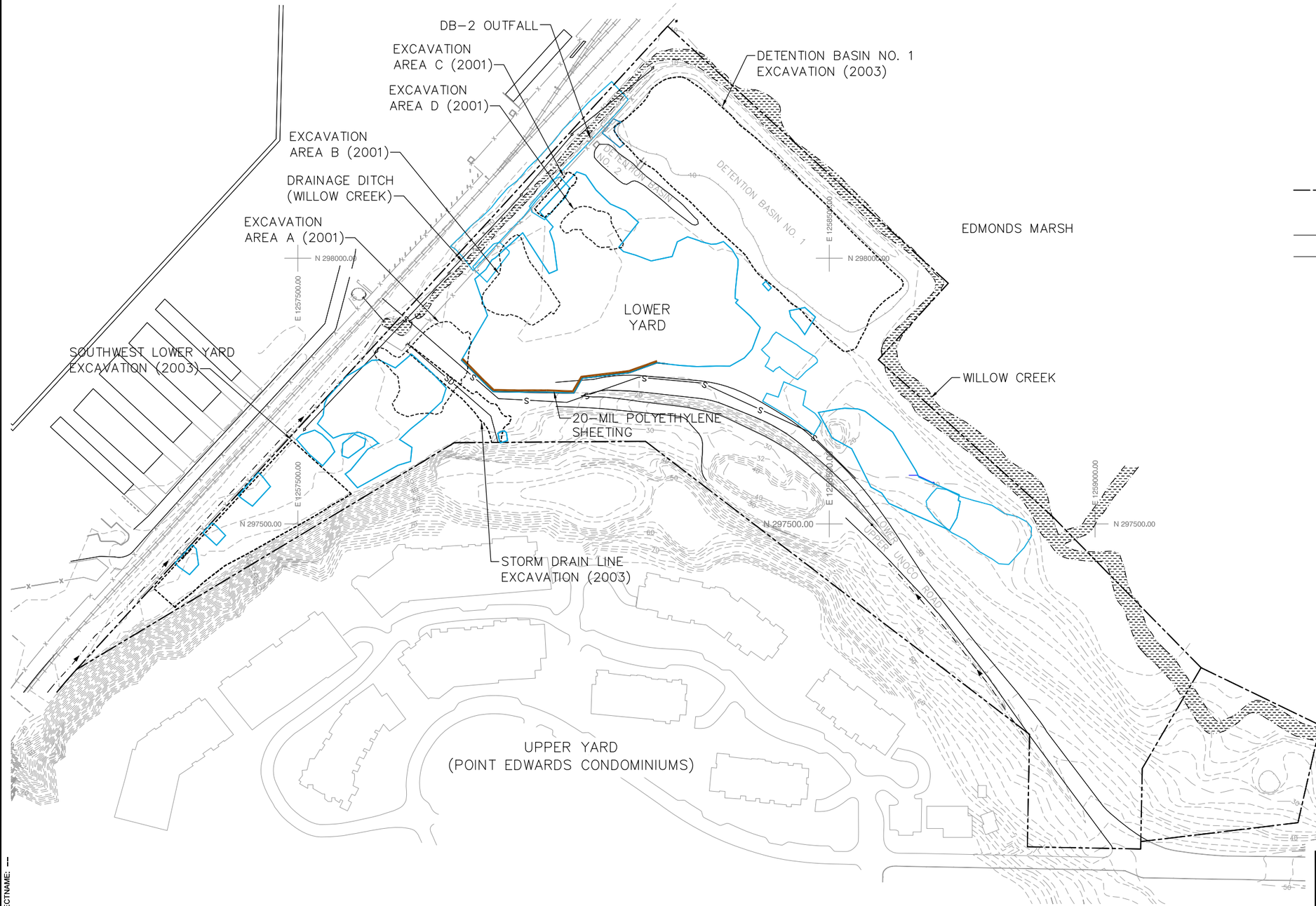
FIGURE 1



LEGEND:

- 2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
- LOWER YARD PROPERTY BOUNDARY
- 2007/2008 EXCAVATION BOUNDARIES
- S — WSDOT STORM DRAIN LINE
- SD — POINT EDWARDS STORM DRAIN LINE

NOTE:

20-MIL POLYETHYLENE SHEETING INSTALLED UPON COMPLETION OF PHASE I OF THE 2007/2008 EXCAVATION. SHEETING REACHES TO APPROXIMATELY 7.5 FEET ABOVE MEAN SEA LEVEL.

0 200' 400'

GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

SITE LAYOUT

ARCADIS

FIGURE 2

CITY: SYRACUSE, NY DIV/GROUP: ENV/REM+WM+DV DB: K. DAVIS, R. ALLEN, P. LISTER PM/TM: R. ANDRESEN TR: D. RASAR LYR: ON=*;OFF=*REF*, (FRZ)
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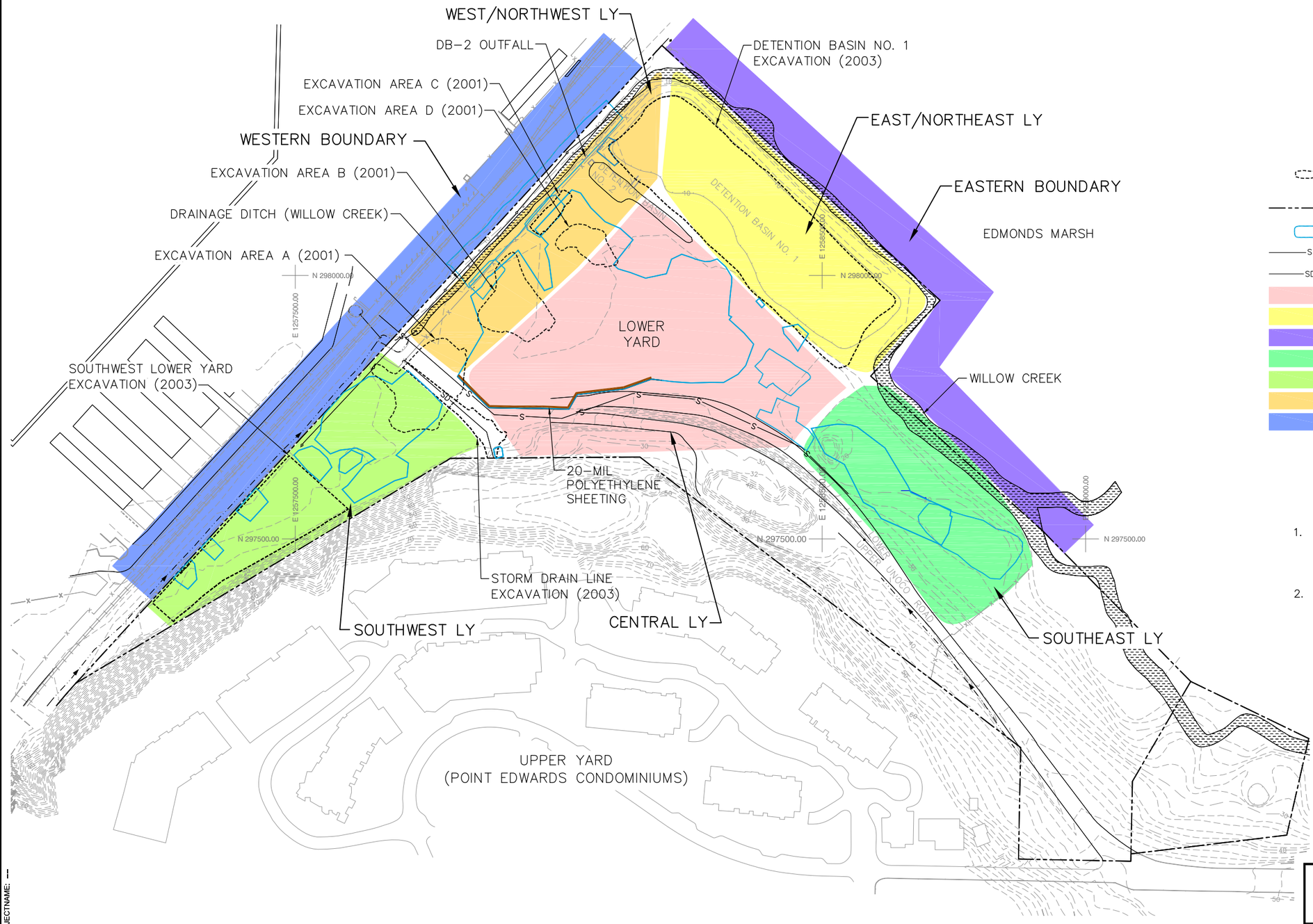
45362XDL
45362X03



LEGEND:

- 2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
- LOWER YARD PROPERTY BOUNDARY
- 2007/2008 EXCAVATION BOUNDARIES
- S — WSDOT STORM DRAIN LINE
- SD — POINT EDWARDS STORM DRAIN LINE
- CENTRAL LY
- EAST/NORTHEAST LY
- EASTERN BOUNDARY
- SOUTHEAST LY
- SOUTHWEST LY
- WEST/NORTHWEST LY
- WESTERN BOUNDARY

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).

0 200' 400'

GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

AREAS OF THE LOWER YARD MAP

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FIGURE 3

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: K. DAVIS, R. ALLEN, P. LISTER PM/TM: R. ANDRESEN TR: D. RASAR LYR: ON=*;OFF=*REF*,(FRZ)
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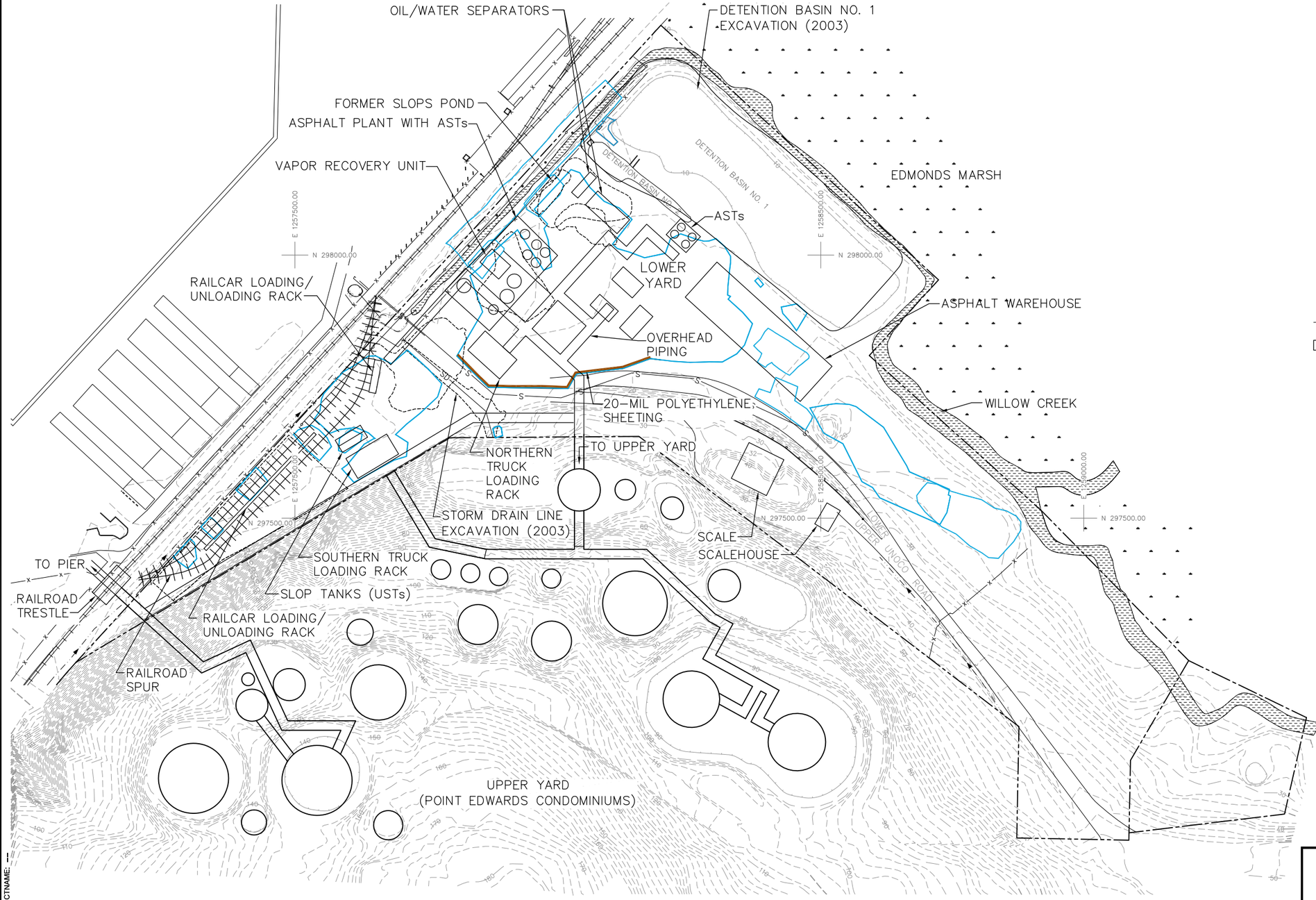
45362X03



LEGEND:

- 2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
- 2007/2008 EXCAVATION BOUNDARIES
- STORM DRAIN LINE
- HISTORIC FEATURE

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).

0 200' 400'

GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

HISTORIC FACILITIES LOCATION MAP

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FIGURE
4

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DIV DB: K. DAVIS, R. ALLEN, P. LISTER PM/TM: R. ANDRESEN TR: D. RASAR LYR: ON=*;OFF=*REF*
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45362X02
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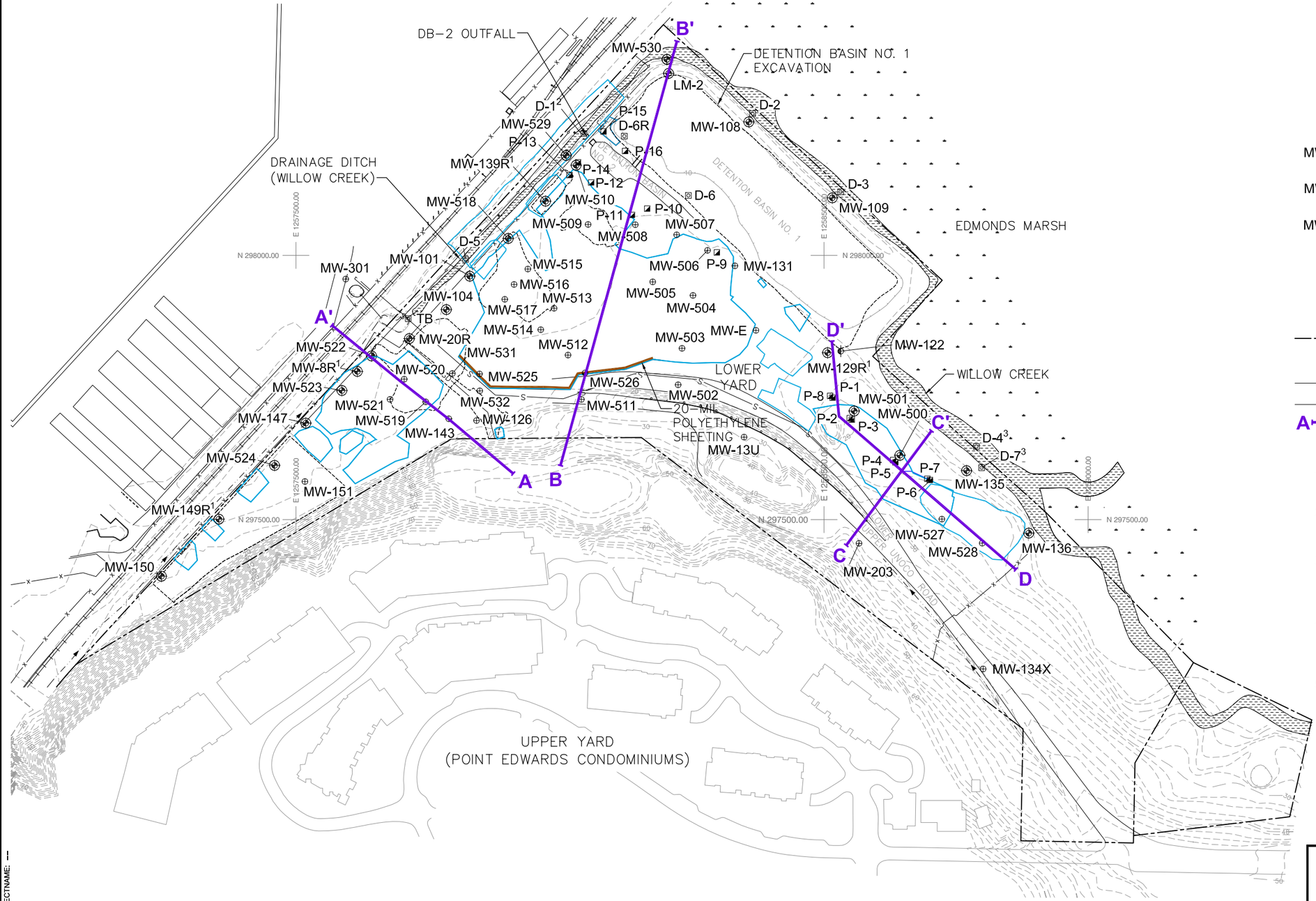

LEGEND:

- MW-203 ⊕ INTERIOR MONITORING WELL LOCATION AND DESIGNATION
- MW-122 ◐ DEEP MONITORING WELL LOCATION AND DESIGNATION
- MW-109 ⊕ SURFACE WATER POINT OF COMPLIANCE MONITORING WELL LOCATION
- P-11 ◪ PIEZOMETER
- D-1 ⊡ STAFF GAUGE
- 2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
- LOWER YARD PROPERTY BOUNDARY
- 2007/2008 EXCAVATION BOUNDARIES
- S — WSDOT STORM DRAIN LINE
- SD — POINT EDWARDS STORM DRAIN LINE
- A — A' CROSS SECTION LOCATIONS

NOTES:

1. STAFF GAUGE D-1 RE-ESTABLISHED PRIOR TO JUNE 2009 SAMPLING EVENT.
2. STAFF GAUGE D-4 WAS ESTABLISHED PRIOR TO JUNE 2009 SAMPLING EVENT TO REPLACE STAFF GAUGE D-7 WHICH IS NOT WITHIN THE WILLOW CREEK CHANNEL.
3. STAFF GAUGES WERE RESURVEYED BY OTAK INCORPORATED JUNE 1, 2009. STAFF GAUGES WERE SURVEYED FROM TOP OF GAUGE AND WATER LEVELS ARE NOW MEASURED FROM TOP DOWN TO WATER.
4. 20-MIL POLYETHYLENE SHEETING INSTALLED UPON COMPLETION OF PHASE I EXCAVATION. SHEETING REACHES TO APPROXIMATELY 7.5 FEET ABOVE MEAN SEA LEVEL.
5. 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).

0 200' 400'

GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

CROSS SECTION LOCATION MAP

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FIGURE 5

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: K. DAVIS, R. ALLEN, P. LISTER PM/TM: R. ANDRESEN TR: D. RASAR LYR: ON=*OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIB\00453620003\00016\DWG\45362G04.dwg LAYOUT: 5 SAVED: 4/8/2013 9:20 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/8/2013 9:20 AM BY: LISTER, PAUL
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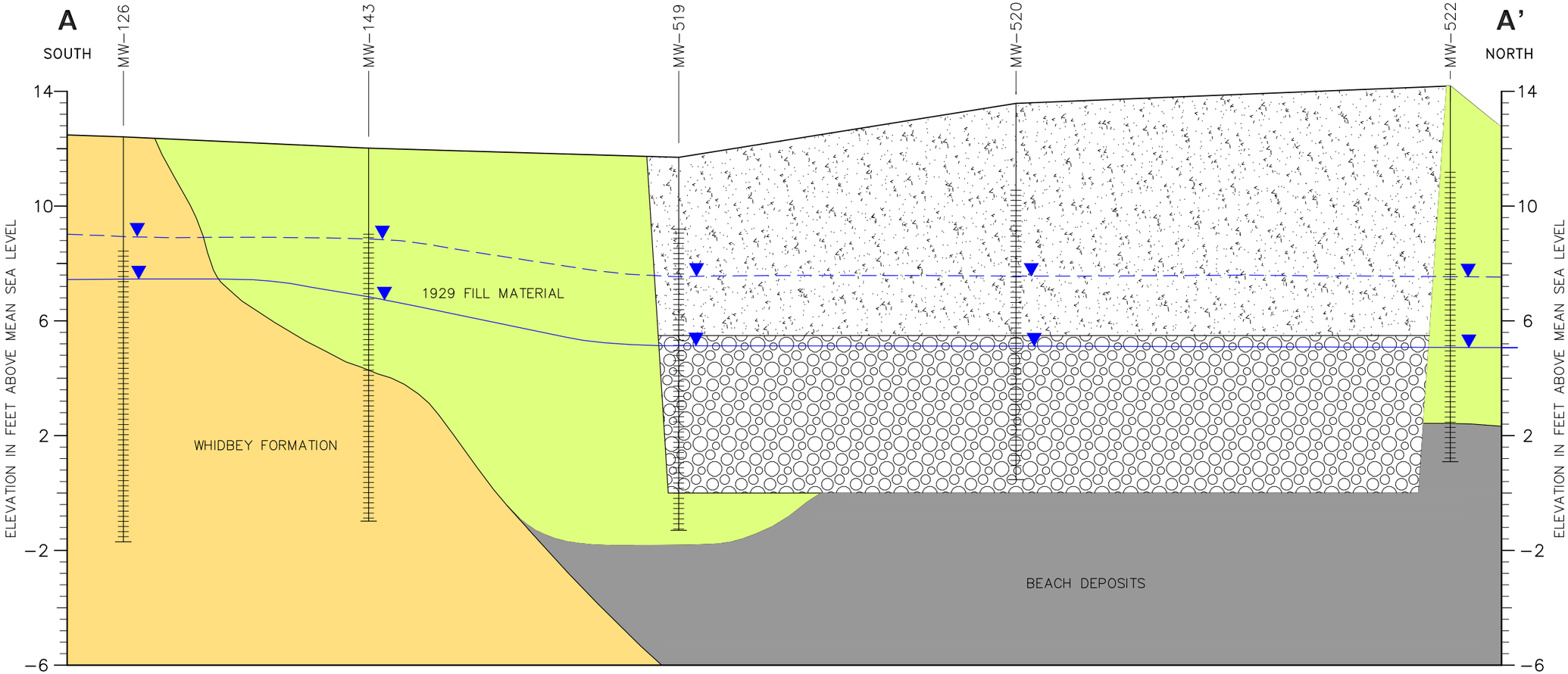
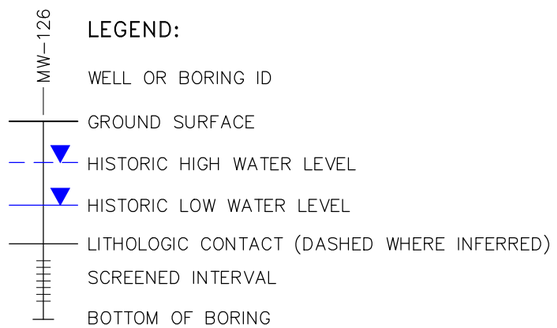
45362X02
45362X03



NOTES:

- 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).



- 1929 FILL MATERIAL
- BEACH DEPOSITS
- TRANSITIONAL SILT BED
- WHIDBEY FORMATION
- MARSH DEPOSITS
- 2007/2008 FILL (GRAVEL)
- 2007/2008 FILL (SILT, SAND AND GRAVEL)

(35' SE)= OFFSET DISTANCE FROM CROSS SECTION PROFILE

VERTICAL EXAGGERATION: 5x

0 4' 8'

VERTICAL SCALE

0 20' 40'

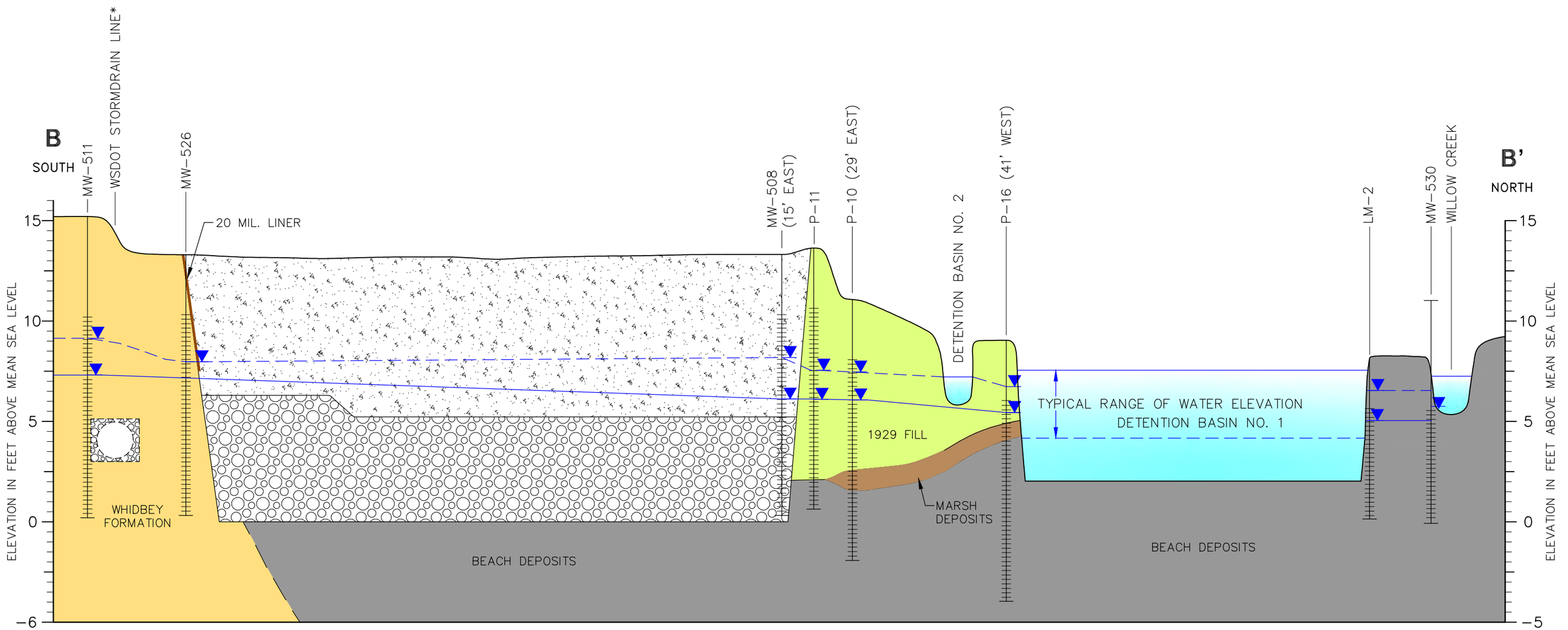
HORIZONTAL SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

LOWER YARD
GEOLOGIC CROSS SECTION A-A'

ARCADIS

FIGURE
6



NOTES:

1. WSDOT STORMDRAIN LINE LOCATION IS APPROXIMATE AND DRAWN TO A NON EXAGGERATED SCALE FOR CLARITY.
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).

MW-511 — WELL OR BORING ID

LEGEND:

- GROUND SURFACE
- HISTORIC HIGH WATER LEVEL
- HISTORIC LOW WATER LEVEL
- LITHOLOGIC CONTACT (DASHED WHERE INFERRED)
- SCREENED INTERVAL
- BOTTOM OF BORING

- 1929 FILL MATERIAL
- BEACH DEPOSITS
- WHIDBEY FORMATION
- MARSH DEPOSITS
- 2007/2008 FILL (GRAVEL)
- 2007/2008 FILL (SILT, SAND AND GRAVEL)

(29' E)= OFFSET DISTANCE FROM CROSS SECTION PROFILE

VERTICAL EXAGGERATION: 10x

0 5' 10'
VERTICAL SCALE

0 50' 100'
HORIZONTAL SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

LOWER YARD
GEOLOGIC CROSS SECTION B-B'

ARCADIS

FIGURE
7

C

SOUTHWEST

C'

NORTHEAST

MW-203 (20' NW)

UPPER UNOCO ROAD

LOWER UNOCO ROAD

WSDOT STORMDRAIN LINE*

P5 (30' SE)

P4 (35' SE)

MW-500 (35' SE)

MW-500

WILLOW CREEK

1929 FILL

TRANSITIONAL SILT BED

WHIDBEY FORMATION

MARSH DEPOSITS

ELEVATION IN FEET ABOVE MEAN SEA LEVEL

35
30
25
20
15
10
5
0
−5
−8

LEGEND:

- WELL OR BORING ID
- GROUND SURFACE
- HISTORIC HIGH WATER LEVEL
- HISTORIC LOW WATER LEVEL
- LITHOLOGIC CONTACT (DASHED WHERE INFERRED)
- SCREENED INTERVAL
- BOTTOM OF BORING
- 1929 FILL MATERIAL
- BEACH DEPOSITS
- TRANSITIONAL SILT BED
- WHIDBEY FORMATION
- MARSH DEPOSITS
- 2007/2008 FILL (GRAVEL)
- 2007/2008 FILL (SILT, SAND AND GRAVEL)

(35' SE)=OFFSET DISTANCE FROM CROSS SECTION PROFILE

NOTES:

* WSDOT STORMDRAIN LINE LOCATION IS APPROXIMATE AND DRAWN TO A NON EXAGGERATED SCALE FOR CLARITY.

- 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).

VERTICAL EXAGGERATION: 6x

0 5' 10'

VERTICAL SCALE

0 30' 60'

HORIZONTAL SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

SOUTHEAST LOWER YARD GEOLOGIC CROSS SECTION C-C'

ARCADIS

FIGURE 8

CITY: SYRACUSE, N.Y. GROUP: ENV/IM+DV DB: K. DAVIS, P. LISTER, W.JONES PM: R. ANDRESEN TM: S. ZORN TR: N. OLIVIER LYR: ON=*;OFF=REF
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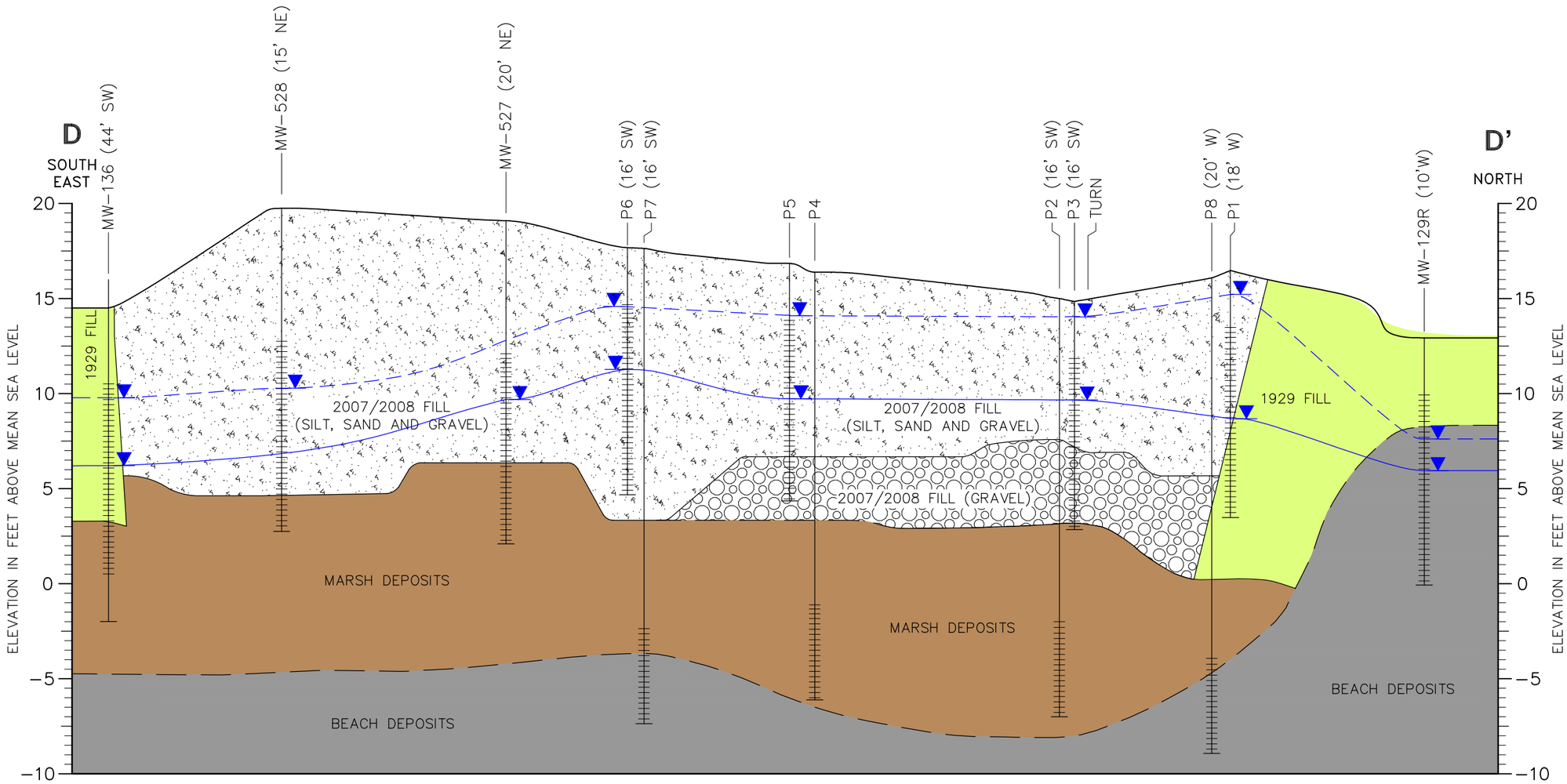


LEGEND:

- MW-136 — WELL OR BORING ID
- GROUND SURFACE
- HISTORIC HIGH WATER LEVEL
- HISTORIC LOW WATER LEVEL
- LITHOLOGIC CONTACT (DASHED WHERE INFERRED)
- SCREENED INTERVAL
- BOTTOM OF BORING

- 1929 FILL MATERIAL
- BEACH DEPOSITS
- TRANSITIONAL SILT BED
- WHIDBEY FORMATION
- MARSH DEPOSITS
- 2007/2008 FILL (GRAVEL)
- 2007/2008 FILL (SILT, SAND AND GRAVEL)

(20' W)= OFFSET DISTANCE FROM CROSS SECTION PROFILE

NOTES:

1. CROSS SECTION DEPICTS SOIL CHARACTERISTICS OF EXCAVATION SIDE WALLS. EXCAVATIONS REACHED TOTAL DEPTHS OF 15 FT. BGS. (<0 FEET AMSI).
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).

VERTICAL EXAGGERATION: 8x

0 — 6.25' — 12.5'
VERTICAL SCALE

0 — 50' — 100'
HORIZONTAL SCALE

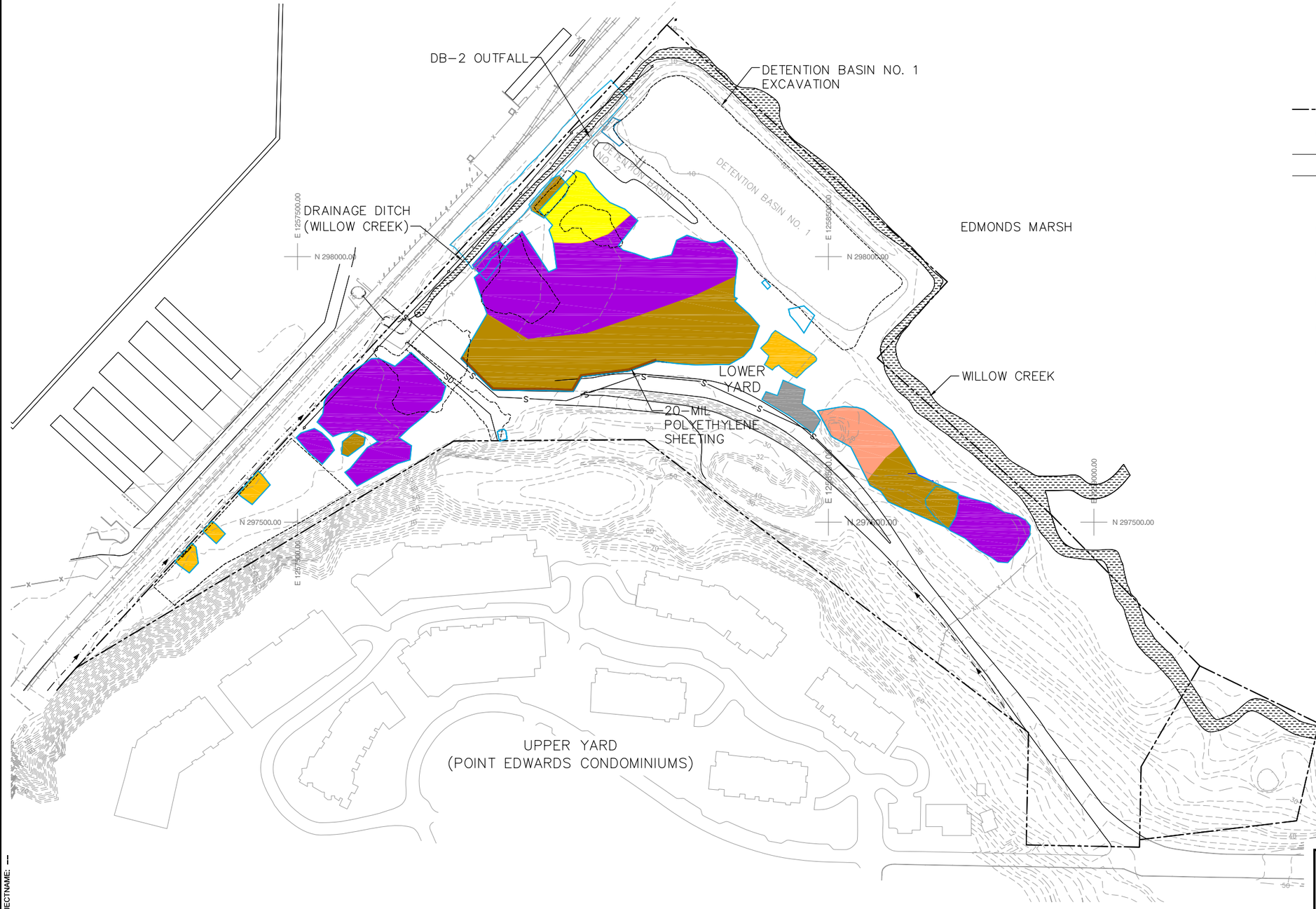
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

SOUTHEAST LOWER YARD GEOLOGIC CROSS SECTION D-D'

ARCADIS

FIGURE 9

CITY: SYRACUSE, NY DIV/GROUP: ENV/REM-WIM-DV DB: K.DAVIS, P. LISTER PM: R. ANDRESEN TM: S. ZORN TR: R. LAGRANDEUR LYR: ON=*;OFF=*REF
G:\ENVCAD\SYRACUSE\ACTIB\00453620\000300016\DWG\453620V01.dwg LAYOUT: 9 SAVED: 4/8/2013 10:45 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/8/2013 10:46 AM BY: LISTER, PAUL
XREFS: IMAGES: PROJECTNAME: ---
45362XDL



LEGEND:

- 2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
- LOWER YARD PROPERTY BOUNDARY
- 2007/2008 EXCAVATION BOUNDARIES
- S — WSDOT STORM DRAIN LINE
- SD — POINT EDWARDS STORM DRAIN LINE

TOP OF GRAVEL BACKFILL ELEVATION:

- 2 – 3 FT AMSL
- 4 – 5 FT AMSL
- 5 – 6 FT AMSL
- 6 – 7 FT AMSL
- 7 – 8 FT AMSL
- 9 – 11 FT AMSL

NOTES:

1. MONITORING WELLS MW-129R, MW-139R, MW-8R, AND MW-149R WERE ABANDONED DURING INTERIM ACTION AND REPLACED IN OCTOBER 2008.
2. STAFF GAUGE D-1 RE-ESTABLISHED PRIOR TO JUNE 2009 SAMPLING EVENT.
3. STAFF GAUGE D-4 WAS ESTABLISHED PRIOR TO JUNE 2009 SAMPLING EVENT TO REPLACE STAFF GAUGE D-7 WHICH IS NOT WITHIN THE WILLOW CREEK CHANNEL.
4. STAFF GAUGES WERE RESURVEYED BY OTAK INCORPORATED JUNE 1, 2009. STAFF GAUGES WERE SURVEYED FROM TOP OF GAUGE AND WATER LEVELS ARE NOW MEASURED FROM TOP DOWN TO WATER.
5. 20-MIL POLYETHYLENE SHEETING INSTALLED UPON COMPLETION OF PHASE I EXCAVATION. SHEETING REACHES TO APPROXIMATELY 7.5 FEET ABOVE MEAN SEA LEVEL.
6. 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).
7. FT AMSL = FEET ABOVE MEAN SEA LEVEL.

0 200' 400'

GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

TOP OF 2008 GRAVEL BACKFILL ELEVATIONS

ARCADIS

FIGURE
10

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: K. DAVIS, R. ALLEN, P. LISTER PM/TM: R. ANDRESEN TR: A. PATEL LYR: ON=*;OFF=*REF*
G:\ENV\CAD\SYRACUSE\ACTIVE\00453620\000300016\DWG\45362B02.dwg LAYOUT: 10 SAVED: 6/3/2013 10:39 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 6/3/2013 10:40 AM BY: LISTER, PAUL
XREFS: 45362X02 45362XDL 45362X03 IMAGES: PROJECTNAME: ---

DB–2 OUTFALL

EXCAVATION AREA C (2001)

EXCAVATION AREA D (2001)

EXCAVATION AREA B (2001)

DRAINAGE DITCH (WILLOW CREEK)

EXCAVATION AREA A (2001)

SOUTHWEST LOWER YARD EXCAVATION (2003)

DETENTION BASIN NO. 1 EXCAVATION (2003)

DETENTION BASIN NO. 2

DETENTION BASIN NO. 1

EDMONDS MARSH

LOWER YARD

WILLOW CREEK

20–MIL POLYETHYLENE SHEETING

STORM DRAIN LINE EXCAVATION (2003)

LOWER UNOCAL ROAD

UPPER UNOCAL ROAD

UPPER YARD
(POINT EDWARDS CONDOMINIUMS)

N 298000.00

E 1257500.00

E 1258500.00

N 297500.00

E 1259000.00

LEGEND:

- 2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
- LOWER YARD PROPERTY BOUNDARY
- 2007/2008 EXCAVATION BOUNDARIES
- S — WSDOT STORM DRAIN LINE
- SD — 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.

0 200’ 400’

GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

BOTTOM OF 2008 GRAVEL BACKFILL ELEVATIONS

ARCADIS

FIGURE 11

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DIV DB: K. DAVIS, R. ALLEN, P. LISTER PM/TM: R. ANDRESEN TR: D. RASAR LYR: ON=*;OFF=*REF*; (FRZ)
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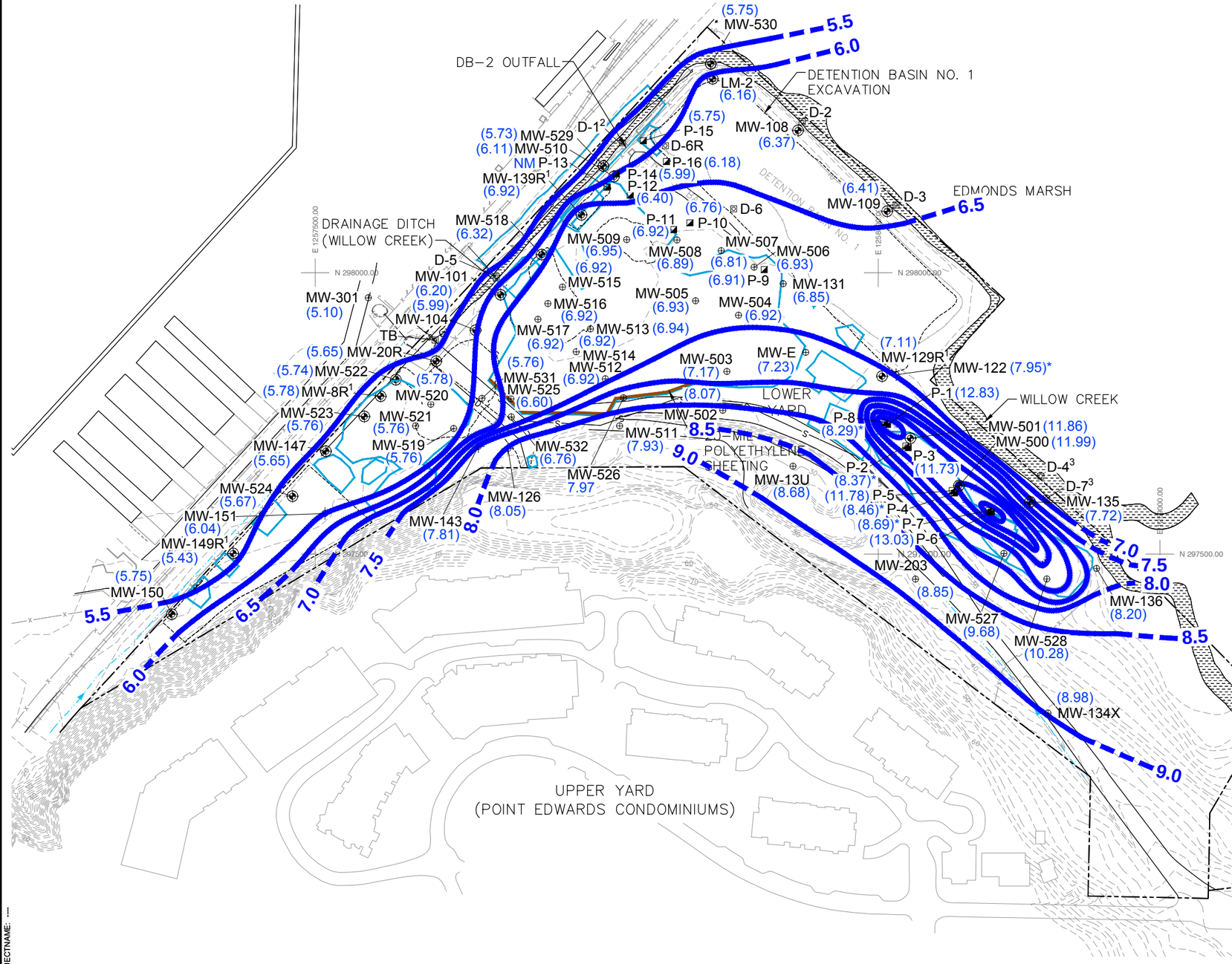

LEGEND:

- MW-203 ⊕ — INTERIOR MONITORING WELL LOCATION AND DESIGNATION
- MW-122 ◖ — DEEP MONITORING WELL LOCATION AND DESIGNATION
- MW-109 ⊕ — SURFACE WATER POINT OF COMPLIANCE MONITORING WELL LOCATION
- P-11 ◪ — PIEZOMETER
- D-1 ⊠ — STAFF GAUGE
- 2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
- LOWER YARD PROPERTY BOUNDARY
- 2007/2008 EXCAVATION BOUNDARIES
- S — WSDOT STORM DRAIN LINE
- SD — POINT EDWARDS STORM DRAIN LINE
- 7.5 — GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
- (7.33) — GROUNDWATER ELEVATION
- (8.97)* — GROUNDWATER ELEVATION NOT USED IN CONTOURING

NOTES:

1. STAFF GAUGE D-1 RE-ESTABLISHED PRIOR TO JUNE 2009 SAMPLING EVENT.
2. STAFF GAUGE D-4 WAS ESTABLISHED PRIOR TO JUNE 2009 SAMPLING EVENT TO REPLACE STAFF GAUGE D-7 WHICH IS NOT WITHIN THE WILLOW CREEK CHANNEL.
3. STAFF GAUGES WERE RESURVEYED BY OTAK INCORPORATED JUNE 1, 2009. STAFF GAUGES WERE SURVEYED FROM TOP OF GAUGE AND WATER LEVELS ARE NOW MEASURED FROM TOP DOWN TO WATER.
4. 20-MIL POLYETHYLENE SHEETING INSTALLED UPON COMPLETION OF PHASE I EXCAVATION. SHEETING REACHES TO APPROXIMATELY 7.5 FEET ABOVE MEAN SEA LEVEL.
5. 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).

0 200' 400'

GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

SECOND QUARTER, 2012 GROUNDWATER ELEVATIONS AND CONTOURS, JUNE 2012

ARCADIS

FIGURE
12

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: K. DAVIS, R. ALLEN, P. LISTER PM/TM: R.ANDRESEN TR: D. RASAR LYR: ON=*OFF=*REF*
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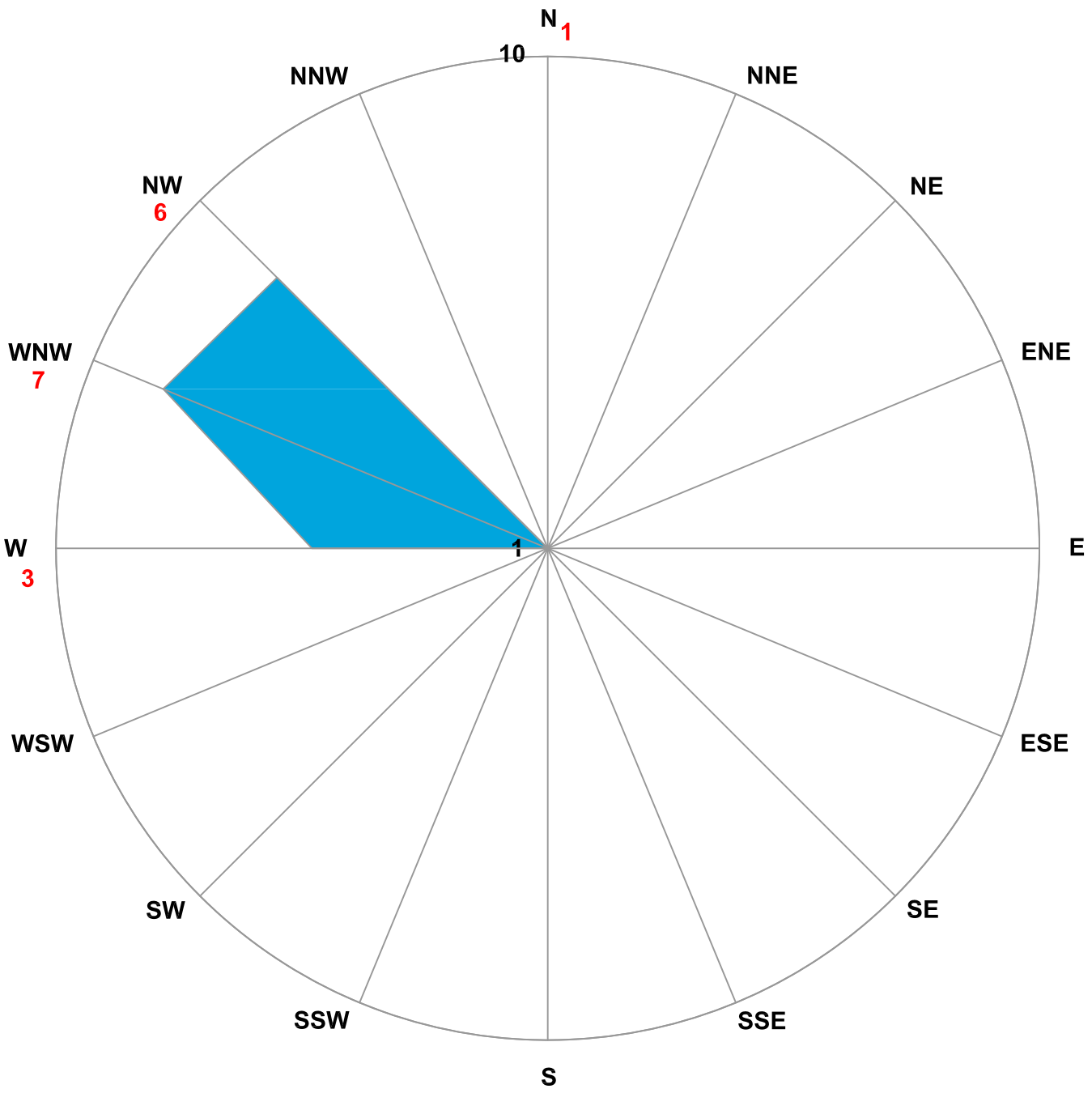


LEGEND:

GROUNDWATER FLOW DIRECTION

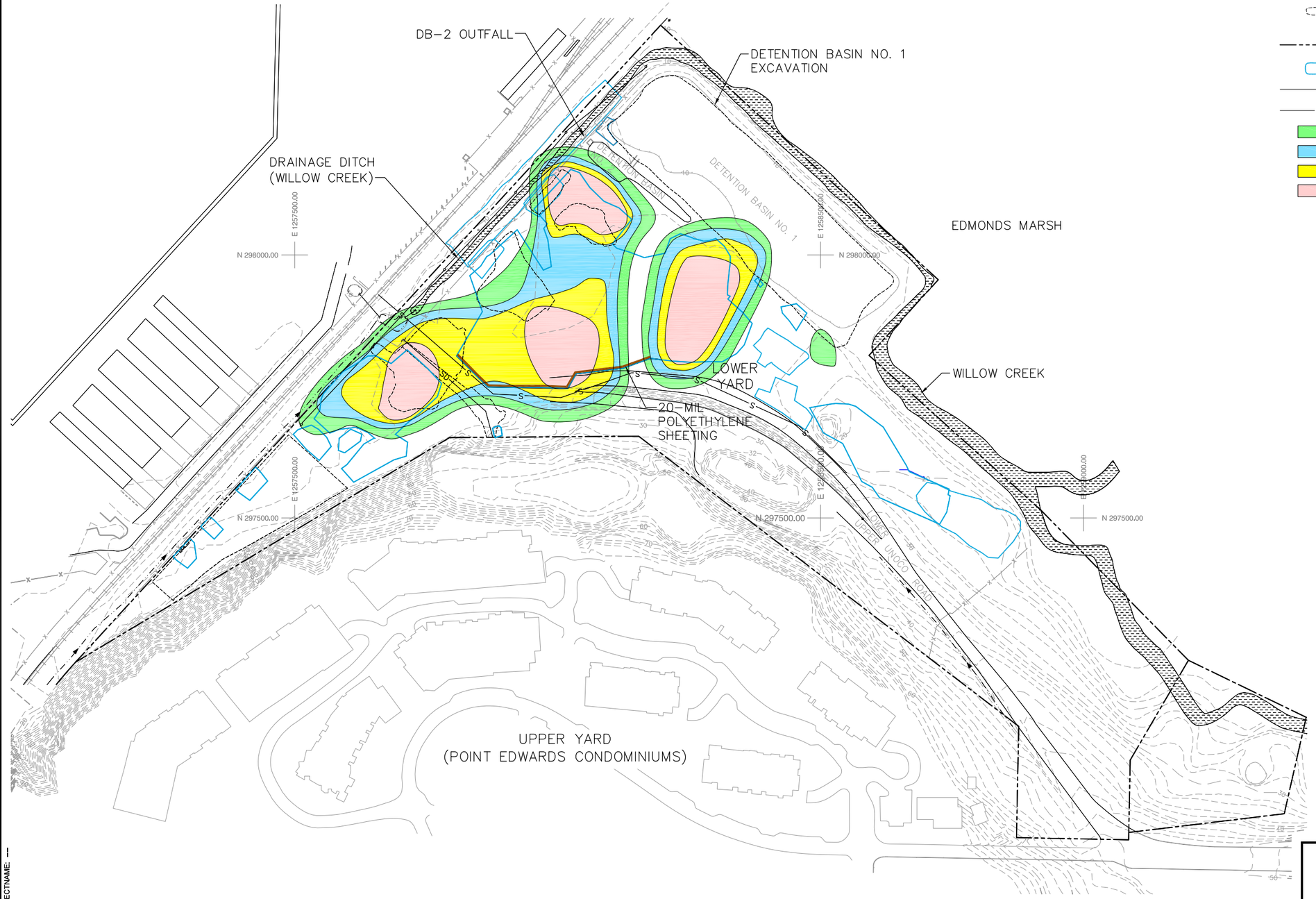
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON

CONCEPTUAL SITE MODEL

LOWER YARD
GROUNDWATER FLOW ROSE DIAGRAM

ARCADIS

FIGURE
13



LEGEND:

- 2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
- LOWER YARD PROPERTY BOUNDARY
- 2007/2008 EXCAVATION BOUNDARIES
- S — WSDOT STORM DRAIN LINE
- SD — POINT EDWARDS STORM DRAIN LINE
- >500 µg/L
- >700 µg/L
- >900 µg/L
- LIGHT NONAQUEOUS PHASE LIQUID (LNAPL)

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).

0 200' 400'

GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON

CONCEPTUAL SITE MODEL

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

ARCADIS

FIGURE 14

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: K. DAVIS, R. ALLEN, P. LISTER PM/TM: R. ANDRESEN TR: D. RASAR LYR: ON=*OFF=*REF*
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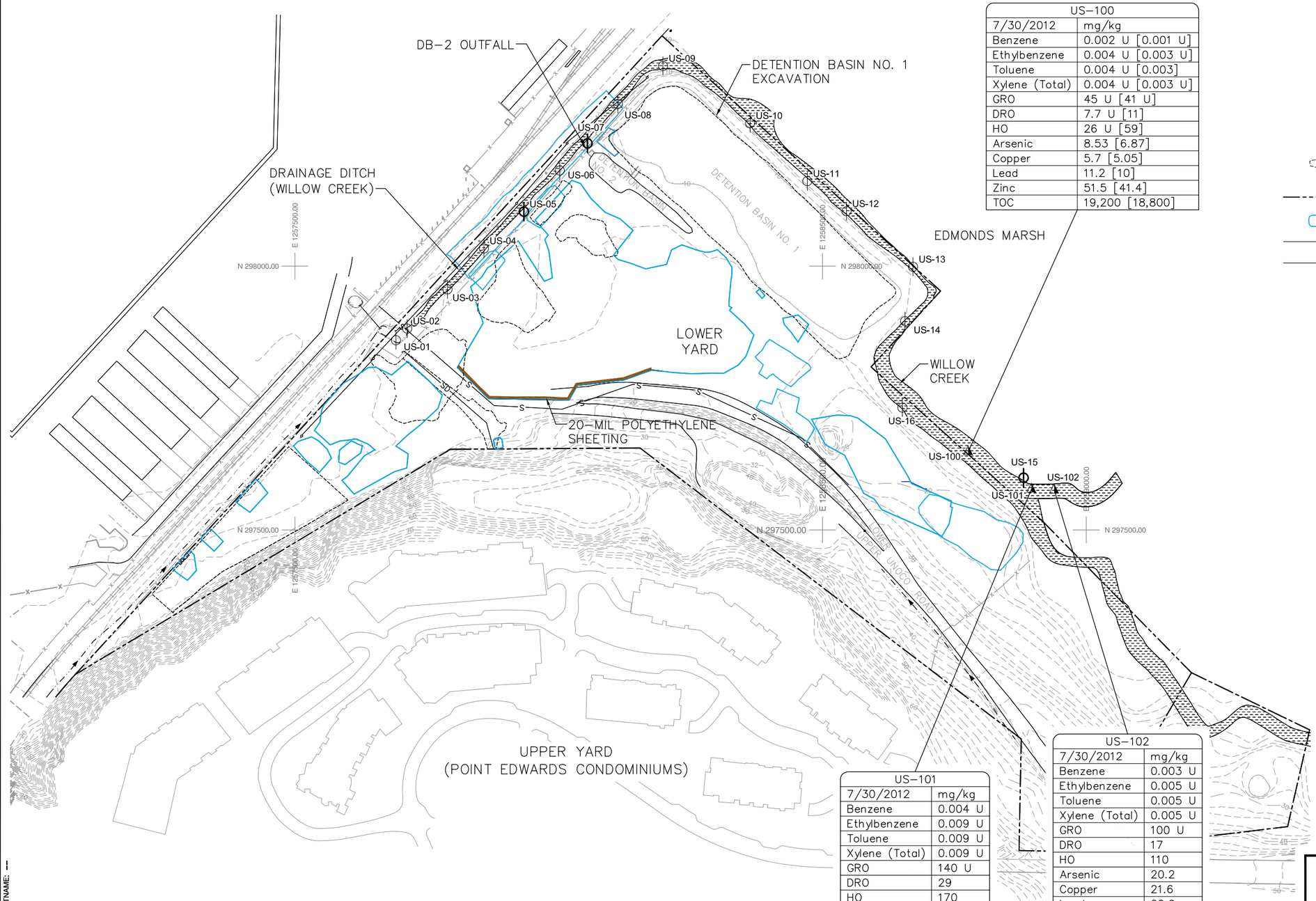
45362X03



US-100	
7/30/2012	mg/kg
Benzene	0.002 U [0.001 U]
Ethylbenzene	0.004 U [0.003 U]
Toluene	0.004 U [0.003]
Xylene (Total)	0.004 U [0.003 U]
GRO	45 U [41 U]
DRO	7.7 U [11]
HO	26 U [59]
Arsenic	8.53 [6.87]
Copper	5.7 [5.05]
Lead	11.2 [10]
Zinc	51.5 [41.4]
TOC	19,200 [18,800]

US-101	
7/30/2012	mg/kg
Benzene	0.004 U
Ethylbenzene	0.009 U
Toluene	0.009 U
Xylene (Total)	0.009 U
GRO	140 U
DRO	29
HO	170
Arsenic	29.1
Copper	43.6
Lead	107
Zinc	319
TOC	64,700

US-102	
7/30/2012	mg/kg
Benzene	0.003 U
Ethylbenzene	0.005 U
Toluene	0.005 U
Xylene (Total)	0.005 U
GRO	100 U
DRO	17
HO	110
Arsenic	20.2
Copper	21.6
Lead	60.6
Zinc	144
TOC	65,200

LEGEND:

- 2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
- LOWER YARD PROPERTY BOUNDARY
- 2007/2008 EXCAVATION BOUNDARIES
- S — WSDOT STORM DRAIN LINE
- SD — POINT EDWARDS STORM DRAIN LINE
- SEDIMENT SAMPLE LOCATIONS (2003)
- SEDIMENT SAMPLE LOCATIONS (2012)
- BOLDED SEDIMENT SAMPLE LOCATIONS INDICATE FAILED BIOASSAY TESTING IN 2003.

GRO = Total petroleum hydrocarbons in the gasoline range
DRO = Total petroleum hydrocarbons in the diesel range
HO = Total petroleum hydrocarbons in the heavy oil range
TOC = Total Organic Carbon
U = Indicates the value was below the Method Detection Limit.
[ ] = Duplicate results are shown in brackets

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).

0 200' 400'
GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

SEDIMENT SAMPLING LOCATIONS AND 2012 ANALYTICAL RESULTS

ARCADIS

FIGURE 15

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: K. DAVIS, R. ALLEN, P. LISTER PM/TM: R. ANDRESEN TR: D. RASAR LYR: ON=*OFF=*REF*
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XREFS: 45362X02 45362XDL 45362X03 IMAGES: PROJECTNAME: ---

MW–525				
Sample Depth	4'	6'	10.5'	12.5'
Sample Date	6/14/2012	6/14/2012	6/18/2012	6/18/2012
Benzene	3.5 W	34 T	0.014 [0.10]	1.7
Toluene	0.19 W	4.9 T	0.012 [0.051]	0.84
Ethylbenzene	0.18 W	220 T	0.013 [0.14]	2.6
Total Xylenes	0.51 W	1,200 T	0.042 [0.42]	9
Total cPAHs	N/A	0.29	NA [NA]	NA
DRO	270	5,700	1,200 [790]	290
GRO	13 UW	12,000	2.8 [43]	380
HO	1,000	300 U	130 U [120 U]	25 U
Total TPH	1,277	17,850	1,268 [893]	683

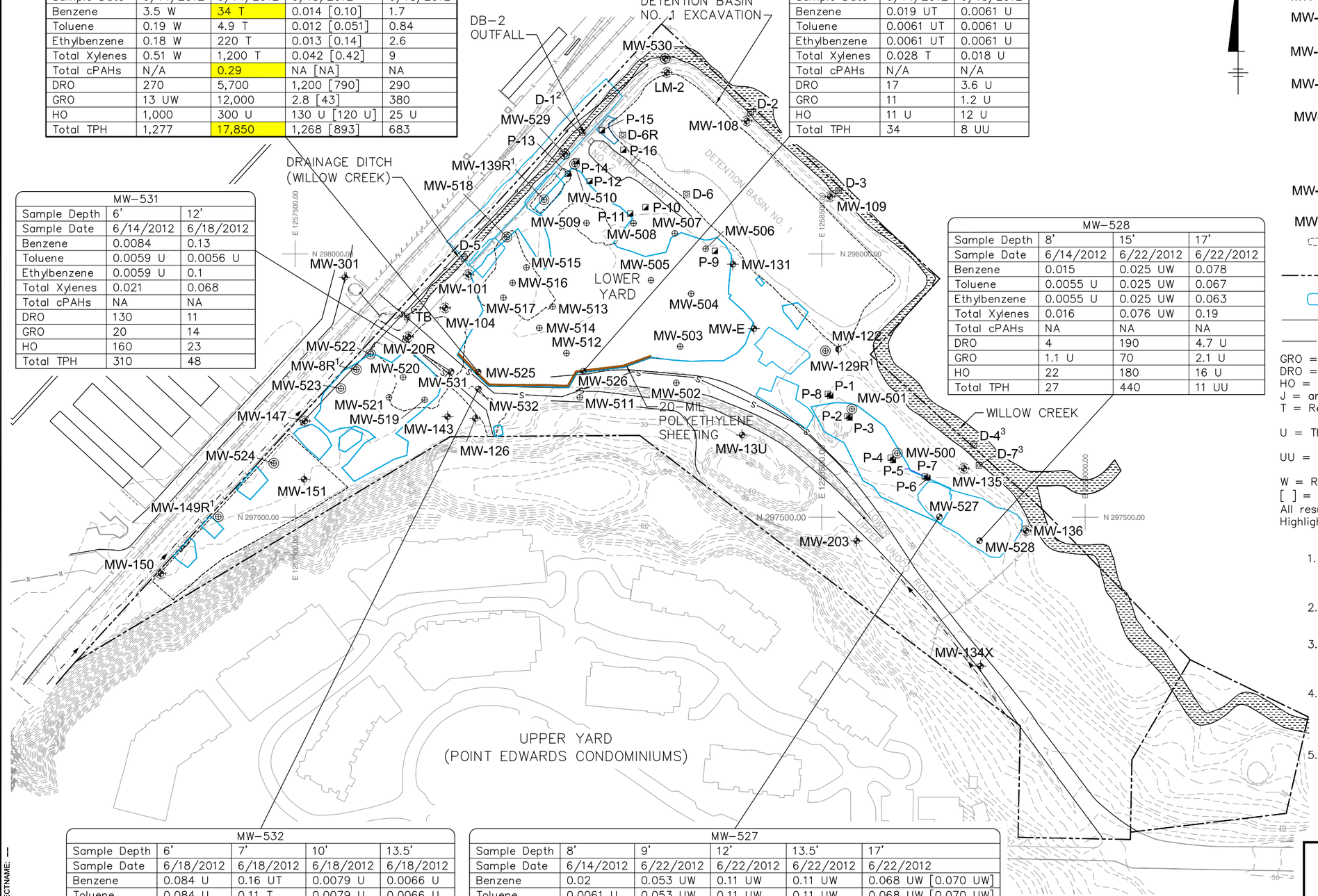
MW–526		
Sample Depth	4'	12.5'
Sample Date	6/14/2012	6/18/2012
Benzene	0.019 UT	0.0061 U
Toluene	0.0061 UT	0.0061 U
Ethylbenzene	0.0061 UT	0.0061 U
Total Xylenes	0.028 T	0.018 U
Total cPAHs	N/A	N/A
DRO	17	3.6 U
GRO	11	1.2 U
HO	11 U	12 U
Total TPH	34	8 UU

MW–531		
Sample Depth	6'	12'
Sample Date	6/14/2012	6/18/2012
Benzene	0.0084	0.13
Toluene	0.0059 U	0.0056 U
Ethylbenzene	0.0059 U	0.1
Total Xylenes	0.021	0.068
Total cPAHs	NA	NA
DRO	130	11
GRO	20	14
HO	160	23
Total TPH	310	48

MW–528			
Sample Depth	8'	15'	17'
Sample Date	6/14/2012	6/22/2012	6/22/2012
Benzene	0.015	0.025 UW	0.078
Toluene	0.0055 U	0.025 UW	0.067
Ethylbenzene	0.0055 U	0.025 UW	0.063
Total Xylenes	0.016	0.076 UW	0.19
Total cPAHs	NA	NA	NA
DRO	4	190	4.7 U
GRO	1.1 U	70	2.1 U
HO	22	180	16 U
Total TPH	27	440	11 UU

MW–532				
Sample Depth	6'	7'	10'	13.5'
Sample Date	6/18/2012	6/18/2012	6/18/2012	6/18/2012
Benzene	0.084 U	0.16 UT	0.0079 U	0.0066 U
Toluene	0.084 U	0.11 T	0.0079 U	0.0066 U
Ethylbenzene	0.084 U	0.026 UT	0.0079 U	0.0066 U
Total Xylenes	0.25 U	0.026 UT	0.024 U	0.02
Total cPAHs	NA	0.04	NA	NA
DRO	800	5,000	4.4 U	760
GRO	17 UW	340	1.6 U	1.3 U
HO	690	5,200	15 U	920
Total TPH	1,499	10,540	11 UU	1,681

MW–527					
Sample Depth	8'	9'	12'	13.5'	17'
Sample Date	6/14/2012	6/22/2012	6/22/2012	6/22/2012	6/22/2012
Benzene	0.02	0.053 UW	0.11 UW	0.11 UW	0.068 UW [0.070 UW]
Toluene	0.0061 U	0.053 UW	0.11 UW	0.11 UW	0.068 UW [0.070 UW]
Ethylbenzene	0.0061 U	0.053 UW	0.11 UW	0.11 UW	0.068 UW [0.070 UW]
Total Xylenes	0.018 U	0.16 UW	0.32 UW	0.32 UW	0.20 UW [0.21 UW]
Total cPAHs	NA	NA	NA	NA	NA [NA]
DRO	170	240	220	990	3.8 U [3.9 U]
GRO	2.4	11 UW	96	21 UW	14 UW [14 UW]
HO	180	390	400	620	13 U [13 U]
Total TPH	352	636	716	1,621	15 UU [15 UU]



LEGEND:

- MW-203 — MONITORING WELL LOCATION AND DESIGNATION
- MW-122 — DEEP MONITORING WELL LOCATION AND DESIGNATION
- MW-109 — EXISTING SURFACE WATER COMPLIANCE MONITORING WELL LOCATION AND DESIGNATION
- MW-518 — SURFACE WATER COMPLIANCE MONITORING WELL LOCATION INSTALLED OCTOBER 2008
- MW-521 — MONITORING WELL LOCATION INSTALLED OCTOBER 2008
- P-11 — PIEZOMETER
- D-1 — STAFF GAUGE
- MW-529 — SURFACE WATER COMPLIANCE MONITORING WELL LOCATION INSTALLED JUNE 2012
- MW-531 — MONITORING WELL LOCATION INSTALLED JUNE 2012
- 2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
- LOWER YARD PROPERTY BOUNDARY
- 2007/2008 EXCAVATION BOUNDARIES
- S — WSDOT STORM DRAIN LINE
- SD — POINT EDWARDS STORM DRAIN LINE

GRO = Total petroleum hydrocarbons in the gasoline range
DRO = Total petroleum hydrocarbons in the diesel range
HO = Total petroleum hydrocarbons in the heavy oil range
J = an estimated value.
T = Reporting limits were raised due to interference from the sample matrix.
U = The compound was analyzed for but not detected. The associated value is the compound quantitation limit.
UU = The constituents making up the total are all Non–detects.
W = Reporting limits were raised due to sample foaming.
[ ] = Duplicate results are shown in brackets
All results are micrograms per kilogram (mg/kg).
Highlighted values exceed remediation or cleanup levels.

NOTES:

1. MONITORING WELLS MW–129R, MW–139R, MW–8R, AND MW–149R WERE ABANDONED DURING INTERIM ACTION AND REPLACED IN OCTOBER 2008.
2. STAFF GAUGE D–1 RE–ESTABLISHED PRIOR TO JUNE 2009 SAMPLING EVENT.
3. STAFF GAUGE D–4 WAS ESTABLISHED PRIOR TO JUNE 2009 SAMPLING EVENT TO REPLACE STAFF GAUGE D–7 WHICH IS NOT WITHIN THE WILLOW CREEK CHANNEL.
4. STAFF GAUGES WERE RESURVEYED BY OTAK INCORPORATED JUNE 1, 2009. STAFF GAUGES WERE SURVEYED FROM TOP OF GAUGE AND WATER LEVELS ARE NOW MEASURED FROM TOP DOWN TO WATER.
5. 20–MIL POLYETHYLENE SHEETING INSTALLED UPON COMPLETION OF PHASE I EXCAVATION. SHEETING REACHES TO APPROXIMATELY 7.5 FEET ABOVE MEAN SEA LEVEL.

0 200' 400'
GRAPHIC SCALE

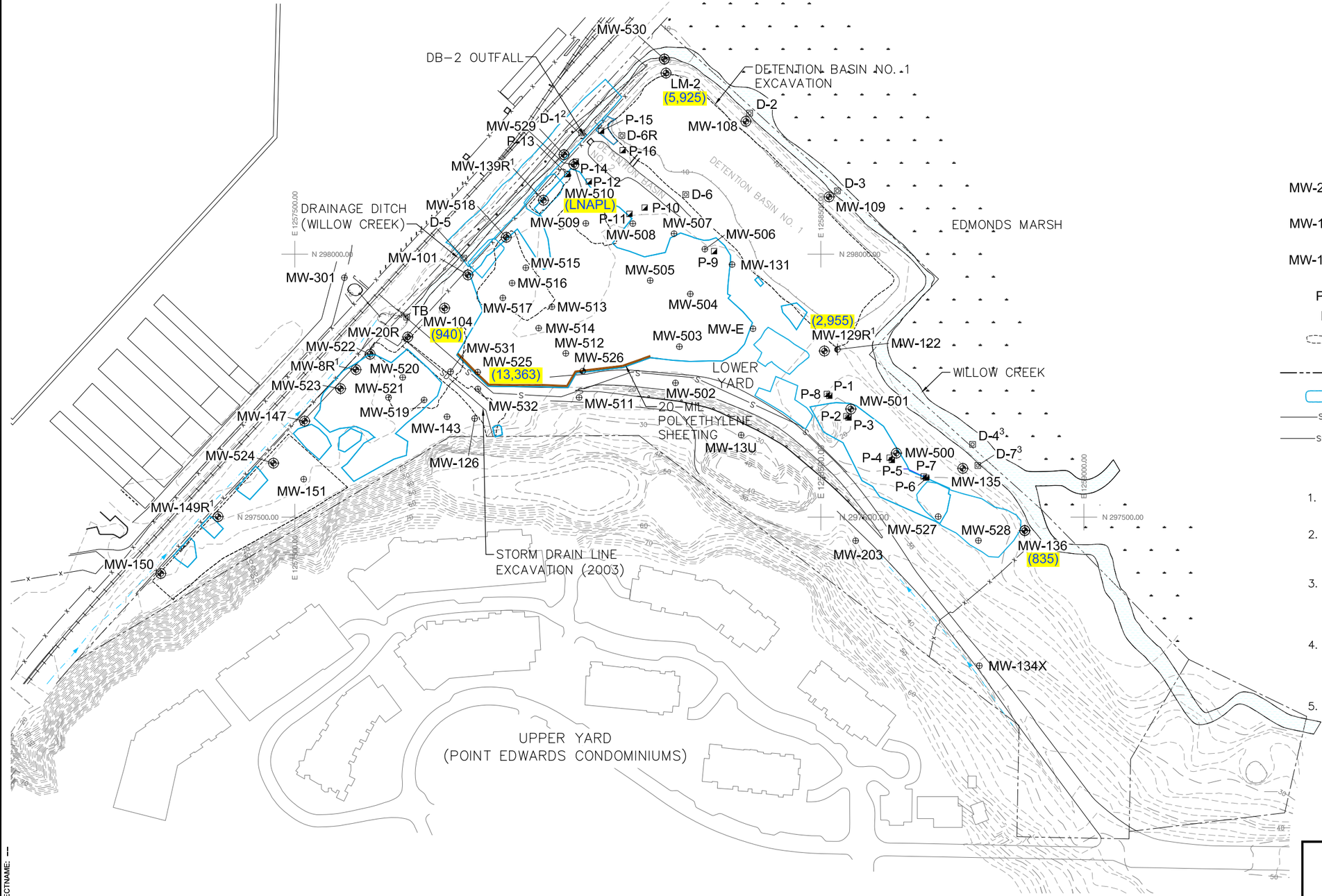
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

SOIL SAMPLE ANALYTICAL DATA - JUNE 2012

ARCADIS

FIGURE 16

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: K. DAVIS, R. ALLEN, P. LISTER PM/TM: R. ANDRESEN TR: D. RASAR LYR: ON=*OFF=*REF*
G:\ENV\CAD\SYRACUSE\ACTIVE\00453620003\00016\DWG\45362C05.dwg LAYOUT: 16 SAVED: 4/8/2013 9:04 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/8/2013 9:05 AM BY: LISTER, PAUL
XREFS: 45362X02 45362XDL 45362X03 IMAGES: PROJECTNAME: ---



LEGEND:

- MW-203 ⊕ INTERIOR MONITORING WELL LOCATION AND DESIGNATION
- MW-122 ⊕ DEEP MONITORING WELL LOCATION AND DESIGNATION
- MW-109 ⊕ SURFACE WATER POINT OF COMPLIANCE MONITORING WELL LOCATION
- P-11 ◪ PIEZOMETER
- D-1 ⊠ STAFF GAUGE
- 2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
- LOWER YARD PROPERTY BOUNDARY
- 2007/2008 EXCAVATION BOUNDARIES
- S — WSDOT STORM DRAIN LINE
- SD — POINT EDWARDS STORM DRAIN LINE

NOTES:

1. STAFF GAUGE D-1 RE-ESTABLISHED PRIOR TO JUNE 2009 SAMPLING EVENT.
2. STAFF GAUGE D-4 WAS ESTABLISHED PRIOR TO JUNE 2009 SAMPLING EVENT TO REPLACE STAFF GAUGE D-7 WHICH IS NOT WITHIN THE WILLOW CREEK CHANNEL.
3. STAFF GAUGES WERE RESURVEYED BY OTAK INCORPORATED JUNE 1, 2009. STAFF GAUGES WERE SURVEYED FROM TOP OF GAUGE AND WATER LEVELS ARE NOW MEASURED FROM TOP DOWN TO WATER.
4. 20-MIL POLYETHYLENE SHEETING INSTALLED UPON COMPLETION OF PHASE I EXCAVATION. SHEETING REACHES TO APPROXIMATELY 7.5 FEET ABOVE MEAN SEA LEVEL.
5. HIGHLIGHTED NUMBERS ARE MAXIMUM CONCENTRATIONS OF TOTAL TPH IN MICROGRAMS PER LITER (ug/L) IN ALL WELLS THAT EXCEEDED GROUNDWATER CULs WITHIN THE PAST FOUR MONITORING EVENTS (SEPTEMBER 2011 TO JUNE 2012).

0 200' 400'

GRAPHIC SCALE

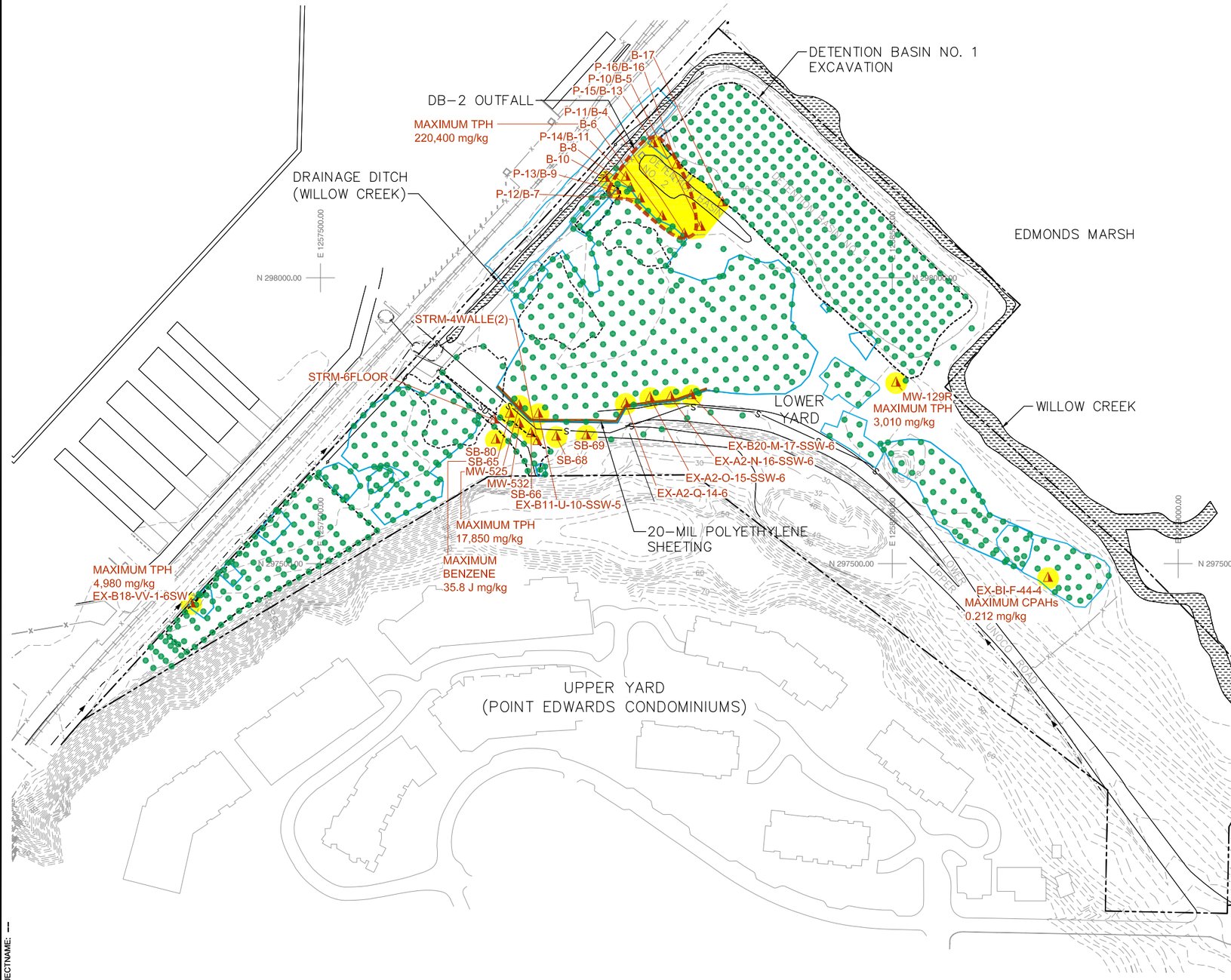
CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

LOWER YARD REMAINING GROUNDWATER IMPACTS MAP

ARCADIS

FIGURE 17

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: R. ALLEN, P. LISTER PM/TM: R. ANDRESEN TR: D. RASAR LYR: ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIVE\00453620000300016\DWG\45362B11.dwg LAYOUT: 17 SAVED: 4/8/2013 9:06 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/8/2013 9:06 AM BY: LISTER, PAUL
XREFS: IMAGES: PROJECTNAME: ---
45362XDL
45362X02
45362X03



LEGEND:

- PIEZOMETERS IN WHICH FREE PRODUCT WAS OBSERVED
- SOIL SAMPLE COLLECTION LOCATION WITH CONCENTRATIONS OF TOTAL TPH AND / OR CPAHs NOT EXCEEDING APPLICABLE SITE CULs AND / OR RELs.
- SOIL SAMPLE COLLECTION LOCATION WITH CONCENTRATIONS OF TOTAL TPH AND/OR CPAHS EXCEEDING APPLICABLE SITE CULs AND/OR RELs.
- AREA WITH REMAINING SOIL IMPACTS EXCEEDING SITE CULs AND/OR RELs
- TPH — TOTAL PETROLEUM HYDROCARBONS
- CPAH — CARCINOGENIC POLYNUCLEAR AROMATIC HYDROCARBONS
- mg/kg — MILLIGRAMS PER KILOGRAM
- J — INDICATES AN ESTIMATED VALUE
- 2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
- LOWER YARD PROPERTY BOUNDARY
- 2007/2008 EXCAVATION BOUNDARIES
- S — WSDOT STORM DRAIN LINE
- SD — 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. FOR ANALYTICAL DATA FOR SAMPLE LOCATIONS SHOWN IN RED, REFER TO FIGURE 18a.

0 200’ 400’

GRAPHIC SCALE

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

LOWER YARD REMAINING SOIL IMPACTS MAP

ARCADIS

FIGURE 18

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DIV DB: K. DAVIS, R. ALLEN, P. LISTER PM/TM: R. ANDRESEN TR: A. PATEL LYR: ON=*;OFF=*REF*
G:\ENV\CAD\SYRACUSE\ACTIVE\00453621000316\DWG\45362B13.dwg LAYOUT: 18 SAVED: 6/3/2013 10:59 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---
XREFS: PROJECTNAME: ---
IMAGES:
45362X02
45362XDL
45362X03

Sample ID	Sample Depth (feet bgs)	Date Sampled	Benzene (mg/kg)	Total cPAHs Adjusted for Toxicity (mg/kg)	Total TPH (mg/kg)
WSDOT Stormwater Line					
EX-A2-N-16-SSW-6	6	02/20/08	0.0382 U	0.0868	**7,550 J**
EX-A2-O-15-SSW-6	6	02/20/08	1.69	0.0308	**7,540 J**
EX-A2-Q-14-6	6	02/20/08	0.169 J	0.0241	**3,060 J**
EX-B11-U-10-SSW-5	5	02/12/08	14.9	**0.159**	1,810
EX-B20-M-17-SSW-6	6	01/28/08	0.577	**0.166**	**15,700 J**
MW-525-4	4	06/14/12	3.5 W	N/A	1,277
MW-525-6	6	06/14/12	**34 T**	**0.29**	**17,850**
MW-525-10.5	10.5	06/18/12	0.014 [0.10]	N/A [NA]	1,268 [893]
MW-525-12.5	12.5	06/18/12	1.7	N/A	683
MW-532-6	6	06/18/12	0.084 U	N/A	1,499
MW-532-7	7	06/18/12	0.16 U T	0.04	**10,540**
MW-532-10	10	06/18/12	0.0079 U	N/A	11 UU
MW-532-13.5	13.5	06/18/12	0.0066 U	N/A	1,681
SB-65-6.5	6.5	06/26/08	**35.8 J**	**1.01**	**16,900 J**
SB-65-8.0	8	06/26/08	14.5	0.0928	**4,390**
SB-65-16.0	16	06/26/08	0.0588	0.00883 UU	225
SB-65-20	20	06/26/08	0.259	0.0161	210
SB-65-23	23	06/26/08	0.275	0.0158	161
SB-66-6.0	6	06/26/08	0.0746	**0.209**	**11,900 J**
SB-66-11.5	11.5	06/30/08	0.0381 U	0.00914 UU	33.4
SB-66-15	15	06/30/08	0.0331 U	NA	23.1 UU
SB-68-4.0	4	06/24/08	0.334 U	**0.165**	**5,470**
SB-68-5.5	5.5	06/24/08	0.350 U	0.101	**4,660**
SB-68-13.5	13.5	06/25/08	0.0367 U	0.00898 UU	100
SB-68-15.0	15	06/25/08	0.0364 U	NA	24.1 UU
SB-69-6.0	6	06/26/08	0.149 J	**0.236 UU**	**3,720**
SB-69-12.0	12	06/26/08	0.0385 U	NA	24.0 UU
SB-69-15.0	15	06/26/08	0.0393 U [0.0384 U]	NA [NA]	24.1 UU [32.6]

Sample ID	Sample Depth (feet bgs)	Date Sampled	Benzene (mg/kg)	Total cPAHs Adjusted for Toxicity (mg/kg)	Total TPH (mg/kg)
Detention Basin No.2 Area					
B6-4.5-5	4.5-5	08/22/11	0.021 U W	0.09	970
B6-7-7.5	7-7.5	08/22/11	0.55 U	**0.36**	**21,620**
B6-9-9.5	9-9.5	08/22/11	0.97	**3.2 T**	**220,400**
B6-11-11.5	11-11.5	08/22/11	0.023 U W	0.012	317
B6-13-13.5	13-13.5	08/22/11	0.0028 U	N/A	8 UU
B8-4.5-5	4.5-5	08/23/11	0.24 U T	0.114	**16,500**
B8-7.5-8	7.5-8	08/23/11	0.0029	0.077	**9,360**
B8-9.5-10	9.5-10	08/23/11	3.2	**0.5 T**	**75,730**
B8-11-11.5	11-11.5	08/23/11	0.51 W	0.09	**8,200**
B8-13.5-14	13.5-14	08/23/11	0.0073	**0.1**	55
B8-14.5-15	14.5-15	08/23/11	0.0056	N/A	8 UU
B10-0.5-1	0.5-1	08/25/11	0.030 U W	**0.2**	758
B10-1.5-2	1.5-2	08/25/11	0.046 U W	0.018	86
B10-2.5-3	2.5-3	08/25/11	0.030 U W	0.00068	37
B10-3.5-4	3.5-4	08/25/11	0.0037 U V	0.00072	57
B17-3.5-4	3.5-4	08/24/11	0.025 U W	0.00109	1,756
B17-4.5-5	4.5-5	08/24/11	[illegible] [0.0066]	**[illegible] [0.0008 UU]**	**[illegible] [22,201]**
B17-5.5-6	5.5-6	08/24/11	0.033 U W	N/A	18 UU
P-10/B5-4.5-5	4.5-5	08/22/11	0.0022 U	N/A	8 UU
P-10/B5-9-9.5	9-9.5	08/22/11	0.083 U W	0.0138	**27,021**
P-10/B5-11.5-12	11.5-12	08/22/11	0.0023 U	N/A	9 UU
P-10/B5-13.5-14	13.5-14	08/22/11	0.0024 U	N/A	8 UU
P-11/B4-4.5-5	4.5-5	08/22/11	0.0020 U	0.00053 UU	187
P-11/B4-9.5-10	9.5-10	08/22/11	0.024 W	0.0075	**4,413**
P-11/B4-13-13.5	13-13.5	08/22/11	0.010	0.0006	12
P-11/B4-14.5-15	14.5-15	08/22/11	0.021 U W	N/A	13 UU
P-12/B7-4.5-5	4.5-5	08/22/11	0.083 U W	0.071	700
P-12/B7-8-8.5	8-8.5	08/22/11	1.5 U W	**2.8 T**	**111,400**
P-12/B7-9.5-10	9.5-10	08/22/11	0.030 U W	0.037 T	**5947**
P-12/B7-14-14.5	14-14.5	08/22/11	0.0021 U	N/A	8 UU

Sample ID	Sample Depth (feet bgs)	Date Sampled	Benzene (mg/kg)	Total cPAHs Adjusted for Toxicity (mg/kg)	Total TPH (mg/kg)
Detention Basin No.2 Area					
P-13/B9-4.5-5	4.5-5	08/23/11	0.0022 U	N/A	29
P-13/B9-8.5-9	8.5-9	08/23/11	0.023 U W	**0.29**	**20,970**
P-13/B9-9.5-10	9.5-10	08/23/11	0.0025 U	0.0024	30
P-13/B9-10.5-11	10.5-11	08/23/11	0.0030 U	0.025	921
P-13/B9-11-11.5	11-11.5	08/23/11	1.1 W	**0.15 T**	**16,250**
P-13/B9-12.5-13	12.5-13	08/23/11	0.0026 U V	0.00065	15
P-14/B11-4.5-5	4.5-5	08/25/11	0.0027 U	0.24	1,011
P-14/B11-7.5-8	7.5-8	08/25/11	0.25 U W	0.012	**35,240**
P-14/B11-8.5-9	8.5-9	08/25/11	0.15 U W	0.012	53
P-14/B11-9.5-10	9.5-10	08/25/11	0.0034	1.6 T	12
P-14/B11-10-10.5	10-10.5	08/25/11	0.1 U W	3.4	**37,150**
P-14/B11-11-11.5	11-11.5	08/25/11	0.0042 U V	0.01	461
P-14/B11-13.5-14	13.5-14	08/25/11	0.002 U	N/A	8 UU
P-15/B13-4.5-5	4.5-5	08/23/11	0.025 U W	0.0046	81
P-15/B13-6-6.5	6-6.5	08/23/11	0.031 U W	0.036	368
P-15/B13-7-7.5	7-7.5	08/23/11	0.16 U W	0.054 R	**15,900**
P-15/B13-9-9.5	9-9.5	08/23/11	0.018	N/A	9 UU
P-15/B13-10-10.5	10-10.5	08/23/11	0.071 U W	0.026	2,150
P-15/B13-11.5-12	11.5-12	08/23/11	0.0056	N/A	9 UU
P-16/B16-3.5-4	3.5-4	08/24/11	0.023 U W	0.018	386
P-16/B16-4.5-5	4.5-5	08/24/11	[illegible] [0.27 U W]	**[illegible] [0.1]**	[illegible] [1,290]
P-16/B16-6-6.5	6-6.5	08/24/11	0.0031 U	N/A	9 UU
Monitoring Well MW-129R					
MW-129R-4.5	4.5	10/14/08	0.0303 U	0.0439	1,030 J
MW-129R-7.0	7	10/14/08	0.0446 U	0.0479 UU	**3,010**
Southwest Lower Yard					
EX-B18-VV-1-6SW	6	08/17/07	1.56 U	0.0457	**4,980 J**
Southeast Lower Yard					
EX-B1-F-44-4	4	08/18/08	0.0298 U	**0.212**	121
Point Edwards Stormdrain Line					
SB-80-7.5	7.5	06/26/08	0.0392 U	**0.693**	**4,660 J**
SB-80-11.0	11	06/26/08	0.0518 U	NA	28.1 UU

KEY:

TPH Total Petroleum Hydrocarbon
CPAHS Carcinogenic Polynuclear Aromatic Hydrocarbons
CULs Cleanup Levels
RELs Remediation Levels
J Indicates an estimated value.
JY Results in the diesel organics range are primarily due to overlap from a heavy oil range product.
JZ Detected hydrocarbons in the gasoline range appear to be due to overlap of diesel range hydrocarbons.
U The compound was analyzed for but not detected. The associated value is the compound quantitation limit.
UU The constituents making up the total are all non-detects.
R The GC/MS semivolatile internal standard peak areas were outside of the QC limits for both the initial injection and the re-injection. The values here are from the initial injection of the sample.
T Reporting limits were raised due to interference from the sample matrix.
V The recovery for the sample surrogate is outside the QC acceptance limits as noted on the QC Summary. A reanalysis was not performed to confirm a matrix effect.
W Reporting limits were raised due to sample foaming.
[ ] Brackets indicate duplicate sample.

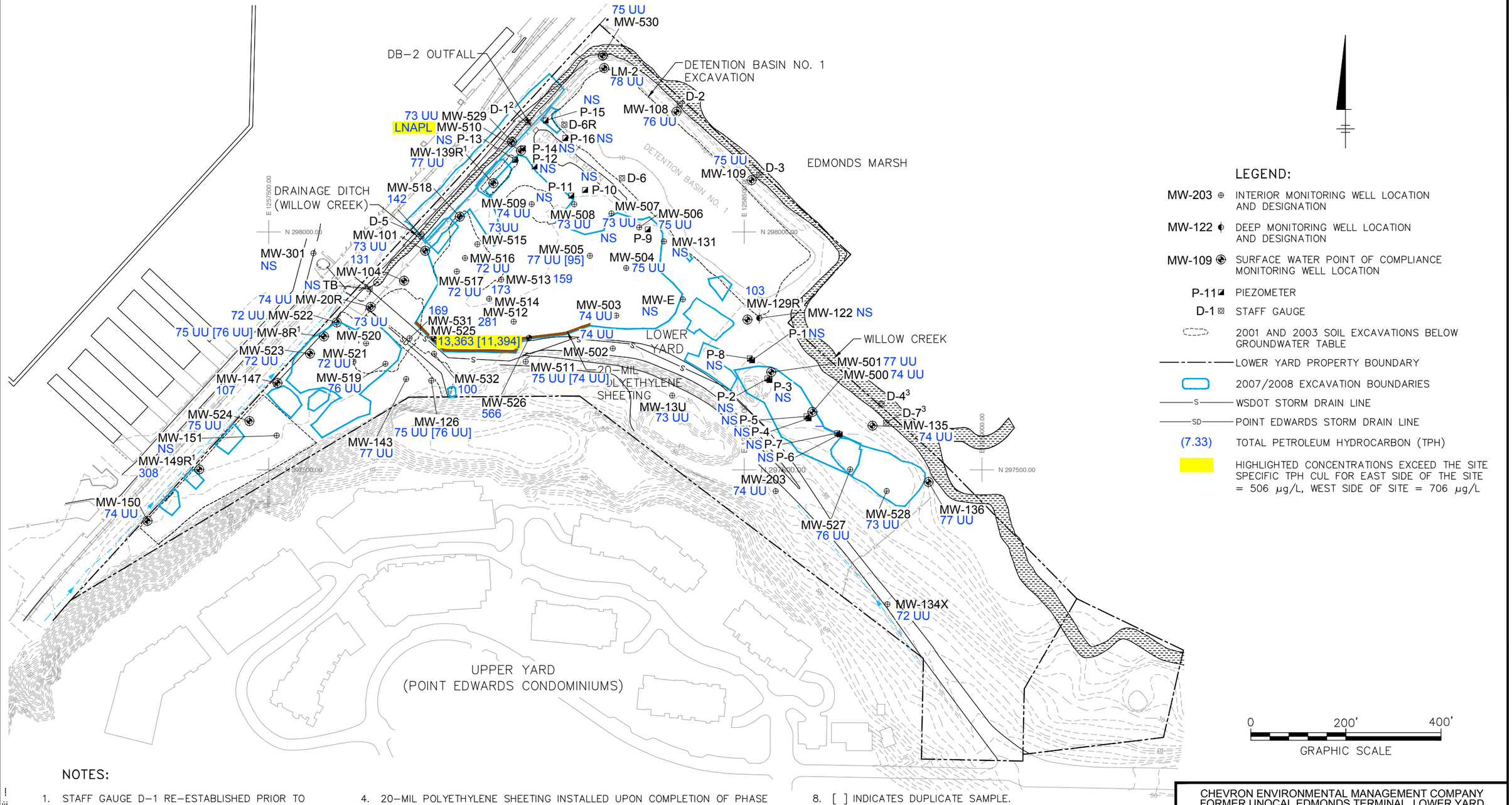
NOTE: HIGHLIGHTED CELLS INDICATE CONCENTRATIONS EXCEEDING TOTAL TPH OR CPAHs RELs/CULs.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

REMAINING IMPACTS SOIL ANALYTICAL DATA

ARCADIS

FIGURE
18a



LEGEND:

MW-203 ⊕	INTERIOR MONITORING WELL LOCATION AND DESIGNATION
MW-122 ◐	DEEP MONITORING WELL LOCATION AND DESIGNATION
MW-109 ⊕	SURFACE WATER POINT OF COMPLIANCE MONITORING WELL LOCATION
P-11 ◪	PIEZOMETER
D-1 ⊠	STAFF GAUGE
	2001 AND 2003 SOIL EXCAVATIONS BELOW GROUNDWATER TABLE
	LOWER YARD PROPERTY BOUNDARY
	2007/2008 EXCAVATION BOUNDARIES
S	WSDOT STORM DRAIN LINE
SD	POINT EDWARDS STORM DRAIN LINE
(7.33)	TOTAL PETROLEUM HYDROCARBON (TPH)
	HIGHLIGHTED CONCENTRATIONS EXCEED THE SITE SPECIFIC TPH CUL FOR EAST SIDE OF THE SITE = 506 µg/L, WEST SIDE OF SITE = 706 µg/L

0 200' 400'

GRAPHIC SCALE

NOTES:

1. STAFF GAUGE D–1 RE–ESTABLISHED PRIOR TO JUNE 2009 SAMPLING EVENT.
2. STAFF GAUGE D–4 WAS ESTABLISHED PRIOR TO JUNE 2009 SAMPLING EVENT TO REPLACE STAFF GAUGE D–7 WHICH IS NOT WITHIN THE WILLOW CREEK CHANNEL.
3. STAFF GAUGES WERE RESURVEYED BY OTAK INCORPORATED JUNE 1, 2009. STAFF GAUGES WERE SURVEYED FROM TOP OF GAUGE AND WATER LEVELS ARE NOW MEASURED FROM TOP DOWN TO WATER.
4. 20–MIL POLYETHYLENE SHEETING INSTALLED UPON COMPLETION OF PHASE I EXCAVATION. SHEETING REACHES TO APPROXIMATELY 7.5 FEET ABOVE MEAN SEA LEVEL.
5. TPH = TOTAL PETROLEUM HYDROCARBONS. TOTAL TPH CALCULATED BY SUMMING THE CONCENTRATIONS OF GASOLINE, DIESEL, AND HEAVY OIL. FOR RESULTS WHICH DID NOT EXCEED METHOD REPORTING LIMITS, HALF OF THE REPORTING LIMIT WAS ADDED TO DETERMINE TOTAL TPH.
6. ALL CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L).
7. UU = THE CONSTITUENTS MAKING UP THE TOTAL ARE ALL NON–DETECTS.
8. [ ] INDICATES DUPLICATE SAMPLE.
9. LNAPL = LIGHT NON–AQUEOUS PHASE LIQUIDS.
10. NS = NOT SAMPLED.

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON

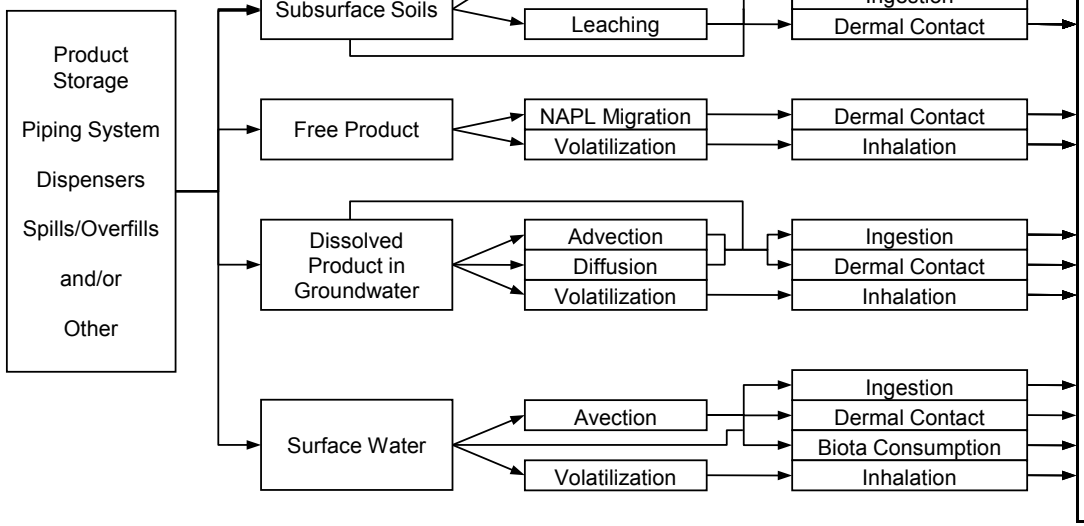
CONCEPTUAL SITE MODEL

GROUNDWATER ANALYTICAL RESULTS MAP - JUNE 2012

ARCADIS

FIGURE 19

CITY: SYRACUSE, NY DIV/GROUP: ENV/IM-DV DB: K. DAVIS, R. ALLEN, P. LISTER PM/TM: R.ANDRESEN TR: D. RASAR LYR: ON=*OFF=*REF*
G:\ENVCAD\SYRACUSE\ACTIVE\045362\00030016\DWG\45362C18.dwg LAYOUT: 19 SAVED: 4/8/2013 9:09 AM ACADVER: 18.1S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 4/8/2013 9:09 AM BY: LISTER, PAUL
XREFS: 45362X02 45362XDL 45362X03 IMAGES: PROJECTNAME: ---



POTENTIAL RECEPTORS						
Residential	Commercial	Trespassers		Construction & Excavation	Aquatic Biota	
Future	Future	Current	Future	Future	Current	Future
-	-	-	-	P	-	-
P	P	-	-	P	-	-
P	P	-	-	P	-	-
-	-	-	-	P	-	-
-	-	-	-	P	-	-
-	-	-	-	P	-	-
-	-	-	-	P	-	-
U	P	-	-	P	-	-
U	U	U	U	-	P	P
U	U	U	U	-	P	P
-	-	-	-	-	-	-
-	-	-	-	-	-	-

Notes:

- = There is no exposure by this route
U = Unlikey source of exposure
P = This route is a potential source of exposure

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
FORMER UNOCAL EDMONDS TERMINAL, LOWER YARD
EDMONDS, WASHINGTON
CONCEPTUAL SITE MODEL

CONCEPTUAL SITE MODEL
HUMAN EXPOSURE PATHWAYS

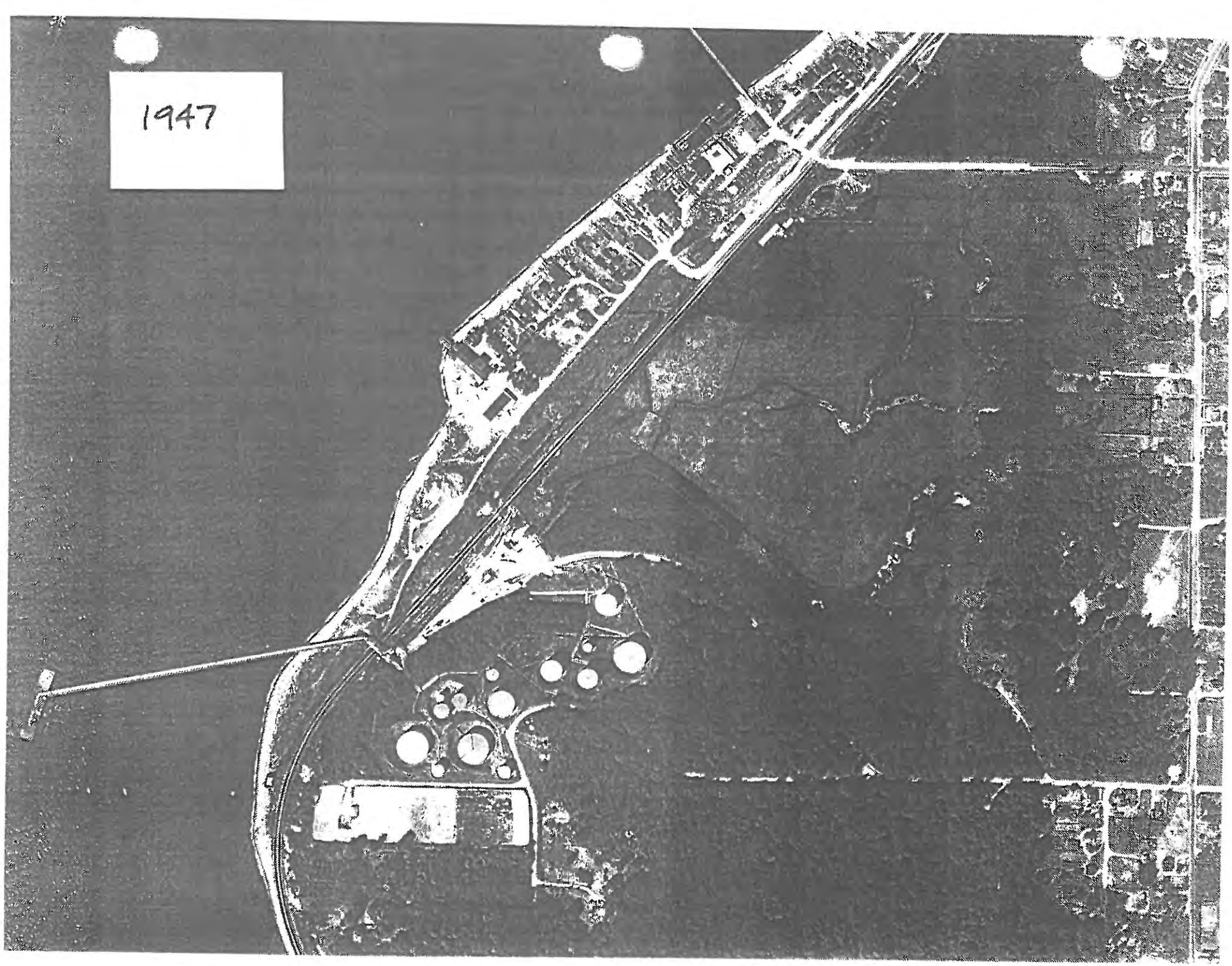
ARCADIS

FIGURE
20

ARCADIS

Appendix A

Historical Aerial Photographs,
1947 to 1967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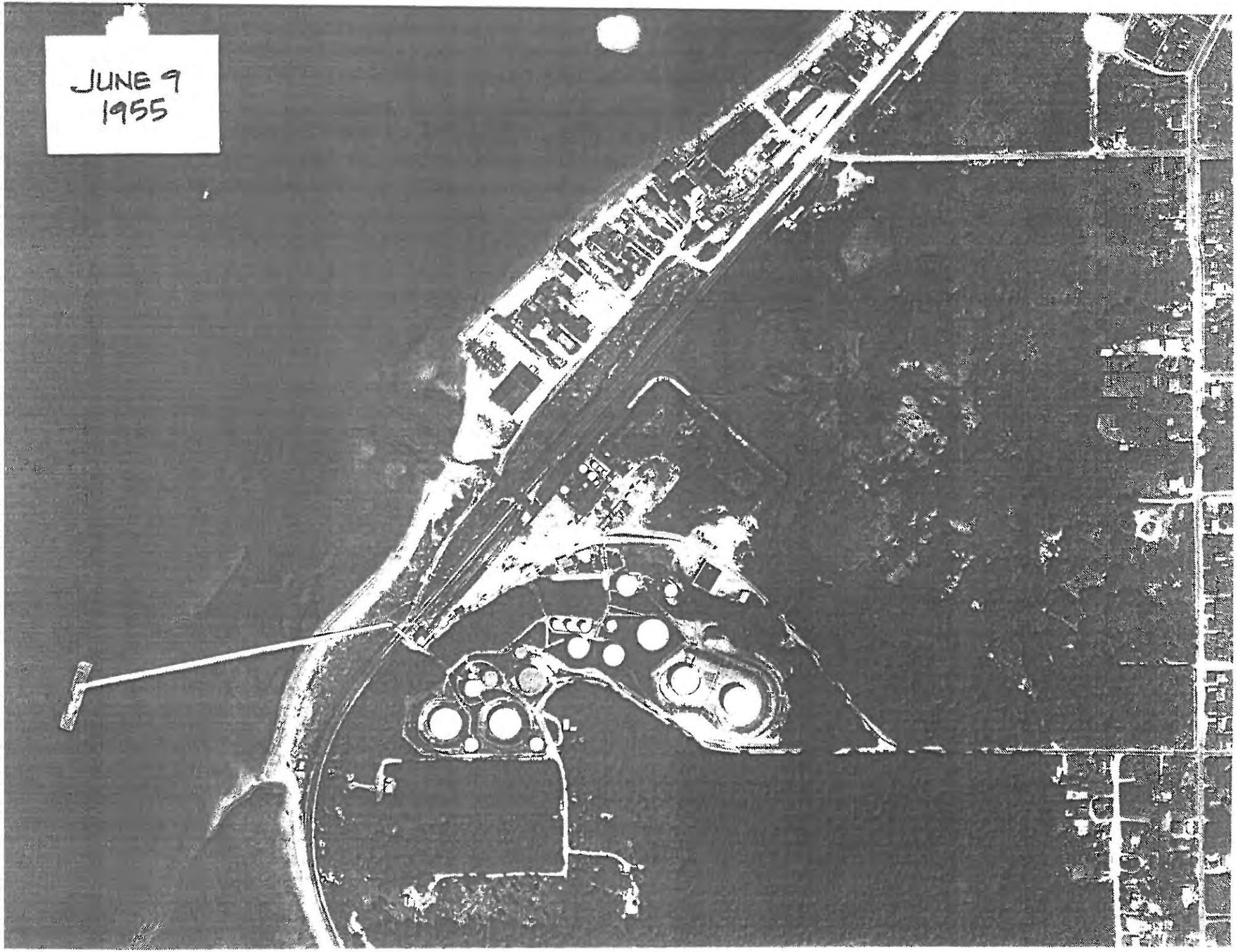
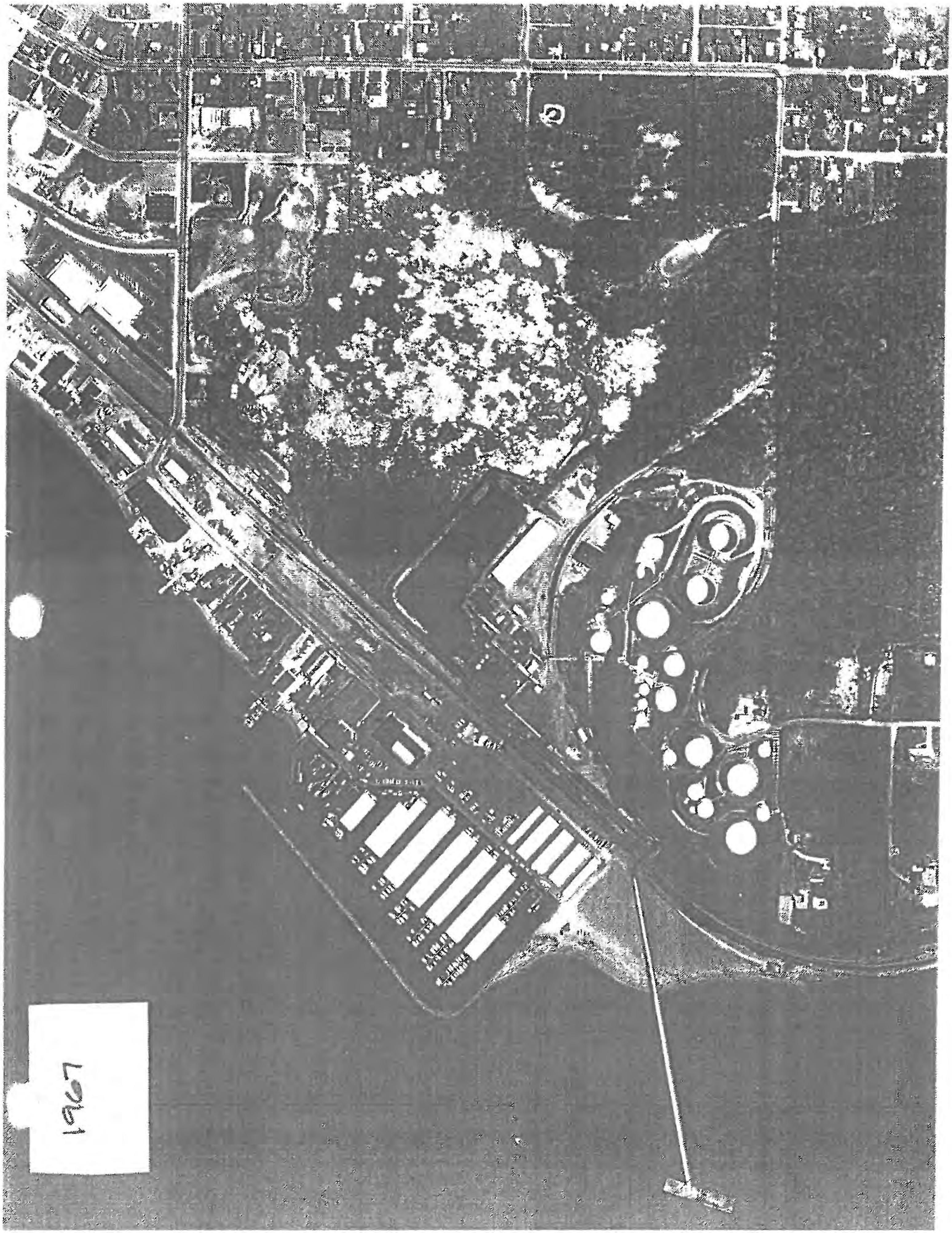

JUNE 9
1955


6-29-65
JUNE 29
1965
K-SN-65-176 41


1967

ARCADIS

Appendix B

Boring Logs – June 2012

Date Start/Finish: 06/18/2012
Drilling Company: Cascade Drilling, L.P.
Driller's Name: Curtis
Drilling Method: Hollow-stem Auger
Auger Size: 8"
Rig Type:
Sampling Method: Split Spoon Sampler

Northing:
Easting:
Casing Elevation: NE

Borehole Depth: 13 feet
Surface Elevation:

Descriptions By: Dave Rasar

Well/Boring ID: MW-525

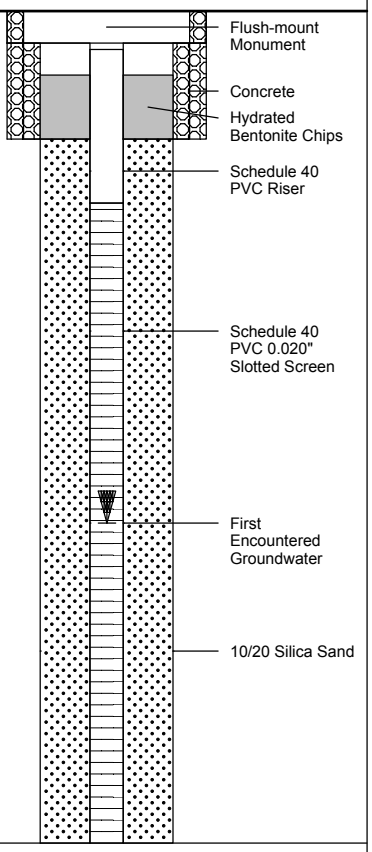
Client: Chevron EMC

Location: Former Unocal Edmonds Bulk Fuel Terminal

DRAFT

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description
0	0	AK					0.0		SM		Silty SAND with gravel, medium to coarse grain, silt non-plastic, gravel fine to medium grain, brown, moist. (Fill).
											2-inch layer of gravel backfill and plastic sheeting.
		AK					103	X	SM		Silty SAND with gravel, gray, moist, slight HCLO, no LNAPL.
5	-5	AK					257	X	SM		Same as above. Damp, large amount of organics (grass). Slight HCLO, no LNAPL.
									SM		Same as above. Wet, slight HCLO, no LNAPL.
		1	8'-9.5'	1.5	4 4 5	9	260 202		SP		SAND with trace silt, poorly graded, fine to medium grain, gray, wet, slight HCLO, no LNAPL, small amount of sheen on water. Wood at 9 feet, no staining.
10	-10	2	9.5'-11'	1.5	4 5 6	11	4.0	X	SP		Same as above.
		3	11'-12.5'	1.5	5 5 9	14	60.7	X	SP		Same as above. Slight sheen on water.
											End of Boring at 13' bgs.

Well/Boring Construction



Remarks: AK = Air Knife
bgs = Below Ground Surface
HCLO = Hydrocarbon-like Odor
LNAPL = Light Non-aqueous Phase Liquid
ppm = Parts Per Million
PVC = Polyvinyl Chloride

ARCADIS
Infrastructure · Water · Environment · Buildings

Project Number:B0045362
Data File:

Date: 8/10/2012 Created/Edited by:KDH

Date Start/Finish: 06/18/2012
Drilling Company: Cascade Drilling, L.P.
Driller's Name: Curtis
Drilling Method: Hollow-stem Auger
Auger Size: 8"
Rig Type:
Sampling Method: Split Spoon Sampler

Northing:
Easting:
Casing Elevation: NE

Borehole Depth: 13 feet
Surface Elevation:

Descriptions By: Dave Rasar

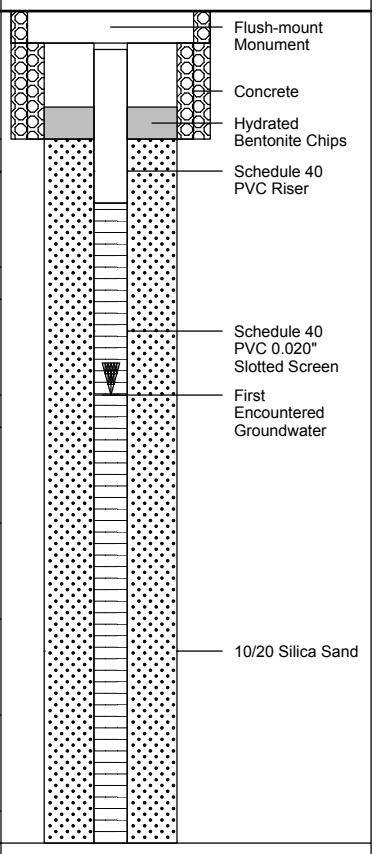
Well/Boring ID: MW-526

Client: Chevron EMC

Location: Former Unocal Edmonds Bulk Fuel Terminal

DRAFT

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description
0	0	AK					65		SP		SAND with trace silt, poorly graded, fine to medium grain, brown and gray, damp, no LNAPL.
		AK					107	X	SP		Same as above. No LNAPL.
5	-5	AK					20.5		SP		Same as above. No LNAPL, encountered water.
		1	8'-9.5'	1.5	15 18 30	48	0.7		SP		SAND, poorly graded, brown, no LNAPL, no HCLO.
10	-10	2	9.5'-11'	1.5	14 18 20	38	7.2		SP		Same as above.
		3	11'-12.5'	1.5	15 15 20	35	0.8	X	SP		Same as above.
											End of Boring at 13' bgs.



ARCADIS
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Remarks: AK = Air Knife
bgs = Below Ground Surface
HCLO = Hydrocarbon-like Odor
LNAPL = Light Non-aqueous Phase Liquid
ppm = Parts Per Million
PVC = Polyvinyl Chloride

Project Number:B0045362
Data File:

Date: 8/10/2012 Created/Edited by:KDH

Date Start/Finish: 06/22/2012
Drilling Company: Cascade Drilling, L.P.
Driller's Name: Curtis
Drilling Method: Hollow-stem Auger
Auger Size: 8"
Rig Type:
Sampling Method: Split Spoon Sampler

Northing:
Easting:
Casing Elevation: NE

Borehole Depth: 17.5 feet
Surface Elevation:

Descriptions By: Dave Rasar

Well/Boring ID: MW-527

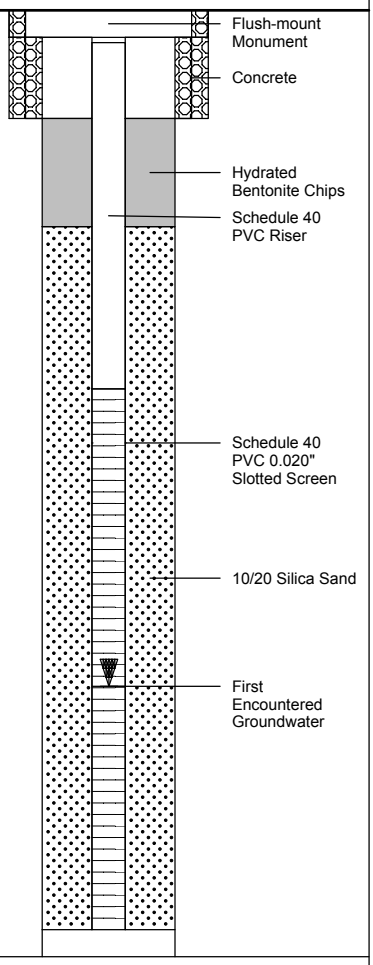
Client: Chevron EMC

Location: Former Unocal Edmonds Bulk Fuel Terminal

DRAFT

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description
0	0	AK					0.0		SM		Silty SAND with gravel, fine to medium grain, low plasticity, brown, moist. (Fill).
		AK					0.0		SM		Same as above. (Fill).
5	-5	AK					0.0		SM		Same as above. (Fill).
		1	8'-9.5'	1	5 8 15	23	0.0 0.2	X	SM		Same as above. Damp. (Fill). Silty SAND with gravel, fine to medium grain, silt non-plastic, gravel fine grain, gray, green, damp.
10	-10	2	9.5'-11'	.5	8 18 35	53	0.3		SM		Poor recovery due to wood in spoon. No sheen or LNAPL.
		3	11'-12.5'	.5	4 9 11	20	2.0	X	SM		Same as above. Poor recovery due to rock in spoon. No sheen or LNAPL.
									SM		No description. Wet.
		4	12.5'-14'	1.5	NM	NM	0.3	X	ML		SILT with organic matter, brown, wet.
15	-15	5	14'-15.5'	1.5	6 7 10	17	0.2		ML		Same as above. Increasing organics, gray, wet, some burnt woody debris, no odor or LNAPL.
		6	16'-17.5'	1.5	4 5 9	14	0.1		ML		Same as above. Black, wet, no sheen or LNAPL.
								X	SM		Silty SAND, no organics, reddish brown, wet.
											End of Boring at 17.5' bgs.

Well/Boring Construction



ARCADIS
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Remarks: AK = Air Knife
bgs = Below Ground Surface
NM = Not Measured
ppm = Parts Per Million
PVC = Polyvinyl Chloride

Project Number:B0045362
Data File:

Date: 8/10/2012 Created/Edited by:KDH

Date Start/Finish: 06/22/2012
Drilling Company: Cascade Drilling, L.P.
Driller's Name: Curtis
Drilling Method: Hollow-stem Auger
Auger Size: 8"
Rig Type:
Sampling Method: Split Spoon Sampler

Northing:
Easting:
Casing Elevation: NE

Borehole Depth: 17 feet
Surface Elevation:

Descriptions By: Dave Rasar

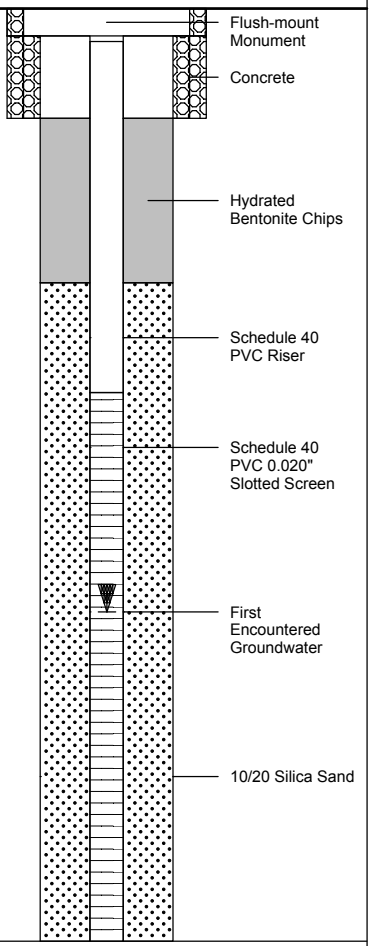
Well/Boring ID: MW-528

Client: Chevron EMC

Location: Former Unocal Edmonds Bulk Fuel Terminal

DRAFT

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description
0	0										
		AK					0.1		SM		Silty SAND with trace gravel, fine to medium grain, non-plastic, gray, moist, no odor, no LNAPL.
		AK					0.0		SM		Silty SAND with gravel, fine to medium grain, non-plastic, gravel fine to coarse grain, brown, moist. (Fill).
5	-5	AK					0.0		SM		Same as above. (Fill).
		1	8'-9.5'	.5	18 50/6"	50	0.0 1.3	X	SM		Same as above. (Fill). Poor recovery due to rock in spoon.
10	-10	2	9.5'-11'	1	12 27 15	42	0.1		SM		Same as above. (Fill).
		3	11'-12.5'	1	11 22 45	50	0.1		SM		Same as above. Wet. (Fill).
		4	12.5'-14'	1	10 12 12	24	0.3		SM		Same as above. (Fill).
		5	14'-15.5'	1.5	11 15 20	35	0.1 0.6		SP		SAND with trace silt and gravel, poorly graded, medium to coarse grain, gravel fine to medium grain, gray, wet.
15	-15							X	SM		Sandy SILT with gravel, non-plastic, sand fine to medium grain, gravel fine to medium grain, gray, wet.
		6	15.5'-17	1.5	6 7 12	19	0.1		SM		
								X	ML		SILT with organics, non-plastic, gray, wet, organics consist of bark and roots.
											End of Boring at 17' bgs.



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Remarks: AK = Air Knife
bgs = Below Ground Surface
ppm = Parts Per Million
PVC = Polyvinyl Chloride

Project Number:B0045362
Data File:

Date: 8/10/2012 Created/Edited by:KDH

Date Start/Finish: 06/15/2012
Drilling Company: Cascade Drilling, L.P.
Driller's Name: Brett
Drilling Method: Hand Auger
Auger Size: 2"
Rig Type:
Sampling Method: Hand Auger

Northing:
Easting:
Casing Elevation: NE

Borehole Depth: 8 feet
Surface Elevation:

Descriptions By: Dave Rasar

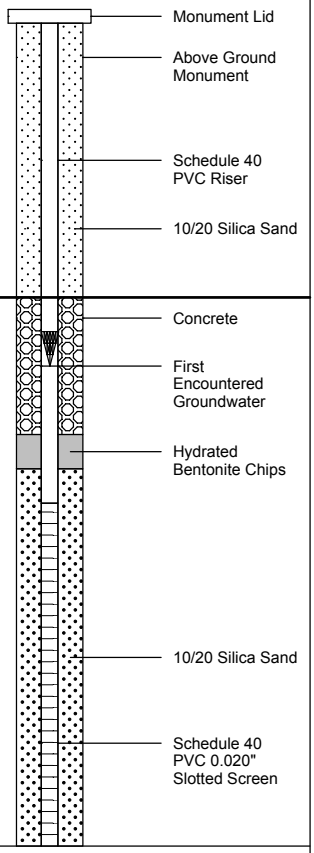
Well/Boring ID: MW-529

Client: Chevron EMC

Location: Former Unocal Edmonds Bulk Fuel Terminal

DRAFT

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description
-5	5										
0	0								SM		SILT, medium plasticity, gray, wet.
							0.0				SAND with silt, poorly graded, fine to coarse grain, gray, wet, no gravel, no HCLO, no LNAPL.
		HA	0'-8'	NA	NA	NA	0.0		SP		
							0.0				
5	-5						0.0				
							0.0				
							0.0				
											End of Boring at 8' bgs.



Remarks:
bgs = Below Ground Surface
HA = Hand Auger
HCLO = Hydrocarbon-like Odor
LNAPL = Light Non-aqueous Phase Liquid
NA = Not Applicable
ppm = Parts Per Million
PVC = Polyvinyl Chloride

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Project Number:B0045362
Data File:

Date: 8/10/2012 Created/Edited by:KDH

Date Start/Finish: 06/15/2012
Drilling Company: Cascade Drilling, L.P.
Driller's Name: Brad
Drilling Method: Hand Auger
Auger Size: 2"
Rig Type:
Sampling Method: Hand Auger

Northing:
Easting:
Casing Elevation: NE

Borehole Depth: 7.5 feet
Surface Elevation:

Descriptions By: Dave Rasar

Well/Boring ID: MW-530

Client: Chevron EMC

Location: Former Unocal Edmonds Bulk Fuel Terminal

DRAFT

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
-5	5											Monument Lid; Above Ground Monument; Schedule 40 PVC Riser; 10/20 Silica Sand
0	0	HA	0'-8'	NA	NA	NA	0.0		SP		SAND with silt, poorly graded, fine to coarse grain, gray, wet.	Concrete; First Encountered Groundwater; Hydrated Bentonite Chips
							0.0				Decreasing silt content.	
							0.0					
5	-5						0.0					10/20 Silica Sand
							0.0					
							0.0					Schedule 40 PVC 0.020" Slotted Screen
											End of Boring at 7.5' bgs.	

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Remarks: bgs = Below Ground Surface
HA = Hand Auger
NA = Not Applicable
ppm = Parts Per Million
PVC = Polyvinyl Chloride

Project Number:B0045362
Data File:

Date: 8/10/2012 Created/Edited by:KDH

Date Start/Finish: 06/18/2012
Drilling Company: Cascade Drilling, L.P.
Driller's Name: Curtis
Drilling Method: Hollow-stem Auger
Auger Size: 8"
Rig Type:
Sampling Method: Split Spoon Sampler

Northing:
Easting:
Casing Elevation: NE

Borehole Depth: 13 feet
Surface Elevation:

Descriptions By: Dave Rasar

Well/Boring ID: **MW-531**

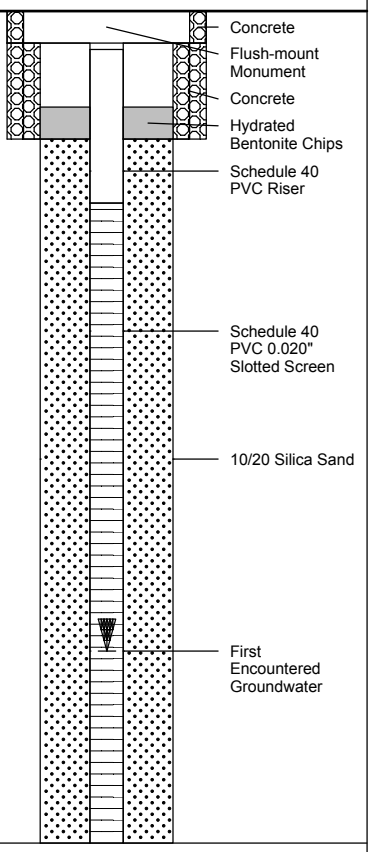
Client: Chevron EMC

Location: Former Unocal Edmonds Bulk Fuel Terminal

DRAFT

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description
0	0	AK									Quarry spall from 2' to 4' bgs.
		AK					0.0		GP		
5	-5	AK					10.5	X	SP		Sandy GRAVEL, fine to medium grain, sand medium grain, brown, damp. (Fill).
		1	8'-9.5'	NR	50/6"	50	3.1		SP		SAND with gravel, poorly graded, fine to coarse grain, gravel fine to medium grain, gray, moist, no LNAPL. Same as above. No LNAPL. No recovery due to gravel in spoon.
10	-10	2	9.5'-11'	.5	50/6"	50	3.7		SP		SAND with trace silt, poorly graded, wet, no odor, no organics.
		3	11'-12.5'	.5	11 12 12	24	0.8	X	SP		Sandy GRAVEL, fine to coarse grain, sand fine to coarse grain, gray, wet, some sheen on water in spoon, no HCLO, no LNAPL.
											End of Boring at 13' bgs.

Well/Boring Construction



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Remarks:
AK = Air Knife
bgs = Below Ground Surface
HCLO = Hydrocarbon-like Odor
LNAPL = Light Non-aqueous Phase Liquid
NR = No Recovery
ppm = Parts Per Million
PVC = Polyvinyl Chloride

Project Number:B0045362
Data File:

Date: 8/10/2012 Created/Edited by:KDH

Date Start/Finish: 06/18/2012
Drilling Company: Cascade Drilling, L.P.
Driller's Name: Curtis
Drilling Method: Hollow-stem Auger
Auger Size: 8"
Rig Type:
Sampling Method: Split Spoon Sampler

Northing:
Easting:
Casing Elevation: NE

Borehole Depth: 13.5 feet
Surface Elevation:

Descriptions By: Dave Rasar

Well/Boring ID: MW-532

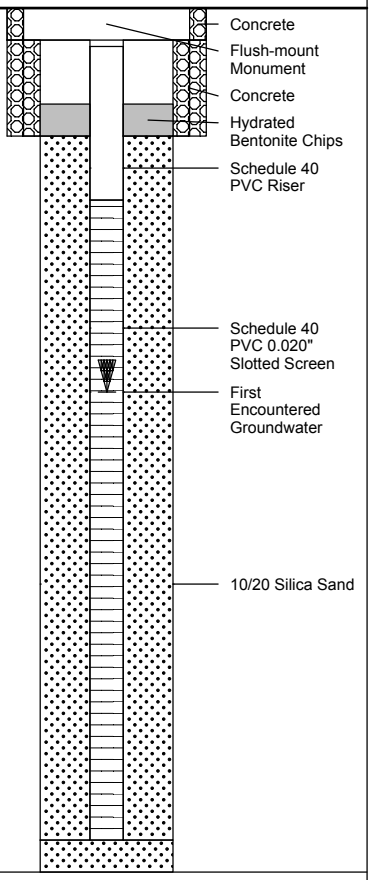
Client: Chevron EMC

Location: Former Unocal Edmonds Bulk Fuel Terminal

DRAFT

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (inches)	Blow Counts	N-Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description
0	0	AK					0.0		SM		Silty SAND with gravel, fine to medium grain, non-plastic, gravel fine to medium grain, brown, moist. (Fill).
		1	3'-4.5'	NR	50/6"	50	NM				No recovery due to asphalt in spoon.
5	-5	2	4.5'-6'	1	6 8 18	26	6.7		ML		SILT with trace sand and gravel, non-plastic, sand fine grain, gravel fine grain, blue-green, moist, no LNAPL.
		3	6'-7.5'	1	6 8 8	16	17.1		SP		SAND, poorly graded, wet, small amount of sheen.
		4	7.5'-9'	1	3 3 7	10	4.1		SM		Sandy SILT, non-plastic, fine to medium grain, gray, wet, no LNAPL, no sheen.
10	-10	5	9'-10.5'	1	4 6 7	13	0.6		SP		SAND, poorly graded, fine to medium grain, gray, wet, no sheen, no LNAPL.
		6	10.5'-12'	1.5	4 5 6	11	0.2		SP		Same as above. No LNAPL.
		7	12'-13.5'	1	5 8 8	16	0.3		SP		Same as above. No LNAPL. Wood Debris.
											End of Boring at 13' bgs.

Well/Boring Construction



ARCADIS
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Remarks:
AK = Air Knife
bgs = Below Ground Surface
LNAPL = Light Non-aqueous Phase Liquid
NM = Not Measured
NR = No Recovery
ppm = Parts Per Million
PVC = Polyvinyl Chloride

Project Number:B0045362
Data File:

Date: 8/10/2012 Created/Edited by:KDH

ARCADIS

Appendix C

Laboratory Analytical Data Reports – June 2012 Soil Sampling

(Analytical Reports available on attached CD)

eurofins | Lancaster Laboratories

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Analysis Report

ANALYTICAL RESULTS

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

Prepared for:

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

July 07, 2012

Project: Edmonds Terminal

Submittal Date: 06/15/2012
Group Number: 1316137
PO Number: 0015093389
Release Number: ALBAN
State of Sample Origin: WA

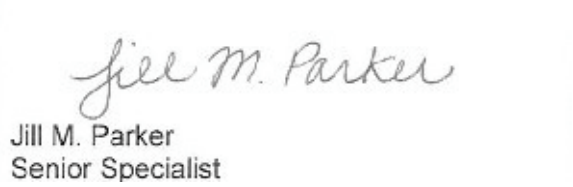
Client Sample Description	Lancaster Labs (LLI) #
MW-525-4 Grab Soil Sample	6689587
MW-525-6 Grab Soil Sample	6689588
MW-526-4 Grab Soil Sample	6689589
MW-527-8 Grab Soil Sample	6689590
MW-528-8 Grab Soil Sample	6689591
MW-531-6 Grab Soil Sample	6689592

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	Arcadis	Attn: Rebecca Andresen
ELECTRONIC COPY TO	Arcadis	Attn: Scott Zorn
ELECTRONIC COPY TO	Arcadis	Attn: Dave Rasar

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Respectfully Submitted,



Jill M. Parker
Senior Specialist

(717) 556-7262

eurofins | Lancaster Laboratories

2425 New Holland Pike, PO Box 12425, Lancaster, PA 17605-2425 • 717-656-2300 Fax: 717-656-2681 • www.lancasterlabs.com

Analysis Report

Sample Description: MW-525-4 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6689587
LLI Group # 1316137
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/14/2012 10:20 by DR

Submitted: 06/15/2012 09:50
Reported: 07/07/2012 06:35

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

E5254

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	N.D.	13	282.68
	Reporting limits were raised due to sample foaming.				
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	3.5	0.067	282.68
08179	Ethylbenzene	100-41-4	0.18	0.067	282.68
08179	Toluene	108-88-3	0.19	0.067	282.68
08179	Total Xylenes	1330-20-7	0.51	0.20	282.68
	Reporting limits were raised due to sample foaming.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	270	18	5
12006	HRO C24-C40 w/Si Gel	n.a.	1,000	60	5
	Due to the dilution of the sample extract, capric acid recovery can not be determined.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	16.0	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12179SLA026	06/27/2012 18:25	Sally L Appleyard	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31B	06/22/2012 19:55	Marie D John	282.68
08179	BTEX by 8021	SW-846 8021B	1	12173A31B	06/22/2012 19:55	Marie D John	282.68
01150	GC - Bulk Soil Prep	SW-846 5035A Modified	1	201217127941	06/19/2012 09:06	Larry E Bevins	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121720007A	06/30/2012 00:16	Glorines Suarez-Rivera	5
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121720007A	06/20/2012 18:00	Sally L Appleyard	1
00111	Moisture	SM20 2540 G	1	12172820001A	06/20/2012 08:49	William C Schwebel	1

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Analysis Report

Sample Description: MW-525-6 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6689588
LLI Group # 1316137
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/14/2012 10:25 by DR

Submitted: 06/15/2012 09:50
Reported: 07/07/2012 06:35

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

E5256

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM**		**mg/kg**	**mg/kg**	
10722	Acenaphthene	83-32-9	2.6	0.0080	10
10722	Acenaphthylene	208-96-8	0.85	0.0040	10
10722	Anthracene	120-12-7	21	0.20	500
10722	Benzo(a)anthracene	56-55-3	0.49	0.0080	10
10722	Benzo(a)pyrene	50-32-8	0.18	0.0080	10
10722	Benzo(b)fluoranthene	205-99-2	0.31	0.0080	10
10722	Benzo(g,h,i)perylene	191-24-2	0.11	0.0080	10
10722	Benzo(k)fluoranthene	207-08-9	0.13	0.0080	10
10722	Chrysene	218-01-9	0.83	0.0040	10
10722	Dibenz(a,h)anthracene	53-70-3	0.021	0.0080	10
10722	Fluoranthene	206-44-0	1.3	0.0080	10
10722	Fluorene	86-73-7	6.4	0.40	500
10722	Indeno(1,2,3-cd)pyrene	193-39-5	0.041	0.0080	10
10722	Naphthalene	91-20-3	130	0.40	500
10722	Phenanthrene	85-01-8	12	0.40	500
10722	Pyrene	129-00-0	2.3	0.0080	10
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	12,000	590	12156.99
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	34	2.9	12156.99
08179	Ethylbenzene	100-41-4	220	2.9	12156.99
08179	Toluene	108-88-3	4.9	2.9	12156.99
08179	Total Xylenes	1330-20-7	1,200	8.8	12156.99
	Reporting limits were raised due to interference from the sample matrix.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	5,700	90	25
12006	HRO C24-C40 w/Si Gel	n.a.	N.D.	300	25
	Due to the dilution of the sample extract, capric acid recovery can not be determined.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	16.9	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Sample Description: MW-525-6 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6689588
LLI Group # 1316137
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/14/2012 10:25 by DR

Submitted: 06/15/2012 09:50
Reported: 07/07/2012 06:35

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

E5256

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10722	PAH SIM 8270 Soil Microwave	SW-846 8270C SIM	1	12185SLC026	07/04/2012 20:28	Mark A Clark	10
10722	PAH SIM 8270 Soil Microwave	SW-846 8270C SIM	1	12185SLC026	07/05/2012 13:53	Mark A Clark	500
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12185SLC026	06/27/2012 18:25	Sally L Appleyard	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31B	06/22/2012 03:17	Marie D John	12156.99
08179	BTEX by 8021	SW-846 8021B	1	12173A31B	06/22/2012 03:17	Marie D John	12156.99
01150	GC - Bulk Soil Prep	SW-846 5035A Modified	1	201217127941	06/19/2012 09:07	Larry E Bevins	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121720007A	06/30/2012 00:38	Glorines Suarez-Rivera	25
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121720007A	06/20/2012 18:00	Sally L Appleyard	1
00111	Moisture	SM20 2540 G	1	12172820001A	06/20/2012 08:49	William C Schwebel	1

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Analysis Report

Sample Description: MW-526-4 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6689589
LLI Group # 1316137
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/14/2012 11:00 by DR

Submitted: 06/15/2012 09:50
Reported: 07/07/2012 06:35

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

E5266

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	11	1.2	27.85
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	N.D.	0.019	27.85
08179	Ethylbenzene	100-41-4	N.D.	0.0061	27.85
08179	Toluene	108-88-3	N.D.	0.0061	27.85
08179	Total Xylenes	1330-20-7	0.028	0.018	27.85
	Reporting limits were raised due to interference from the sample matrix.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	17	3.3	1
12006	HRO C24-C40 w/Si Gel	n.a.	N.D.	11	1
	The reverse surrogate, capric acid, is present at 1.1%.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	8.9	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12179SLA026	06/27/2012 18:25	Sally L Appleyard	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31B	06/22/2012 00:53	Marie D John	27.85
08179	BTEX by 8021	SW-846 8021B	1	12173A31B	06/22/2012 00:53	Marie D John	27.85
01150	GC - Bulk Soil Prep	SW-846 5035A Modified	1	201217127941	06/19/2012 09:07	Larry E Bevins	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121720007A	06/29/2012 22:26	Glorines Suarez-Rivera	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121720007A	06/20/2012 18:00	Sally L Appleyard	1
00111	Moisture	SM20 2540 G	1	12172820001A	06/20/2012 08:49	William C Schwebel	1

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Analysis Report

Sample Description: MW-527-8 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6689590
LLI Group # 1316137
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/14/2012 12:10 by DR

Submitted: 06/15/2012 09:50
Reported: 07/07/2012 06:35

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

E5278

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	2.4	1.2	27.86
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	0.020	0.0061	27.86
08179	Ethylbenzene	100-41-4	N.D.	0.0061	27.86
08179	Toluene	108-88-3	N.D.	0.0061	27.86
08179	Total Xylenes	1330-20-7	N.D.	0.018	27.86
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	170	6.6	2
12006	HRO C24-C40 w/Si Gel	n.a.	180	22	2
	Due to the dilution of the sample extract, capric acid recovery can not be determined.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	8.9	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12179SLA026	06/27/2012 18:25	Sally L Appleyard	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31B	06/22/2012 16:28	Marie D John	27.86
08179	BTEX by 8021	SW-846 8021B	1	12173A31C	06/23/2012 00:44	Marie D John	27.86
01150	GC - Bulk Soil Prep	SW-846 5035A Modified	1	201217127941	06/19/2012 09:08	Larry E Bevins	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121720007A	06/29/2012 23:10	Glorines Suarez-Rivera	2
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121720007A	06/20/2012 18:00	Sally L Appleyard	1
00111	Moisture	SM20 2540 G	1	12172820001A	06/20/2012 08:49	William C Schwebel	1

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Analysis Report

Sample Description: MW-528-8 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6689591
LLI Group # 1316137
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/14/2012 13:20 by DR

Submitted: 06/15/2012 09:50
Reported: 07/07/2012 06:35

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

E5288

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	N.D.	1.1	25.7
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	0.015	0.0055	25.7
08179	Ethylbenzene	100-41-4	N.D.	0.0055	25.7
08179	Toluene	108-88-3	N.D.	0.0055	25.7
08179	Total Xylenes	1330-20-7	N.D.	0.016	25.7
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	4.0	3.2	1
12006	HRO C24-C40 w/Si Gel	n.a.	22	11	1
	The reverse surrogate, capric acid, is present at <1%.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	5.9	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12179SLA026	06/27/2012 18:25	Sally L Appleyard	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31B	06/22/2012 01:29	Marie D John	25.7
08179	BTEX by 8021	SW-846 8021B	1	12173A31B	06/22/2012 01:29	Marie D John	25.7
01150	GC - Bulk Soil Prep	SW-846 5035A Modified	1	201217127941	06/19/2012 09:09	Larry E Bevins	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121720007A	06/29/2012 22:48	Glorines Suarez-Rivera	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121720007A	06/20/2012 18:00	Sally L Appleyard	1
00111	Moisture	SM20 2540 G	1	12172820001A	06/20/2012 08:49	William C Schwebel	1

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Analysis Report

Sample Description: MW-531-6 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6689592
LLI Group # 1316137
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/14/2012 14:30 by DR

Submitted: 06/15/2012 09:50
Reported: 07/07/2012 06:35

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

E5316

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	20	1.2	26.59
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	0.0084	0.0059	26.59
08179	Ethylbenzene	100-41-4	N.D.	0.0059	26.59
08179	Toluene	108-88-3	N.D.	0.0059	26.59
08179	Total Xylenes	1330-20-7	0.021	0.018	26.59
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	130	3.3	1
12006	HRO C24-C40 w/Si Gel	n.a.	160	11	1
	The reverse surrogate, capric acid, is present at 2.1%.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	9.9	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12179SLA026	06/27/2012 18:25	Sally L Appleyard	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31B	06/22/2012 17:04	Marie D John	26.59
08179	BTEX by 8021	SW-846 8021B	1	12173A31B	06/22/2012 17:04	Marie D John	26.59
01150	GC - Bulk Soil Prep	SW-846 5035A Modified	1	201217127941	06/19/2012 09:10	Larry E Bevins	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121720007A	06/29/2012 23:32	Glorines Suarez-Rivera	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121720007A	06/20/2012 18:00	Sally L Appleyard	1
00111	Moisture	SM20 2540 G	1	12172820001A	06/20/2012 08:49	William C Schwebel	1

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Quality Control Summary

Client Name: Chevron Environmental Mgmt Co Group Number: 1316137
Reported: 07/07/12 at 06:35 AM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 12185SLC026	Sample number(s): 6689588							
Acenaphthene	N.D.	0.00067	mg/kg	83	84	73-120	2	30
Acenaphthylene	N.D.	0.00033	mg/kg	79	82	67-120	3	30
Anthracene	N.D.	0.00033	mg/kg	78	87	69-120	11	30
Benzo(a)anthracene	N.D.	0.00067	mg/kg	86	88	74-120	3	30
Benzo(a)pyrene	N.D.	0.00067	mg/kg	87	92	70-120	5	30
Benzo(b)fluoranthene	N.D.	0.00067	mg/kg	94	99	60-126	5	30
Benzo(g,h,i)perylene	N.D.	0.00067	mg/kg	85	90	66-130	5	30
Benzo(k)fluoranthene	N.D.	0.00067	mg/kg	83	86	65-130	4	30
Chrysene	N.D.	0.00033	mg/kg	85	88	79-120	4	30
Dibenz(a,h)anthracene	N.D.	0.00067	mg/kg	80	84	69-129	4	30
Fluoranthene	N.D.	0.00067	mg/kg	83	85	78-120	3	30
Fluorene	N.D.	0.00067	mg/kg	83	88	75-120	7	30
Indeno(1,2,3-cd)pyrene	N.D.	0.00067	mg/kg	83	87	53-128	4	30
Naphthalene	N.D.	0.00067	mg/kg	87	91	67-120	5	30
Phenanthrene	N.D.	0.00067	mg/kg	84	83	76-120	1	30
Pyrene	N.D.	0.00067	mg/kg	91	95	71-120	5	30
Batch number: 12173A31B	Sample number(s): 6689587-6689592							
Benzene	N.D.	0.0050	mg/kg	103	101	76-118	2	30
Ethylbenzene	N.D.	0.0050	mg/kg	103	102	77-115	1	30
NWTPH-Gx soil C7-C12	N.D.	1.0	mg/kg	91	91	67-119	1	30
Toluene	N.D.	0.0050	mg/kg	102	101	80-120	1	30
Total Xylenes	N.D.	0.015	mg/kg	101	100	78-115	1	30
Batch number: 12173A31C	Sample number(s): 6689590							
Benzene	N.D.	0.0050	mg/kg	103	101	76-118	2	30
Ethylbenzene	N.D.	0.0050	mg/kg	103	102	77-115	1	30
Toluene	N.D.	0.0050	mg/kg	102	101	80-120	1	30
Total Xylenes	N.D.	0.015	mg/kg	101	100	78-115	1	30
Batch number: 121720007A	Sample number(s): 6689587-6689592							
DRO C12-C24 w/Si Gel	N.D.	3.0	mg/kg	59		50-133		
HRO C24-C40 w/Si Gel	N.D.	10.	mg/kg					
Batch number: 12172820001A	Sample number(s): 6689587-6689592							
Moisture				100		99-101		

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: Chevron Environmental Mgmt Co Group Number: 1316137
Reported: 07/07/12 at 06:35 AM

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 121720007A	Sample number(s): 6689587-6689592					BKG: P687765			
DRO C12-C24 w/Si Gel						N.D.	N.D.	0 (1)	20
HRO C24-C40 w/Si Gel						N.D.	N.D.	0 (1)	20
Batch number: 12172820001A	Sample number(s): 6689587-6689592					BKG: P690720			
Moisture						8.0	8.8	9	13

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed
unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: PAH SIM 8270 Soil Microwave
Batch number: 12185SLC026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
6689588	99	92	373*
Blank	87	90	90
LCS	85	88	87
LCSD	88	92	91
Limits:	70-130	70-130	70-130

Analysis Name: NWTPH-Gx soil C7-C12
Batch number: 12173A31B

	Trifluorotoluene-F	Trifluorotoluene-P
6689587	93	97
6689588	1037*	708*
6689589	80	86
6689590	96	
6689591	82	84
6689592	85	88
Blank	100	107
LCS	92	101
LCSD	91	101
Limits:	61-122	73-117

Analysis Name: NWTPH-Gx soil C7-C12
Batch number: 12173A31C

	Trifluorotoluene-F	Trifluorotoluene-P
6689590		90
Blank	97	100
LCS	92	101
LCSD	91	101
Limits:	61-122	73-117

Analysis Name: NWTPH-Dx soil w/ 10g Si Gel
Batch number: 121720007A

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: Chevron Environmental Mgmt Co Group Number: 1316137
Reported: 07/07/12 at 06:35 AM

Surrogate Quality Control

	Orthoterphenyl
6689587	95
6689588	378*
6689589	88
6689590	94
6689591	95
6689592	108
Blank	91
DUP	87
LCS	87
Limits:	50-150

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Chevron Northwest Region Analysis Request/Chain of Custody

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Acct. # 11964 Group # 1316137 For Lancaster Laboratories use only Sample # 6689587-92

Instructions on reverse side correspond with circled numbers.

SCR #: 123362

1 Client Information

Facility # Edmonds Terminal WBS

Site Address 11720 Unocal Rd, Edmonds WA

Chevron PM Kim Joiner Lead Consultant ARCADIS

Consultant/Office ARCADIS / Seattle

Consultant Project Mgr. Rebecca Andresen

Consultant Phone # 206-325-5254

Sampler DR

2 Sample Identification

Sample Identification	Collected Date	Collected Time	3 Grab	3 Composite	4 Matrix: Soil	Water	Sediment	Potable	Ground	NPDES	Surface	Air	Oil	Total Number of Containers	5 Analyses Requested: BTEX	8021	8260	Naphth	8260 full scan	Oxygenates	NWTPH GX	NWTPH DX	Silica Gel Cleanup	Lead	Total	Diss.	Method	WAVPH	WAEPH	PAH SIM 8270 (Hold)
MW-525-4	6/14/12	1020	X		X									5	X			X			X	X	X							X
MW-525-6		1025																												
MW-526-8 4 per D. Rosar jmp 6/19/12		1100																												
MW-527-8		1210																												
MW-528-8		1320																												
MW-531-6		1430																												

6 Remarks

SAMPLE MW-525-6 WILL BE ANALYZED FOR PAHS PER D. ROSAR KMP 6/18/12

Hold PAH pending Dx analysis

Samples extracted & held for PAH's. BTEX by 8021, not 8260, per D. Rosar. jmp 6/19/12

- ☐ Results in Dry Weight
- ☐ J value reporting needed
- ☐ Must meet lowest detection limits possible for 8260 compounds
- ☐ 8021 MTBE Confirmation
- ☐ Confirm MTBE + Naphthalene
- ☐ Confirm highest hit by 8260
- ☐ Confirm all hits by 8260
- ☐ Run _____ oxy's on highest hit
- ☐ Run _____ oxy's on all hits

7 Turnaround Time Requested (TAT) (please circle)

Standard | 5 day | 4 day | 72 hour | 48 hour | 24 hour

8 Data Package Options (please circle if required)

Type I - Full | Type VI (Raw Data)

Relinquished by	Date	Time	Received by	Date	Time
[signature]	6-6-12	1030			
[signature]	6/14/12	1600	FedEx	6/14/12	1600

Relinquished by Commercial Carrier: UPS ____ FedEx ____ Other ____

Received by [signature] Date 6/15/12 Time 0950

Temperature Upon Receipt 3.0 °C

Custody Seals Intact? Yes No

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		**Inorganic Qualifiers**	
A	TIC is a possible aldol-condensation product	**B**	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	**E**	Estimated due to interference
C	Pesticide result confirmed by GC/MS	**M**	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	**N**	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	**S**	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	**U**	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	**W**	Post digestion spike out of control limits
U	Compound was not detected	*****	Duplicate analysis not within control limits
X,Y,Z	Defined in case narrative	**+**	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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Analysis Report

ANALYTICAL RESULTS

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

Prepared for:

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

July 11, 2012

Project: Edmonds Terminal

Submittal Date: 06/19/2012
Group Number: 1316824
PO Number: 0015093389
Release Number: ALBAN
State of Sample Origin: WA

Client Sample Description	Lancaster Labs (LLI) #
MW-531-12 Grab Soil Sample	6692924
MW-525-10.5 Grab Soil Sample	6692925
MW-525-12.5 Grab Soil Sample	6692926
DUP-1 Grab Soil Sample	6692927
MW-532-6 Grab Soil Sample	6692928
MW-532-7 Grab Soil Sample	6692929
MW-532-10 Grab Soil Sample	6692930
MW-532-13.5 Grab Soil Sample	6692931
MW-526-12.5 Grab Soil Sample	6692932

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	Arcadis	Attn: Rebecca Andresen
ELECTRONIC COPY TO	Arcadis	Attn: Scott Zorn
ELECTRONIC COPY TO	Arcadis	Attn: Dave Rasar

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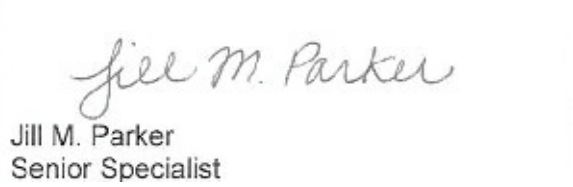
Respectfully Submitted,



Jill M. Parker
Senior Specialist

(717) 556-7262

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Analysis Report

Sample Description: MW-531-12 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6692924
LLI Group # 1316824
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/18/2012 09:10 by DR

Submitted: 06/19/2012 09:30
Reported: 07/11/2012 13:31

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

53112

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	14	1.1	23.77
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	0.13	0.0056	23.77
08179	Ethylbenzene	100-41-4	0.10	0.0056	23.77
08179	Toluene	108-88-3	N.D.	0.0056	23.77
08179	Total Xylenes	1330-20-7	0.068	0.017	23.77
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	11	3.5	1
12006	HRO C24-C40 w/Si Gel	n.a.	23	12	1
	The reverse surrogate, capric acid, is present at 1%.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	15.1	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31B	06/22/2012 21:07	Marie D John	23.77
08179	BTEX by 8021	SW-846 8021B	1	12173A31D	06/25/2012 18:21	Marie D John	23.77
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217227963	06/18/2012 09:10	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121730026A	06/30/2012 02:50	Glorines Suarez-Rivera	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121730026A	06/22/2012 11:50	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12177820005A	06/25/2012 11:56	William C Schwebel	1

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Analysis Report

Sample Description: MW-525-10.5 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6692925
LLI Group # 1316824
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/18/2012 10:20 by DR

Submitted: 06/19/2012 09:30
Reported: 07/11/2012 13:31

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

52510

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	2.8	1.4	27.48
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	0.014	0.0072	27.48
08179	Ethylbenzene	100-41-4	0.013	0.0072	27.48
08179	Toluene	108-88-3	0.012	0.0072	27.48
08179	Total Xylenes	1330-20-7	0.042	0.022	27.48
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	1,200	39	10
12006	HRO C24-C40 w/Si Gel	n.a.	N.D.	130	10
	Due to the dilution of the sample extract, capric acid recovery can not be determined.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	23.4	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31B	06/22/2012 17:42	Marie D John	27.48
08179	BTEX by 8021	SW-846 8021B	1	12173A31D	06/25/2012 19:03	Marie D John	27.48
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217227963	06/18/2012 10:20	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121730026A	06/30/2012 15:08	Glorines Suarez-Rivera	10
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121730026A	06/22/2012 11:50	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12177820005A	06/25/2012 11:56	William C Schwebel	1

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Analysis Report

Sample Description: MW-525-12.5 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6692926
LLI Group # 1316824
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/18/2012 10:30 by DR

Submitted: 06/19/2012 09:30
Reported: 07/11/2012 13:31

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

52512

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	380	33	661.95
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	1.7	0.17	661.95
08179	Ethylbenzene	100-41-4	2.6	0.17	661.95
08179	Toluene	108-88-3	0.84	0.17	661.95
08179	Total Xylenes	1330-20-7	9.0	0.50	661.95
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	290	7.5	2
12006	HRO C24-C40 w/Si Gel	n.a.	N.D.	25	2
	Due to the dilution of the sample extract, capric acid recovery can not be determined.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	20.3	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31D	06/26/2012 16:17	Marie D John	661.95
08179	BTEX by 8021	SW-846 8021B	1	12173A31B	06/22/2012 22:19	Marie D John	661.95
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217227963	06/18/2012 10:30	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121730026A	06/30/2012 15:56	Glorines Suarez-Rivera	2
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121730026A	06/22/2012 11:50	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12177820005A	06/25/2012 11:56	William C Schwebel	1

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Analysis Report

Sample Description: DUP-1 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6692927
LLI Group # 1316824
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/18/2012 by DR

Submitted: 06/19/2012 09:30
Reported: 07/11/2012 13:31

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

FDEDM

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	43	4.8	98.61
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	0.10	0.0060	24.65
08179	Ethylbenzene	100-41-4	0.14	0.0060	24.65
08179	Toluene	108-88-3	0.051	0.0060	24.65
08179	Total Xylenes	1330-20-7	0.42	0.018	24.65
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	790	36	10
12006	HRO C24-C40 w/Si Gel	n.a.	N.D.	120	10
	Due to the dilution of the sample extract, capric acid recovery can not be determined.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	17.6	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31D	06/26/2012 16:53	Marie D John	98.61
08179	BTEX by 8021	SW-846 8021B	1	12173A31B	06/22/2012 21:43	Marie D John	24.65
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217227963	06/18/2012 00:00	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121730026A	06/30/2012 15:30	Glorines Suarez-Rivera	10
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121730026A	06/22/2012 11:50	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12177820005A	06/25/2012 11:56	William C Schwebel	1

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Analysis Report

Sample Description: MW-532-6 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6692928
LLI Group # 1316824
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/18/2012 12:10 by DR

Submitted: 06/19/2012 09:30
Reported: 07/11/2012 13:31

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

532-6

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	N.D.	17	321.2
	Reporting limits were raised due to sample foaming.				
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	N.D.	0.084	321.2
08179	Ethylbenzene	100-41-4	N.D.	0.084	321.2
08179	Toluene	108-88-3	N.D.	0.084	321.2
08179	Total Xylenes	1330-20-7	N.D.	0.25	321.2
	Reporting limits were raised due to sample foaming.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	800	20	5
12006	HRO C24-C40 w/Si Gel	n.a.	690	65	5
	Due to the dilution of the sample extract, capric acid recovery can not be determined.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	23.7	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31B	06/22/2012 20:31	Marie D John	321.2
08179	BTEX by 8021	SW-846 8021B	1	12173A31B	06/22/2012 20:31	Marie D John	321.2
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217227963	06/18/2012 12:10	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121730026A	06/30/2012 04:41	Glorines Suarez-Rivera	5
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121730026A	06/22/2012 11:50	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12177820005A	06/25/2012 11:56	William C Schwebel	1

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Analysis Report

Sample Description: MW-532-7 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6692929
LLI Group # 1316824
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/18/2012 12:15 by DR

Submitted: 06/19/2012 09:30
Reported: 07/11/2012 13:31

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

532-7

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Semivolatiles	**SW-846 8270C SIM**		**mg/kg**	**mg/kg**	
10722	Acenaphthene	83-32-9	0.14	0.0079	10
10722	Acenaphthylene	208-96-8	0.084	0.0040	10
10722	Anthracene	120-12-7	0.057	0.0040	10
10722	Benzo(a)anthracene	56-55-3	0.046	0.0079	10
10722	Benzo(a)pyrene	50-32-8	0.026	0.0079	10
10722	Benzo(b)fluoranthene	205-99-2	0.085	0.0079	10
10722	Benzo(g,h,i)perylene	191-24-2	0.0093	0.0079	10
10722	Benzo(k)fluoranthene	207-08-9	N.D.	0.0079	10
10722	Chrysene	218-01-9	0.14	0.0040	10
10722	Dibenz(a,h)anthracene	53-70-3	N.D.	0.0079	10
10722	Fluoranthene	206-44-0	0.092	0.0079	10
10722	Fluorene	86-73-7	0.59	0.0079	10
10722	Indeno(1,2,3-cd)pyrene	193-39-5	N.D.	0.0079	10
10722	Naphthalene	91-20-3	0.21	0.0079	10
10722	Phenanthrene	85-01-8	1.1	0.0079	10
10722	Pyrene	129-00-0	0.21	0.0079	10
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	340	13	272.34
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	N.D.	0.16	108.93
08179	Ethylbenzene	100-41-4	N.D.	0.026	108.93
08179	Toluene	108-88-3	0.11	0.026	108.93
08179	Total Xylenes	1330-20-7	N.D.	0.26	108.93
	Reporting limits were raised due to interference from the sample matrix.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	5,000	90	25
12006	HRO C24-C40 w/Si Gel	n.a.	5,200	300	25
	Due to the dilution of the sample extract, capric acid recovery can not be determined.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	17.2	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Sample Description: MW-532-7 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6692929
LLI Group # 1316824
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/18/2012 12:15 by DR

Submitted: 06/19/2012 09:30
Reported: 07/11/2012 13:31

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

532-7

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10722	PAH SIM 8270 Soil Microwave	SW-846 8270C SIM	1	12188SLA026	07/10/2012 11:15	Mark A Clark	10
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12188SLA026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31B	06/22/2012 05:05	Marie D John	272.34
08179	BTEX by 8021	SW-846 8021B	1	12173A31D	06/25/2012 23:45	Laura M Krieger	108.93
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217227963	06/18/2012 12:15	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121730026A	06/30/2012 05:24	Glorines Suarez-Rivera	25
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121730026A	06/22/2012 11:50	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12177820005A	06/25/2012 11:56	William C Schwebel	1

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Analysis Report

Sample Description: MW-532-10 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6692930
LLI Group # 1316824
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/18/2012 12:25 by DR

Submitted: 06/19/2012 09:30
Reported: 07/11/2012 13:31

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

53210

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	N.D.	1.6	27.02
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	N.D.	0.0079	27.02
08179	Ethylbenzene	100-41-4	N.D.	0.0079	27.02
08179	Toluene	108-88-3	N.D.	0.0079	27.02
08179	Total Xylenes	1330-20-7	N.D.	0.024	27.02
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	N.D.	4.4	1
12006	HRO C24-C40 w/Si Gel	n.a.	N.D.	15	1
	The reverse surrogate, capric acid, is present at 1%.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	31.8	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31B	06/22/2012 18:42	Marie D John	27.02
08179	BTEX by 8021	SW-846 8021B	1	12173A31B	06/22/2012 18:42	Marie D John	27.02
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217227963	06/18/2012 12:25	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121730026A	06/30/2012 03:34	Glorines Suarez-Rivera	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121730026A	06/22/2012 11:50	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12177820005A	06/25/2012 11:56	William C Schwebel	1

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Analysis Report

Sample Description: MW-532-13.5 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6692931
LLI Group # 1316824
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/18/2012 12:30 by DR

Submitted: 06/19/2012 09:30
Reported: 07/11/2012 13:31

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

53213

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	N.D.	1.3	26.48
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	N.D.	0.0066	26.48
08179	Ethylbenzene	100-41-4	N.D.	0.0066	26.48
08179	Toluene	108-88-3	N.D.	0.0066	26.48
08179	Total Xylenes	1330-20-7	N.D.	0.020	26.48
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	760	19	5
12006	HRO C24-C40 w/Si Gel	n.a.	920	63	5
	Due to the dilution of the sample extract, capric acid recovery can not be determined.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	20.3	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31B	06/22/2012 19:19	Marie D John	26.48
08179	BTEX by 8021	SW-846 8021B	1	12173A31B	06/22/2012 19:19	Marie D John	26.48
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217227963	06/18/2012 12:30	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121730026A	06/30/2012 05:02	Glorines Suarez-Rivera	5
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121730026A	06/22/2012 11:50	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12177820005A	06/25/2012 11:56	William C Schwebel	1

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Analysis Report

Sample Description: MW-526-12.5 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6692932
LLI Group # 1316824
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/18/2012 14:10 by DR

Submitted: 06/19/2012 09:30
Reported: 07/11/2012 13:31

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

52612

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	N.D.	1.2	25.49
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	N.D.	0.0061	25.49
08179	Ethylbenzene	100-41-4	N.D.	0.0061	25.49
08179	Toluene	108-88-3	N.D.	0.0061	25.49
08179	Total Xylenes	1330-20-7	N.D.	0.018	25.49
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	N.D.	3.6	1
12006	HRO C24-C40 w/Si Gel	n.a.	N.D.	12	1
	The reverse surrogate, capric acid, is present at <1%.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	16.5	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12173A31B	06/22/2012 02:05	Marie D John	25.49
08179	BTEX by 8021	SW-846 8021B	1	12173A31B	06/22/2012 02:05	Marie D John	25.49
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217227963	06/18/2012 14:10	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121730026A	06/30/2012 02:06	Glorines Suarez-Rivera	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121730026A	06/22/2012 11:50	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12177820005A	06/25/2012 11:56	William C Schwebel	1

Quality Control Summary

Client Name: Chevron Environmental Mgmt Co Group Number: 1316824
Reported: 07/11/12 at 01:31 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 12188SLA026	Sample number(s): 6692929							
Acenaphthene	N.D.	0.00067	mg/kg	79	80	73-120	1	30
Acenaphthylene	N.D.	0.00033	mg/kg	74	77	67-120	4	30
Anthracene	N.D.	0.00033	mg/kg	80	85	69-120	5	30
Benzo(a)anthracene	N.D.	0.00067	mg/kg	82	86	74-120	5	30
Benzo(a)pyrene	N.D.	0.00067	mg/kg	84	88	70-120	4	30
Benzo(b)fluoranthene	N.D.	0.00067	mg/kg	90	94	60-126	4	30
Benzo(g,h,i)perylene	N.D.	0.00067	mg/kg	84	88	66-130	5	30
Benzo(k)fluoranthene	N.D.	0.00067	mg/kg	81	84	65-130	4	30
Chrysene	N.D.	0.00033	mg/kg	82	87	79-120	6	30
Dibenz(a,h)anthracene	N.D.	0.00067	mg/kg	78	83	69-129	5	30
Fluoranthene	N.D.	0.00067	mg/kg	79	83	78-120	5	30
Fluorene	N.D.	0.00067	mg/kg	82	83	75-120	2	30
Indeno(1,2,3-cd)pyrene	N.D.	0.00067	mg/kg	82	85	53-128	4	30
Naphthalene	N.D.	0.00067	mg/kg	82	84	67-120	3	30
Phenanthrene	N.D.	0.00067	mg/kg	76	81	76-120	6	30
Pyrene	N.D.	0.00067	mg/kg	87	93	71-120	6	30
Batch number: 12173A31B	Sample number(s): 6692924-6692932							
Benzene	N.D.	0.0050	mg/kg	103	101	76-118	2	30
Ethylbenzene	N.D.	0.0050	mg/kg	103	102	77-115	1	30
NWTPH-Gx soil C7-C12	N.D.	1.0	mg/kg	91	91	67-119	1	30
Toluene	N.D.	0.0050	mg/kg	102	101	80-120	1	30
Total Xylenes	N.D.	0.015	mg/kg	101	100	78-115	1	30
Batch number: 12173A31D	Sample number(s): 6692924-6692927,6692929							
Benzene	N.D.	0.0050	mg/kg	103	101	76-118	2	30
Ethylbenzene	N.D.	0.0050	mg/kg	103	102	77-115	1	30
NWTPH-Gx soil C7-C12	N.D.	1.0	mg/kg	91	91	67-119	1	30
Toluene	N.D.	0.0050	mg/kg	102	101	80-120	1	30
Total Xylenes	N.D.	0.015	mg/kg	101	100	78-115	1	30
Batch number: 121730026A	Sample number(s): 6692924-6692932							
DRO C12-C24 w/Si Gel	N.D.	3.0	mg/kg	69		50-133		
HRO C24-C40 w/Si Gel	N.D.	10.	mg/kg					
Batch number: 12177820005A	Sample number(s): 6692924-6692932							
Moisture				100		99-101		

Sample Matrix Quality Control

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: Chevron Environmental Mgmt Co Group Number: 1316824
Reported: 07/11/12 at 01:31 PM
Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 121730026A	Sample number(s): 6692924-6692932					BKG: 6692924			
DRO C12-C24 w/Si Gel						9.7	9.1	7 (1)	20
HRO C24-C40 w/Si Gel						19	18	8 (1)	20
Batch number: 12177820005A	Sample number(s): 6692924-6692932					BKG: P693801			
Moisture						17.5	18.2	4	13

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed
unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: PAH SIM 8270 Soil Microwave
Batch number: 12188SLA026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
6692929	76	73	140*
Blank	76	79	78
LCS	83	85	84
LCSD	86	89	86
Limits:	70-130	70-130	70-130

Analysis Name: NWTPH-Gx soil C7-C12
Batch number: 12173A31B

	Trifluorotoluene-F	Trifluorotoluene-P
6692924	76	
6692925	65	
6692926		161*
6692927		79
6692928	88	88
6692929	93	
6692930	90	86
6692931	72	79
6692932	79	83
Blank	100	107
LCS	92	101
LCSD	91	101
Limits:	61-122	73-117

Analysis Name: NWTPH-Gx soil C7-C12
Batch number: 12173A31D

	Trifluorotoluene-F	Trifluorotoluene-P
6692924		82
6692925		61*
6692926	143*	

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: Chevron Environmental Mgmt Co Group Number: 1316824
Reported: 07/11/12 at 01:31 PM

Surrogate Quality Control

6692927	80	
6692929		95
Blank	96	99
LCS	92	101
LCSD	91	101
Limits:	61-122	73-117

Analysis Name: NWTPH-Dx soil w/ 10g Si Gel
Batch number: 121730026A

	Orthoterphenyl
6692924	83
6692925	110
6692926	98
6692927	94
6692928	225*
6692929	280*
6692930	85
6692931	261*
6692932	86
Blank	87
DUP	86
LCS	90
Limits:	50-150

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Chevron Northwest Region Analysis Request/Chain of Custody

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Acct. # 11904 Group # 1316824 For Lancaster Laboratories use only Sample # 6692924-32

Instructions on reverse side correspond with circled numbers.

SCR #: _____

1 Client Information

Facility # Edmonds Terminal WBS

Site Address 11720 Unoco Rd Edmonds WA

Chevron PM TCM Jolitz Lead Consultant ARCADIS

Consultant/Office ARCADIS / Seattle

Consultant Project Mgr. Rebecca Andresen

Consultant Phone # 206-325-5254

Sampler DR and TP

2 Sample Identification

Sample Identification	Collected Date	Collected Time	3 Grab	3 Composite
MW-531-12	6/18/12	910		
MW-525-10.5		1020		
MW-525-12.5		1030		
Dup-1		—		
MW-532-6		1210		
MW-532-7		1215		
MW-532-10	* 1225	~~1235~~		
MW-532-13.5		1230		
MW-526-12.5		1410		

4 Matrix

Soil | Sediment | Water | Ground | Potable | NPDES | Surface | Oil | Air

Total Number of Containers: 5

5 Analyses Requested

BTEX + 8260 | 8021 | Naphth | 8260 full scan | Oxygenates | NWTPH GX | NWTPH DX | Silica Gel Cleanup | Lead | Total | Diss. | Method | WAVPH | WAEPH | PAH 8270 SIM

- ☐ Results in Dry Weight
- ☐ J value reporting needed
- ☐ Must meet lowest detection limits possible for 8260 compounds
- ☐ 8021 MTBE Confirmation
- ☐ Confirm MTBE + Naphthalene
- ☐ Confirm highest hit by 8260
- ☐ Confirm all hits by 8260
- ☐ Run _____ oxy's on highest hit
- ☐ Run _____ oxy's on all hits

*collection time updated per D. Rasar. jmp 6/20/12.

6 Remarks

HOLD all PAH PAHs on MW-532-7 only per S. Zom. jmp 7/6/12 pending Dx analysis results

Extract + hold for PAH's per D. Rasar. jmp 6/20/12

7 Turnaround Time Requested (TAT) (please circle)

Standard | 5 day | 4 day | 72 hour | 48 hour | 24 hour

8 Data Package Options (please circle if required)

Type I - Full | Type VI (Raw Data)

Relinquished by	Date	Time	Received by	Date	Time
[signature]	6/18/12	1600	FedEx	6/18/12	1600

Relinquished by Commercial Carrier: UPS ____ FedEx X Other ____

Received by [signature] Date 6/19/12 Time 430

Temperature Upon Receipt 3.1 °C

Custody Seals Intact? Yes No

9

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		**Inorganic Qualifiers**	
A	TIC is a possible aldol-condensation product	**B**	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	**E**	Estimated due to interference
C	Pesticide result confirmed by GC/MS	**M**	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	**N**	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	**S**	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	**U**	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	**W**	Post digestion spike out of control limits
U	Compound was not detected	*****	Duplicate analysis not within control limits
X,Y,Z	Defined in case narrative	**+**	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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ANALYTICAL RESULTS

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

Prepared for:

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

July 11, 2012

Project: Edmonds Terminal

Submittal Date: 06/23/2012
Group Number: 1317915
PO Number: 0015093389
Release Number: ALBAN
State of Sample Origin: WA

Client Sample Description	Lancaster Labs (LLI) #
MW-528-15 Grab Soil Sample	6699455
MW-528-17 Grab Soil Sample	6699456
MW-527-9 Grab Soil Sample	6699457
MW-527-12 Grab Soil Sample	6699458
MW-527-13.5 Grab Soil Sample	6699459
MW-527-17 Grab Soil Sample	6699460
DUP-2 Grab Soil Sample	6699461

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	Arcadis	Attn: Rebecca Andresen
ELECTRONIC COPY TO	Arcadis	Attn: Scott Zorn
ELECTRONIC COPY TO	Arcadis	Attn: Dave Rasar

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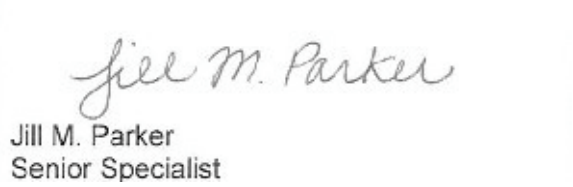
Respectfully Submitted,



Jill M. Parker
Senior Specialist

(717) 556-7262

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Analysis Report

Sample Description: MW-528-15 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6699455
LLI Group # 1317915
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/22/2012 09:10 by DR

Submitted: 06/23/2012 09:30
Reported: 07/11/2012 16:55

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

52815

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	70	5.1	109.25
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	N.D.	0.025	109.25
08179	Ethylbenzene	100-41-4	N.D.	0.025	109.25
08179	Toluene	108-88-3	N.D.	0.025	109.25
08179	Total Xylenes	1330-20-7	N.D.	0.076	109.25
	Reporting limits were raised due to sample foaming.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	190	3.5	1
12006	HRO C24-C40 w/Si Gel	n.a.	180	12	1
	The reverse surrogate, capric acid, is present at <1%.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	13.5	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12180A16B	06/29/2012 18:24	Laura M Krieger	109.25
08179	BTEX by 8021	SW-846 8021B	1	12180A16B	06/29/2012 18:24	Laura M Krieger	109.25
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217528026	06/22/2012 09:10	Client Supplied	n.a.
06647	GC-5g Field Preserved MeOH	SW-846 5035A	2	201217528026	06/22/2012 09:10	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121790015A	07/06/2012 17:57	Glorines Suarez-Rivera	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121790015A	06/28/2012 12:35	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12179820009B	06/27/2012 12:39	Vincent J Norton	1

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Analysis Report

Sample Description: MW-528-17 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6699456
LLI Group # 1317915
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/22/2012 09:20 by DR

Submitted: 06/23/2012 09:30
Reported: 07/11/2012 16:55

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

52817

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	N.D.	2.1	33.94
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	0.078	0.011	33.94
08179	Ethylbenzene	100-41-4	0.063	0.011	33.94
08179	Toluene	108-88-3	0.067	0.011	33.94
08179	Total Xylenes	1330-20-7	0.19	0.032	33.94
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	N.D.	4.7	1
12006	HRO C24-C40 w/Si Gel	n.a.	N.D.	16	1
	The reverse surrogate, capric acid, is present at <1%.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	36.2	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

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All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12180A16B	06/29/2012 17:37	Laura M Krieger	33.94
08179	BTEX by 8021	SW-846 8021B	1	12180A16B	06/29/2012 17:37	Laura M Krieger	33.94
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217528026	06/22/2012 09:20	Client Supplied	n.a.
06647	GC-5g Field Preserved MeOH	SW-846 5035A	2	201217528026	06/22/2012 09:20	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121790015A	07/06/2012 16:53	Glorines Suarez-Rivera	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121790015A	06/28/2012 12:35	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12179820009B	06/27/2012 12:39	Vincent J Norton	1

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Analysis Report

Sample Description: MW-527-9 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6699457
LLI Group # 1317915
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/22/2012 10:30 by DR

Submitted: 06/23/2012 09:30
Reported: 07/11/2012 16:55

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

52709

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	N.D.	11	231.19
	Reporting limits were raised due to sample foaming.				
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	N.D.	0.053	231.19
08179	Ethylbenzene	100-41-4	N.D.	0.053	231.19
08179	Toluene	108-88-3	N.D.	0.053	231.19
08179	Total Xylenes	1330-20-7	N.D.	0.16	231.19
	Reporting limits were raised due to sample foaming.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	240	3.4	1
12006	HRO C24-C40 w/Si Gel	n.a.	390	11	1
	The reverse surrogate, capric acid, is present at <1%.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	12.3	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12180A16B	06/29/2012 19:39	Laura M Krieger	231.19
08179	BTEX by 8021	SW-846 8021B	1	12180A16B	06/29/2012 19:39	Laura M Krieger	231.19
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217528026	06/22/2012 10:30	Client Supplied	n.a.
06647	GC-5g Field Preserved MeOH	SW-846 5035A	2	201217528026	06/22/2012 10:30	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121790015A	07/06/2012 18:18	Glorines Suarez-Rivera	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121790015A	06/28/2012 12:35	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12179820009B	06/27/2012 12:39	Vincent J Norton	1

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Analysis Report

Sample Description: MW-527-12 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6699458
LLI Group # 1317915
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/22/2012 10:45 by DR

Submitted: 06/23/2012 09:30
Reported: 07/11/2012 16:55

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

52712

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	96	21	458.05
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	N.D.	0.11	458.05
08179	Ethylbenzene	100-41-4	N.D.	0.11	458.05
08179	Toluene	108-88-3	N.D.	0.11	458.05
08179	Total Xylenes	1330-20-7	N.D.	0.32	458.05
	Reporting limits were raised due to sample foaming.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	220	17	5
12006	HRO C24-C40 w/Si Gel	n.a.	400	58	5
	The reverse surrogate, capric acid, is present at <1%.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	13.8	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12180A16B	06/29/2012 19:01	Laura M Krieger	458.05
08179	BTEX by 8021	SW-846 8021B	1	12180A16B	06/29/2012 19:01	Laura M Krieger	458.05
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217528026	06/22/2012 10:45	Client Supplied	n.a.
06647	GC-5g Field Preserved MeOH	SW-846 5035A	2	201217528026	06/22/2012 10:45	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121790015A	07/06/2012 19:48	Glorines Suarez-Rivera	5
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121790015A	06/28/2012 12:35	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12179820009B	06/27/2012 12:39	Vincent J Norton	1

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Analysis Report

Sample Description: MW-527-13.5 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6699459
LLI Group # 1317915
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/22/2012 10:50 by DR

Submitted: 06/23/2012 09:30
Reported: 07/11/2012 16:55

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

52713

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	N.D.	21	352.12
	Reporting limits were raised due to sample foaming.				
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	N.D.	0.11	352.12
08179	Ethylbenzene	100-41-4	N.D.	0.11	352.12
08179	Toluene	108-88-3	N.D.	0.11	352.12
08179	Total Xylenes	1330-20-7	N.D.	0.32	352.12
	Reporting limits were raised due to sample foaming.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	990	23	5
12006	HRO C24-C40 w/Si Gel	n.a.	620	76	5
	The reverse surrogate, capric acid, is present at <1%.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	34.0	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12180A16B	06/29/2012 20:17	Laura M Krieger	352.12
08179	BTEX by 8021	SW-846 8021B	1	12180A16B	06/29/2012 20:17	Laura M Krieger	352.12
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217528026	06/22/2012 10:50	Client Supplied	n.a.
06647	GC-5g Field Preserved MeOH	SW-846 5035A	2	201217528026	06/22/2012 10:50	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121790015A	07/06/2012 20:09	Glorines Suarez-Rivera	5
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121790015A	06/28/2012 12:35	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12179820009B	06/27/2012 12:39	Vincent J Norton	1

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Analysis Report

Sample Description: MW-527-17 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6699460
LLI Group # 1317915
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/22/2012 11:05 by DR

Submitted: 06/23/2012 09:30
Reported: 07/11/2012 16:55

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

52717

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	N.D.	14	266.16
	Reporting limits were raised due to sample foaming.				
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	N.D.	0.068	266.16
08179	Ethylbenzene	100-41-4	N.D.	0.068	266.16
08179	Toluene	108-88-3	N.D.	0.068	266.16
08179	Total Xylenes	1330-20-7	N.D.	0.20	266.16
	Reporting limits were raised due to sample foaming.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	N.D.	3.8	1
12006	HRO C24-C40 w/Si Gel	n.a.	N.D.	13	1
	The reverse surrogate, capric acid, is present at <1%.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	21.9	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12180A16B	06/29/2012 20:54	Laura M Krieger	266.16
08179	BTEX by 8021	SW-846 8021B	1	12180A16B	06/29/2012 20:54	Laura M Krieger	266.16
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217528026	06/22/2012 11:05	Client Supplied	n.a.
06647	GC-5g Field Preserved MeOH	SW-846 5035A	2	201217528026	06/22/2012 11:05	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121790015A	07/06/2012 17:14	Glorines Suarez-Rivera	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121790015A	06/28/2012 12:35	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12179820009B	06/27/2012 12:39	Vincent J Norton	1

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Analysis Report

Sample Description: DUP-2 Grab Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6699461
LLI Group # 1317915
Account # 11964

Project Name: Edmonds Terminal

Collected: 06/22/2012 by DR

Submitted: 06/23/2012 09:30
Reported: 07/11/2012 16:55

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

527FD

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02006	NWTPH-Gx soil C7-C12	n.a.	N.D.	14	270.26
	Reporting limits were raised due to sample foaming.				
GC Volatiles	**SW-846 8021B**		**mg/kg**	**mg/kg**	
08179	Benzene	71-43-2	N.D.	0.070	270.26
08179	Ethylbenzene	100-41-4	N.D.	0.070	270.26
08179	Toluene	108-88-3	N.D.	0.070	270.26
08179	Total Xylenes	1330-20-7	N.D.	0.21	270.26
	Reporting limits were raised due to sample foaming.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	N.D.	3.9	1
12006	HRO C24-C40 w/Si Gel	n.a.	N.D.	13	1
	The reverse surrogate, capric acid, is present at <1%.				
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	23.1	0.50	1
	"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.				

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12180SLC026	06/29/2012 10:00	Olivia Arosemena	1
02006	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12180A16B	06/29/2012 21:32	Laura M Krieger	270.26
08179	BTEX by 8021	SW-846 8021B	1	12180A16B	06/29/2012 21:32	Laura M Krieger	270.26
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201217528026	06/22/2012 00:00	Client Supplied	n.a.
06647	GC-5g Field Preserved MeOH	SW-846 5035A	2	201217528026	06/22/2012 00:00	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	121790015A	07/06/2012 17:36	Glorines Suarez-Rivera	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	121790015A	06/28/2012 12:35	Denise L Trimby	1
00111	Moisture	SM20 2540 G	1	12179820009B	06/27/2012 12:39	Vincent J Norton	1

Quality Control Summary

Client Name: Chevron Environmental Mgmt Co Group Number: 1317915
Reported: 07/11/12 at 04:55 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: 12180A16B	Sample number(s): 6699455-6699461							
Benzene	N.D.	0.0050	mg/kg	101		76-118		
Ethylbenzene	N.D.	0.0050	mg/kg	89		77-115		
NWTPH-Gx soil C7-C12	N.D.	1.0	mg/kg	87	86	67-119	1	30
Toluene	N.D.	0.0050	mg/kg	98		80-120		
Total Xylenes	N.D.	0.015	mg/kg	92		78-115		
Batch number: 121790015A	Sample number(s): 6699455-6699461							
DRO C12-C24 w/Si Gel	N.D.	3.0	mg/kg	75		50-133		
HRO C24-C40 w/Si Gel	N.D.	10.	mg/kg					
Batch number: 12179820009B	Sample number(s): 6699455-6699461							
Moisture				100		99-101		

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: 12180A16B	Sample number(s): 6699455-6699461 UNSPK: P701210								
Benzene	111	110	52-135	3	30				
Ethylbenzene	91	92	56-132	1	30				
Toluene	105	103	59-129	5	30				
Total Xylenes	89	93	66-112	1	30				
Batch number: 12179820009B	Sample number(s): 6699455-6699461 BKG: 6699456								
Moisture						36.2	35.1	3	13

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: NWTPH-Gx soil C7-C12
Batch number: 12180A16B

	Trifluorotoluene-F	Trifluorotoluene-P

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: Chevron Environmental Mgmt Co Group Number: 1317915
Reported: 07/11/12 at 04:55 PM

Surrogate Quality Control

6699455	84	99
6699456	58*	75
6699457	45*	54*
6699458	63	79
6699459	43*	51*
6699460	52*	63*
6699461	64	76
Blank	86	100
LCS	90	98
LCSD	88	
MS		93
MSD		88
Limits:	61-122	73-117

Analysis Name: NWTPH-Dx soil w/ 10g Si Gel
Batch number: 121790015A

	Orthoterphenyl
6699455	104
6699456	86
6699457	99
6699458	89
6699459	114
6699460	100
6699461	105
Blank	106
LCS	108
Limits:	50-150

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Chevron Northwest Region Analysis Request/Chain of Custody

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Acct. # 119164 Group # 1317915 For Lancaster Laboratories use only Sample # 6699455-61

Instructions on reverse side correspond with circled numbers.

1 Client Information

Facility # Edmonds Terminal WBS

Site Address 11720 Unocal Rd, Edmonds WA

Chevron PM Kim Jolitz Lead Consultant ARCADIS

Consultant/Office ARCADIS / Seattle

Consultant Project Mgr. Rebecca Andresen

Consultant Phone # 206-325-5254

Sampler OR / TP

2 Sample Identification

Sample Identification	Collected Date	Collected Time	3 Grab	3 Composite	4 Matrix: Soil	Water	Sediment	Potable	Ground	NPDES	Surface	Air	Oil	Total Number of Containers	5 Analyses Requested: BTEX + MTBE	8260 full scan	Oxygenates	NWTPH GX	NWTPH DX	Silica Gel Cleanup	Lead	Total	Diss.	Method	WAVPH	PAH - 8270 SIM
MW-528-15	6/22/12	910	X		X									4	X			X	X							X
MW-528-17		920																								
MW-527-9		1030																								
MW-527-12		1045																								
MW-527-13.5		1050																								
MW-527-17		1105																								
Dup-2		—																								

6 Remarks

extract and hold PAH pending Dx results

page 1 of 1

SCR #: _____

- ☐ Results in Dry Weight
- ☐ J value reporting needed
- ☐ Must meet lowest detection limits possible for 8260 compounds
- ☐ 8021 MTBE Confirmation
- ☐ Confirm MTBE + Naphthalene
- ☐ Confirm highest hit by 8260
- ☐ Confirm all hits by 8260
- ☐ Run _____ oxy's on highest hit
- ☐ Run _____ oxy's on all hits

7 Turnaround Time Requested (TAT) (please circle)

Standard | 5 day | 4 day | 72 hour | 48 hour | 24 hour

8 Data Package Options (please circle if required)

Type I - Full | Type VI (Raw Data)

9	Relinquished by	Date	Time	Received by	Date	Time
	ARCADIS	6/22/12	1330	FedEx 1330	6/22/12	1330
	Relinquished by	Date	Time	Received by	Date	Time
	Relinquished by Commerical Carrier: UPS ____ FedEx X Other ____			Received by	6/23/12	930
	Temperature Upon Receipt 1.7 °C			Custody Seals Intact? Yes / No		

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		**Inorganic Qualifiers**	
A	TIC is a possible aldol-condensation product	**B**	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	**E**	Estimated due to interference
C	Pesticide result confirmed by GC/MS	**M**	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	**N**	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	**S**	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	**U**	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	**W**	Post digestion spike out of control limits
U	Compound was not detected	*****	Duplicate analysis not within control limits
X,Y,Z	Defined in case narrative	**+**	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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Appendix D

Standard Operating Procedure:
Sediment Sample Collection

ARCADIS
Infrastructure, environment, facilities

Imagine the result

Sediment Sampling

Rev. #: 0

Rev Date: July 29, 2003

Approval Signatures

Prepared by: _____ Date: _____

Reviewed by: _____ Date: _____
(Technical Expert)

Reviewed by: _____ Date: _____
(Project Manager)

I. Scope and Application

This Standard Operating Procedure (SOP) sets forth the field procedures for collection of sediment via Lexan tubing and grab samples using a hand-held dredge.

II. Personnel Qualifications

To be completed by Preparer and reviewed by Technical Expert.

III. Equipment List

The following materials will be available, as required, during sediment sampling:

- health and safety equipment (as required by the site Health and Safety Plan [HASP]);
- cleaning equipment;
- disposable aluminum pans;
- disposable spatulas;
- appropriate sample containers and forms;
- coolers with ice;
- field notebook;
- anchor;
- boat and motor;
- rope;
- survey's rod;
- duct tape;
- Lexan tubing with end caps;
- push rod;

- hacksaw;
- steel core driver;
- vacuum pump;
- piston sampler/check valve push core device; and
- 6-foot rule.

IV. Cautions

To be completed by Preparer and reviewed by Technical Expert.

V. Health and Safety Considerations

To be completed by Preparer and reviewed by Technical Expert.

VI. Procedures

The following procedures will be used to collect sediment samples:

1. Don health and safety equipment (as required in the HASP).
2. Clean reusable sampling equipment as follows: non-phosphate detergent and distilled water wash; distilled water rinse; rinse equipment with solvent (hexane); distilled water rinse; allow to air dry and wrap in aluminum foil.
3. Use GPS surveying techniques to locate the proposed sample location and position the boat with anchors.
4. Identify the proposed sample location in the field notebook, along with other appropriate information collected during sediment sampling activities.
5. Measure the total depth of the water using a surveyor's rod to the nearest 0.1 foot.
6. At each sample location, lower a section of Lexan tube until it just reaches the top of the sediment (sections of Lexan tube may need to be spliced together or the Lexan tube may be attached to a check valve core device).

7. Push the Lexan tube with a straight vertical entry into the sediment so as to secure a reliably representative core sample. Measure the depth of sediment.

8. Drive the tube several inches more using a steel core drive and measure the additional distance. (This procedure is performed to obtain a “plug” at the bottom of the core and prevent the loose sediment from escaping.)

9. Place a vacuum pump on the top end of the Lexan tube and create a vacuum to prevent the sediment from escaping (note this is not needed if using a check valve core device).

10. Slowly pull the tube from the sediment, twisting it slightly as it is removed (if necessary).

11. Before the tube is fully removed from the water, place a cap on the bottom end of the tube while it is still submerged.

12. Keeping the tube upright, wipe the bottom end dry and seal the end with duct tape and label. Measure the length of sediment recovered and evaluate the integrity of the core. If additional cores are necessary to obtain a sufficient sample, repeat the coring procedure at the location adjacent to the previous one sampled.

13. While keeping the core upright, use a hacksaw to make a horizontal cut in the tube approximately 1 inch above the sediment.

14. Recap the cut end of the tube, seal the cap with duct tape, and mark this end as “top.”

15. Wipe the tube dry.

16. If sample sectioning is required, slice tube open or push sediment from tube and slice according to appropriate segmenting scheme (i.e., every 2 inches in cap material and 0 to 3 inches in native sediment).

17. Homogenize samples in a disposable aluminum pan.

18. Place homogenized sample in appropriate sample containers and cap.

19. Label all sample containers.

20. Place filled sample containers on ice in a cooler.

21. Follow procedures for packing, handling, and shipping with associated chain-of-custody procedures.

22. Record required information on the appropriate forms and/or field notebook.

23. Field duplicate and matrix spike/matrix spike duplicate (MS/MSD) samples will be obtained for every 20 sediment samples collected.

24. As an alternative sampling method, Steps 6 through 15 may be replaced with Steps a through g, as follows:

    a. At each sample location, drop open dredge from side of boat making sure that the end of the rope is maintained at all times.

    b. Once the dredge has been allowed to settle into the bottom sediment, a hard pull on the rope will close the sediment inside the dredge.

    c. Retrieve the dredge into the boat.

    d. Open the dredge to allow the sediment to empty onto a stainless steel tray or bowl.

    e. Multiple casts will be made and composited at each location until sufficient sample volume is obtained.

    f. Observe the sample and record descriptions in the field notebook.

    g. If chemical laboratory analyses are being performed, rinse blanks will be obtained by pouring deionized water through a cleaned stainless steel dredge onto a cleaned stainless steel tray. From the tray, the appropriate sample containers will be filled. Rinse blanks should be collected at the start and finish of sampling activities.

VII. Data Recording and Project Management

To be completed by Preparer and reviewed by Technical Expert.

VIII. Quality Assurance

To be completed by Preparer and reviewed by Technical Expert.

IX. References

To be completed by Preparer and reviewed by Technical Expert.

ARCADIS

Appendix E

Laboratory Analytical Data Reports – June 2012 Sediment Sampling

(Analytical Reports available on attached CD)

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Analysis Report

ANALYTICAL RESULTS

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

Prepared for:

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

August 07, 2012

Project: Edmonds Terminal

Submittal Date: 07/31/2012
Group Number: 1325435
PO Number: 0015093389
Release Number: ALBAN
State of Sample Origin: WA

Client Sample Description	Lancaster Labs (LLI) #
US-100 Composite Soil Sample	6738023
US-101 Composite Soil Sample	6738024
US-102 Composite Soil Sample	6738025
DUP-1 Composite Soil Sample	6738026

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	Arcadis	Attn: Rebecca Andresen
ELECTRONIC COPY TO	Arcadis	Attn: Scott Zorn
ELECTRONIC COPY TO	Arcadis	Attn: Dave Rasar

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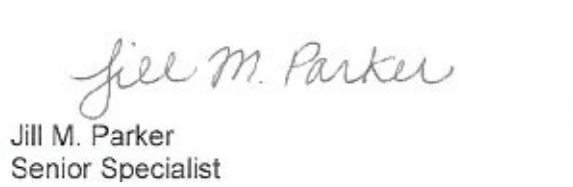
Respectfully Submitted,



Jill M. Parker
Senior Specialist

(717) 556-7262

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Analysis Report

Sample Description: US-100 Composite Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6738023
LLI Group # 1325435
Account # 11964

Project Name: Edmonds Terminal

Collected: 07/30/2012 09:15 by DR

Submitted: 07/31/2012 09:40
Reported: 08/07/2012 13:59

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

US100

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**mg/kg**	**mg/kg**	
10237	Benzene	71-43-2	N.D.	0.002	1.42
10237	Ethylbenzene	100-41-4	N.D.	0.004	1.42
10237	Toluene	108-88-3	N.D.	0.004	1.42
10237	Xylene (Total)	1330-20-7	N.D.	0.004	1.42
GC/MS Semivolatiles	**SW-846 8270C SIM**		**mg/kg**	**mg/kg**	
10722	Acenaphthene	83-32-9	N.D.	0.0051	1
10722	Acenaphthylene	208-96-8	0.011	0.0026	1
10722	Anthracene	120-12-7	0.0086	0.0026	1
10722	Benzo(a)anthracene	56-55-3	0.012	0.0051	1
10722	Benzo(a)pyrene	50-32-8	0.013	0.0051	1
10722	Benzo(b)fluoranthene	205-99-2	0.022	0.0051	1
10722	Benzo(g,h,i)perylene	191-24-2	0.017	0.0051	1
10722	Benzo(k)fluoranthene	207-08-9	0.0070	0.0051	1
10722	Chrysene	218-01-9	0.018	0.0026	1
10722	Dibenz(a,h)anthracene	53-70-3	N.D.	0.0051	1
10722	Fluoranthene	206-44-0	0.046	0.0051	1
10722	Fluorene	86-73-7	0.0086	0.0051	1
10722	Indeno(1,2,3-cd)pyrene	193-39-5	0.013	0.0051	1
10722	Naphthalene	91-20-3	0.056	0.0051	1
10722	Phenanthrene	85-01-8	0.044	0.0051	1
10722	Pyrene	129-00-0	0.045	0.0051	1
	Reporting limits were raised due to interference from the sample matrix.				
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02005	TPH by NWTPH-Gx soils	n.a.	N.D.	45	442.11
	Reporting limits were raised due to sample foaming.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	N.D.	7.7	1
12006	HRO C24-C40 w/Si Gel	n.a.	N.D.	26	1
	The reverse surrogate, capric acid, is present at <1%.				
Metals	**SW-846 6010B**		**mg/kg**	**mg/kg**	
06935	Arsenic	7440-38-2	8.53	0.825	1
06953	Copper	7440-50-8	5.70	0.450	1
06955	Lead	7439-92-1	11.2	1.18	1
06972	Zinc	7440-66-6	51.5	0.500	1
Wet Chemistry	**SW-846 9060 modified**		**mg/kg**	**mg/kg**	
02079	TOC Solids/Sludges Combustion	n.a.	19,200	3,560	1
	EPA 350.3 modified		**mg/kg**	**mg/kg**	
10222	Ammonia-Nitrogen by ISE -solid	7664-41-7	148	8.4	1
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	60.8	0.50	1

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Analysis Report

Sample Description: US-100 Composite Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6738023
LLI Group # 1325435
Account # 11964

Project Name: Edmonds Terminal

Collected: 07/30/2012 09:15 by DR

Submitted: 07/31/2012 09:40
Reported: 08/07/2012 13:59

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

US100

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
Wet Chemistry	**SM20 2540 G**		%	%	

"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10237	BTEX 8260 Soil	SW-846 8260B	1	X122142AA	08/01/2012 18:46	Chelsea B Eastep	1.42
02392	GC/MS - Field Preserved NaHSO4	SW-846 5035A	1	201221328359	07/30/2012 09:15	Client Supplied	1
02392	GC/MS - Field Preserved NaHSO4	SW-846 5035A	2	201221328359	07/30/2012 09:15	Client Supplied	1
07579	GC/MS-5g Field Preserv.MeOH-NC	SW-846 5035A	1	201221328359	07/30/2012 09:15	Client Supplied	1
10722	PAH SIM 8270 Soil Microwave	SW-846 8270C SIM	1	12215SLA026	08/03/2012 02:46	Mark A Clark	1
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12215SLA026	08/02/2012 13:00	Wanda F Oswald	1
02005	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12212A31B	08/01/2012 16:38	Laura M Krieger	442.11
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201221328359	07/30/2012 09:15	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	122130009A	08/01/2012 16:31	Tracy A Cole	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	122130009A	07/31/2012 19:00	Sally L Appleyard	1
06935	Arsenic	SW-846 6010B	1	122135708001	08/01/2012 07:48	Joanne M Gates	1
06953	Copper	SW-846 6010B	1	122135708001	08/01/2012 07:48	Joanne M Gates	1
06955	Lead	SW-846 6010B	1	122135708001	08/01/2012 07:48	Joanne M Gates	1
06972	Zinc	SW-846 6010B	1	122135708001	08/01/2012 07:48	Joanne M Gates	1
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	122135708001	07/31/2012 22:33	Annamaria Stipkovits	1
02079	TOC Solids/Sludges Combustion	SW-846 9060 modified	1	12214049531A	08/01/2012 01:50	James S Mathiot	1
10222	Ammonia-Nitrogen by ISE - solid	EPA 350.3 modified	1	12216102221A	08/03/2012 16:30	Michelle L Lalli	1
10696	Ammonia-Nitrogen ISE Prep	SM20 4500 NH3 B	1	12216102221A	08/03/2012 13:30	Michelle L Lalli	1
00111	Moisture	SM20 2540 G	1	12213820001B	07/31/2012 19:08	Scott W Freisher	1

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Analysis Report

Sample Description: US-101 Composite Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6738024
LLI Group # 1325435
Account # 11964

Project Name: Edmonds Terminal

Collected: 07/30/2012 10:45 by DR

Submitted: 07/31/2012 09:40
Reported: 08/07/2012 13:59

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

US101

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**mg/kg**	**mg/kg**	
10237	Benzene	71-43-2	N.D.	0.004	1.4
10237	Ethylbenzene	100-41-4	N.D.	0.009	1.4
10237	Toluene	108-88-3	N.D.	0.009	1.4
10237	Xylene (Total)	1330-20-7	N.D.	0.009	1.4
GC/MS Semivolatiles	**SW-846 8270C SIM**		**mg/kg**	**mg/kg**	
10722	Acenaphthene	83-32-9	N.D.	0.012	1
10722	Acenaphthylene	208-96-8	0.014	0.0061	1
10722	Anthracene	120-12-7	0.034	0.0061	1
10722	Benzo(a)anthracene	56-55-3	0.16	0.012	1
10722	Benzo(a)pyrene	50-32-8	0.22	0.012	1
10722	Benzo(b)fluoranthene	205-99-2	0.42	0.012	1
10722	Benzo(g,h,i)perylene	191-24-2	0.19	0.012	1
10722	Benzo(k)fluoranthene	207-08-9	0.14	0.012	1
10722	Chrysene	218-01-9	0.28	0.0061	1
10722	Dibenz(a,h)anthracene	53-70-3	0.042	0.012	1
10722	Fluoranthene	206-44-0	0.46	0.012	1
10722	Fluorene	86-73-7	0.059	0.012	1
10722	Indeno(1,2,3-cd)pyrene	193-39-5	0.17	0.012	1
10722	Naphthalene	91-20-3	0.052	0.012	1
10722	Phenanthrene	85-01-8	0.18	0.012	1
10722	Pyrene	129-00-0	0.44	0.012	1
	Reporting limits were raised due to interference from the sample matrix.				
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02005	TPH by NWTPH-Gx soils	n.a.	N.D.	140	561.16
	Reporting limits were raised due to sample foaming.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	29	18	1
12006	HRO C24-C40 w/Si Gel	n.a.	170	61	1
	The reverse surrogate, capric acid, is present at <1%.				
Metals	**SW-846 6010B**		**mg/kg**	**mg/kg**	
06935	Arsenic	7440-38-2	29.1	1.99	1
06953	Copper	7440-50-8	43.6	1.09	1
06955	Lead	7439-92-1	107	2.84	1
06972	Zinc	7440-66-6	319	1.21	1
Wet Chemistry	**SW-846 9060 modified**		**mg/kg**	**mg/kg**	
02079	TOC Solids/Sludges Combustion	n.a.	64,700	14,900	1
	EPA 350.3 modified		**mg/kg**	**mg/kg**	
10222	Ammonia-Nitrogen by ISE -solid	7664-41-7	863	20.1	1
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	83.6	0.50	1

Sample Description: US-101 Composite Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6738024
LLI Group # 1325435
Account # 11964

Project Name: Edmonds Terminal

Collected: 07/30/2012 10:45 by DR

Submitted: 07/31/2012 09:40
Reported: 08/07/2012 13:59

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

US101

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
Wet Chemistry	**SM20 2540 G**		%	%	

"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10237	BTEX 8260 Soil	SW-846 8260B	1	X122142AA	08/01/2012 19:12	Chelsea B Eastep	1.4
02392	GC/MS - Field Preserved NaHSO4	SW-846 5035A	1	201221328359	07/30/2012 10:45	Client Supplied	1
02392	GC/MS - Field Preserved NaHSO4	SW-846 5035A	2	201221328359	07/30/2012 10:45	Client Supplied	1
07579	GC/MS-5g Field Preserv.MeOH-NC	SW-846 5035A	1	201221328359	07/30/2012 10:45	Client Supplied	1
10722	PAH SIM 8270 Soil Microwave	SW-846 8270C SIM	1	12215SLA026	08/03/2012 03:17	Mark A Clark	1
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12215SLA026	08/02/2012 13:00	Wanda F Oswald	1
02005	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12212A31B	08/01/2012 17:30	Laura M Krieger	561.16
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201221328359	07/30/2012 10:45	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	122130009A	08/01/2012 17:19	Tracy A Cole	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	122130009A	07/31/2012 19:00	Sally L Appleyard	1
06935	Arsenic	SW-846 6010B	1	122135708001	08/01/2012 07:52	Joanne M Gates	1
06953	Copper	SW-846 6010B	1	122135708001	08/01/2012 07:52	Joanne M Gates	1
06955	Lead	SW-846 6010B	1	122135708001	08/01/2012 07:52	Joanne M Gates	1
06972	Zinc	SW-846 6010B	1	122135708001	08/01/2012 07:52	Joanne M Gates	1
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	122135708001	07/31/2012 22:33	Annamaria Stipkovits	1
02079	TOC Solids/Sludges Combustion	SW-846 9060 modified	1	12214049531A	08/01/2012 02:15	James S Mathiot	1
10222	Ammonia-Nitrogen by ISE - solid	EPA 350.3 modified	1	12216102221A	08/03/2012 16:30	Michelle L Lalli	1
10696	Ammonia-Nitrogen ISE Prep	SM20 4500 NH3 B	1	12216102221A	08/03/2012 13:30	Michelle L Lalli	1
00111	Moisture	SM20 2540 G	1	12213820001B	07/31/2012 19:08	Scott W Freisher	1

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Analysis Report

Sample Description: US-102 Composite Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6738025
LLI Group # 1325435
Account # 11964

Project Name: Edmonds Terminal

Collected: 07/30/2012 12:10 by DR

Submitted: 07/31/2012 09:40
Reported: 08/07/2012 13:59

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

US102

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**mg/kg**	**mg/kg**	
10237	Benzene	71-43-2	N.D.	0.003	1.23
10237	Ethylbenzene	100-41-4	N.D.	0.005	1.23
10237	Toluene	108-88-3	N.D.	0.005	1.23
10237	Xylene (Total)	1330-20-7	N.D.	0.005	1.23
GC/MS Semivolatiles	**SW-846 8270C SIM**		**mg/kg**	**mg/kg**	
10722	Acenaphthene	83-32-9	N.D.	0.0089	1
10722	Acenaphthylene	208-96-8	0.013	0.0044	1
10722	Anthracene	120-12-7	0.023	0.0044	1
10722	Benzo(a)anthracene	56-55-3	0.061	0.0089	1
10722	Benzo(a)pyrene	50-32-8	0.084	0.0089	1
10722	Benzo(b)fluoranthene	205-99-2	0.15	0.0089	1
10722	Benzo(g,h,i)perylene	191-24-2	0.067	0.0089	1
10722	Benzo(k)fluoranthene	207-08-9	0.060	0.0089	1
10722	Chrysene	218-01-9	0.11	0.0044	1
10722	Dibenz(a,h)anthracene	53-70-3	0.015	0.0089	1
10722	Fluoranthene	206-44-0	0.21	0.0089	1
10722	Fluorene	86-73-7	0.028	0.0089	1
10722	Indeno(1,2,3-cd)pyrene	193-39-5	0.057	0.0089	1
10722	Naphthalene	91-20-3	0.059	0.0089	1
10722	Phenanthrene	85-01-8	0.11	0.0089	1
10722	Pyrene	129-00-0	0.19	0.0089	1
	Reporting limits were raised due to interference from the sample matrix.				
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02005	TPH by NWTPH-Gx soils	n.a.	N.D.	100	566.84
	Reporting limits were raised due to sample foaming.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	17	13	1
12006	HRO C24-C40 w/Si Gel	n.a.	110	44	1
	The reverse surrogate, capric acid, is present at <1%.				
Metals	**SW-846 6010B**		**mg/kg**	**mg/kg**	
06935	Arsenic	7440-38-2	20.2	1.42	1
06953	Copper	7440-50-8	21.6	0.777	1
06955	Lead	7439-92-1	60.6	2.03	1
06972	Zinc	7440-66-6	144	0.863	1
Wet Chemistry	**SW-846 9060 modified**		**mg/kg**	**mg/kg**	
02079	TOC Solids/Sludges Combustion	n.a.	65,200	6,690	1
	EPA 350.3 modified		**mg/kg**	**mg/kg**	
10222	Ammonia-Nitrogen by ISE -solid	7664-41-7	402	14.7	1
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	77.5	0.50	1

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Analysis Report

Sample Description: US-102 Composite Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6738025
LLI Group # 1325435
Account # 11964

Project Name: Edmonds Terminal

Collected: 07/30/2012 12:10 by DR

Submitted: 07/31/2012 09:40
Reported: 08/07/2012 13:59

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

US102

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
Wet Chemistry	**SM20 2540 G**		%	%	

"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10237	BTEX 8260 Soil	SW-846 8260B	1	X122142AA	08/01/2012 19:35	Chelsea B Eastep	1.23
02392	GC/MS - Field Preserved NaHSO4	SW-846 5035A	1	201221328359	07/30/2012 12:10	Client Supplied	1
02392	GC/MS - Field Preserved NaHSO4	SW-846 5035A	2	201221328359	07/30/2012 12:10	Client Supplied	1
07579	GC/MS-5g Field Preserv.MeOH-NC	SW-846 5035A	1	201221328359	07/30/2012 12:10	Client Supplied	1
10722	PAH SIM 8270 Soil Microwave	SW-846 8270C SIM	1	12215SLA026	08/03/2012 03:48	Mark A Clark	1
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12215SLA026	08/02/2012 13:00	Wanda F Oswald	1
02005	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12212A31B	08/01/2012 18:06	Laura M Krieger	566.84
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201221328359	07/30/2012 12:10	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	122130009A	08/01/2012 17:43	Tracy A Cole	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	122130009A	07/31/2012 19:00	Sally L Appleyard	1
06935	Arsenic	SW-846 6010B	1	122135708001	08/01/2012 08:05	Joanne M Gates	1
06953	Copper	SW-846 6010B	1	122135708001	08/01/2012 08:05	Joanne M Gates	1
06955	Lead	SW-846 6010B	1	122135708001	08/01/2012 08:05	Joanne M Gates	1
06972	Zinc	SW-846 6010B	1	122135708001	08/01/2012 08:05	Joanne M Gates	1
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	122135708001	07/31/2012 22:33	Annamaria Stipkovits	1
02079	TOC Solids/Sludges Combustion	SW-846 9060 modified	1	12214049531A	08/01/2012 02:24	James S Mathiot	1
10222	Ammonia-Nitrogen by ISE - solid	EPA 350.3 modified	1	12216102221A	08/03/2012 16:30	Michelle L Lalli	1
10696	Ammonia-Nitrogen ISE Prep	SM20 4500 NH3 B	1	12216102221A	08/03/2012 13:30	Michelle L Lalli	1
00111	Moisture	SM20 2540 G	1	12213820001B	07/31/2012 19:08	Scott W Freisher	1

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Analysis Report

Sample Description: DUP-1 Composite Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6738026
LLI Group # 1325435
Account # 11964

Project Name: Edmonds Terminal

Collected: 07/30/2012 by DR

Submitted: 07/31/2012 09:40
Reported: 08/07/2012 13:59

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

EDMD1

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
GC/MS Volatiles	**SW-846 8260B**		**mg/kg**	**mg/kg**	
10237	Benzene	71-43-2	N.D.	0.001	1.04
10237	Ethylbenzene	100-41-4	N.D.	0.003	1.04
10237	Toluene	108-88-3	N.D.	0.003	1.04
10237	Xylene (Total)	1330-20-7	N.D.	0.003	1.04
GC/MS Semivolatiles	**SW-846 8270C SIM**		**mg/kg**	**mg/kg**	
10722	Acenaphthene	83-32-9	N.D.	0.0050	1
10722	Acenaphthylene	208-96-8	0.0063	0.0025	1
10722	Anthracene	120-12-7	0.0073	0.0025	1
10722	Benzo(a)anthracene	56-55-3	0.012	0.0050	1
10722	Benzo(a)pyrene	50-32-8	0.013	0.0050	1
10722	Benzo(b)fluoranthene	205-99-2	0.023	0.0050	1
10722	Benzo(g,h,i)perylene	191-24-2	0.013	0.0050	1
10722	Benzo(k)fluoranthene	207-08-9	0.0082	0.0050	1
10722	Chrysene	218-01-9	0.019	0.0025	1
10722	Dibenz(a,h)anthracene	53-70-3	N.D.	0.0050	1
10722	Fluoranthene	206-44-0	0.043	0.0050	1
10722	Fluorene	86-73-7	0.0099	0.0050	1
10722	Indeno(1,2,3-cd)pyrene	193-39-5	0.0099	0.0050	1
10722	Naphthalene	91-20-3	0.026	0.0050	1
10722	Phenanthrene	85-01-8	0.036	0.0050	1
10722	Pyrene	129-00-0	0.041	0.0050	1
	Reporting limits were raised due to interference from the sample matrix.				
GC Volatiles	**ECY 97-602 NWTPH-Gx**		**mg/kg**	**mg/kg**	
02005	TPH by NWTPH-Gx soils	n.a.	N.D.	41	409.27
	Reporting limits were raised due to sample foaming.				
GC Petroleum Hydrocarbons w/Si	**ECY 97-602 NWTPH-Dx modified**		**mg/kg**	**mg/kg**	
12006	DRO C12-C24 w/Si Gel	n.a.	11	7.5	1
12006	HRO C24-C40 w/Si Gel	n.a.	59	25	1
	The reverse surrogate, capric acid, is present at <1%.				
Metals	**SW-846 6010B**		**mg/kg**	**mg/kg**	
06935	Arsenic	7440-38-2	6.87	0.797	1
06953	Copper	7440-50-8	5.05	0.435	1
06955	Lead	7439-92-1	10.0	1.14	1
06972	Zinc	7440-66-6	41.4	0.483	1
Wet Chemistry	**SW-846 9060 modified**		**mg/kg**	**mg/kg**	
02079	TOC Solids/Sludges Combustion	n.a.	18,800	2,920	1
	EPA 350.3 modified		**mg/kg**	**mg/kg**	
10222	Ammonia-Nitrogen by ISE -solid	7664-41-7	163	8.3	1
Wet Chemistry	**SM20 2540 G**		**%**	**%**	
00111	Moisture	n.a.	60.2	0.50	1

Sample Description: DUP-1 Composite Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6738026
LLI Group # 1325435
Account # 11964

Project Name: Edmonds Terminal

Collected: 07/30/2012 by DR

Submitted: 07/31/2012 09:40
Reported: 08/07/2012 13:59

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

EDMD1

CAT No.	Analysis Name	CAS Number	Dry Result	Dry Method Detection Limit	Dilution Factor
Wet Chemistry	**SM20 2540 G**		%	%	

"Moisture" represents the loss in weight of the sample after oven drying at 103 - 105 degrees Celsius. The moisture result reported above is on an as-received basis.

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
10237	BTEX 8260 Soil	SW-846 8260B	1	X122142AA	08/01/2012 19:58	Chelsea B Eastep	1.04
02392	GC/MS - Field Preserved NaHSO4	SW-846 5035A	1	201221328359	07/30/2012 00:00	Client Supplied	1
02392	GC/MS - Field Preserved NaHSO4	SW-846 5035A	2	201221328359	07/30/2012 00:00	Client Supplied	1
07579	GC/MS-5g Field Preserv.MeOH-NC	SW-846 5035A	1	201221328359	07/30/2012 00:00	Client Supplied	1
10722	PAH SIM 8270 Soil Microwave	SW-846 8270C SIM	1	12215SLA026	08/03/2012 04:20	Mark A Clark	1
10810	BNA Soil Microwave SIM PAH	SW-846 3546	1	12215SLA026	08/02/2012 13:00	Wanda F Oswald	1
02005	NWTPH-Gx soil C7-C12	ECY 97-602 NWTPH-Gx	1	12212A31B	08/01/2012 18:45	Laura M Krieger	409.27
06647	GC-5g Field Preserved MeOH	SW-846 5035A	1	201221328359	07/30/2012 00:00	Client Supplied	n.a.
12006	NWTPH-Dx soil w/ 10g Si Gel	ECY 97-602 NWTPH-Dx modified	1	122130009A	08/01/2012 18:07	Tracy A Cole	1
12008	NW Dx soil w/ 10g column	ECY 97-602 NWTPH-Dx 06/97	1	122130009A	07/31/2012 19:00	Sally L Appleyard	1
06935	Arsenic	SW-846 6010B	1	122135708001	08/01/2012 08:10	Joanne M Gates	1
06953	Copper	SW-846 6010B	1	122135708001	08/01/2012 08:10	Joanne M Gates	1
06955	Lead	SW-846 6010B	1	122135708001	08/01/2012 08:10	Joanne M Gates	1
06972	Zinc	SW-846 6010B	1	122135708001	08/01/2012 08:10	Joanne M Gates	1
05708	SW SW846 ICP/ICP MS Digest	SW-846 3050B	1	122135708001	07/31/2012 22:33	Annamaria Stipkovits	1
02079	TOC Solids/Sludges Combustion	SW-846 9060 modified	1	12214049531A	08/01/2012 02:32	James S Mathiot	1
10222	Ammonia-Nitrogen by ISE - solid	EPA 350.3 modified	1	12216102221A	08/03/2012 16:30	Michelle L Lalli	1
10696	Ammonia-Nitrogen ISE Prep	SM20 4500 NH3 B	1	12216102221A	08/03/2012 13:30	Michelle L Lalli	1
00111	Moisture	SM20 2540 G	1	12213820001B	07/31/2012 19:08	Scott W Freisher	1

Quality Control Summary

Client Name: Chevron Environmental Mgmt Co Group Number: 1325435
Reported: 08/07/12 at 01:59 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

Analysis Name	Blank Result	Blank MDL	Report Units	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: X122142AA	Sample number(s): 6738023-6738026							
Benzene	N.D.	0.0005	mg/kg	90	96	80-120	6	30
Ethylbenzene	N.D.	0.001	mg/kg	89	94	80-120	6	30
Toluene	N.D.	0.001	mg/kg	88	92	80-120	4	30
Xylene (Total)	N.D.	0.001	mg/kg	93	97	80-120	5	30
Batch number: 12215SLA026	Sample number(s): 6738023-6738026							
Acenaphthene	N.D.	0.00067	mg/kg	81		73-120		
Acenaphthylene	N.D.	0.00033	mg/kg	89		67-120		
Anthracene	N.D.	0.00033	mg/kg	95		61-122		
Benzo(a)anthracene	N.D.	0.00067	mg/kg	96		64-124		
Benzo(a)pyrene	N.D.	0.00067	mg/kg	93		66-122		
Benzo(b)fluoranthene	N.D.	0.00067	mg/kg	103		60-126		
Benzo(g,h,i)perylene	N.D.	0.00067	mg/kg	84		66-130		
Benzo(k)fluoranthene	N.D.	0.00067	mg/kg	87		65-130		
Chrysene	N.D.	0.00033	mg/kg	97		66-121		
Dibenz(a,h)anthracene	N.D.	0.00067	mg/kg	90		69-129		
Fluoranthene	N.D.	0.00067	mg/kg	95		68-119		
Fluorene	N.D.	0.00067	mg/kg	95		66-125		
Indeno(1,2,3-cd)pyrene	N.D.	0.00067	mg/kg	91		66-122		
Naphthalene	N.D.	0.00067	mg/kg	84		67-120		
Phenanthrene	N.D.	0.00067	mg/kg	90		76-120		
Pyrene	N.D.	0.00067	mg/kg	99		60-124		
Batch number: 12212A31B	Sample number(s): 6738023-6738026							
TPH by NWTPH-Gx soils	N.D.	1.0	mg/kg	76		67-119		
Batch number: 122130009A	Sample number(s): 6738023-6738026							
DRO C12-C24 w/Si Gel	N.D.	3.0	mg/kg	62		50-133		
HRO C24-C40 w/Si Gel	N.D.	10.	mg/kg					
Batch number: 122135708001	Sample number(s): 6738023-6738026							
Arsenic	N.D.	0.330	mg/kg	102		80-120		
Copper	N.D.	0.180	mg/kg	102		80-120		
Lead	N.D.	0.470	mg/kg	107		80-120		
Zinc	N.D.	0.200	mg/kg	100		80-120		
Batch number: 12214049531A	Sample number(s): 6738023-6738026							
TOC Solids/Sludges Combustion	N.D.	100.	mg/kg	81	97	22-139	18	20
Batch number: 12216102221A	Sample number(s): 6738023-6738026							
Ammonia-Nitrogen by ISE -solid	6.6	3.3	mg/kg	106		85-115		
Batch number: 12213820001B	Sample number(s): 6738023-6738026							
Moisture				100		99-101		

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: Chevron Environmental Mgmt Co Group Number: 1325435
Reported: 08/07/12 at 01:59 PM

Sample Matrix Quality Control

Unspiked (UNSPK) = the sample used in conjunction with the matrix spike
Background (BKG) = the sample used in conjunction with the duplicate

Analysis Name	MS %REC	MSD %REC	MS/MSD Limits	RPD	RPD MAX	BKG Conc	DUP Conc	DUP RPD	Dup RPD Max
Batch number: X122142AA	Sample number(s): 6738023-6738026 UNSPK: P732275								
Benzene	99		55-143						
Ethylbenzene	97		44-141						
Toluene	98		50-146						
Xylene (Total)	99		44-136						
Batch number: 12215SLA026	Sample number(s): 6738023-6738026 UNSPK: P740463								
Acenaphthene	83	83	37-136	0	30				
Acenaphthylene	89	89	29-133	1	30				
Anthracene	95	98	73-115	2	30				
Benzo(a)anthracene	102	104	32-135	1	30				
Benzo(a)pyrene	95	95	33-145	1	30				
Benzo(b)fluoranthene	94	98	26-142	4	30				
Benzo(g,h,i)perylene	79	81	33-141	3	30				
Benzo(k)fluoranthene	99	101	49-145	2	30				
Chrysene	103	113	23-138	9	30				
Dibenz(a,h)anthracene	87	88	29-138	1	30				
Fluoranthene	106	109	47-135	3	30				
Fluorene	94	97	35-140	2	30				
Indeno(1,2,3-cd)pyrene	91	91	25-136	0	30				
Naphthalene	95	88	31-148	6	30				
Phenanthrene	109	117	62-122	5	30				
Pyrene	100	103	51-131	2	30				
Batch number: 12212A31B	Sample number(s): 6738023-6738026 UNSPK: P733189								
TPH by NWTPH-Gx soils	85	80	39-118	21	30				
Batch number: 122130009A	Sample number(s): 6738023-6738026 BKG: 6738023								
DRO C12-C24 w/Si Gel						N.D.	N.D.	0 (1)	20
HRO C24-C40 w/Si Gel						N.D.	N.D.	0 (1)	20
Batch number: 122135708001	Sample number(s): 6738023-6738026 UNSPK: P738967 BKG: P738967								
Arsenic	97	93	75-125	3	20	5.29	4.72	11 (1)	20
Copper	29*	25*	75-125	3	20	30.9	21.4	36*	20
Lead	96	97	75-125	1	20	11.4	11.7	2	20
Zinc	62*	60*	75-125	2	20	60.9	53.3	13	20
Batch number: 12214049531A	Sample number(s): 6738023-6738026 UNSPK: 6738023 BKG: 6738023								
TOC Solids/Sludges Combustion	118		24-149			7,540	10,900	36* (1)	13
Batch number: 12216102221A	Sample number(s): 6738023-6738026 UNSPK: 6738026 BKG: 6738026								
Ammonia-Nitrogen by ISE -solid	95	92	75-125	1	15	64.9	52.4	21*	15
Batch number: 12213820001B	Sample number(s): 6738023-6738026 BKG: P737509								
Moisture						38.3	37.0	3	13

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Quality Control Summary

Client Name: Chevron Environmental Mgmt Co Group Number: 1325435
Reported: 08/07/12 at 01:59 PM

Surrogate Quality Control

Surrogate recoveries which are outside of the QC window are confirmed
unless attributed to dilution or otherwise noted on the Analysis Report.

Analysis Name: 8260 Ext. Soil Master w/GRO
Batch number: X122142AA

	Dibromofluoromethane	1,2-Dichloroethane-d4	Toluene-d8	4-Bromofluorobenzene
6738023	110	106	99	70
6738024	113	107	99	67
6738025	113	105	98	68
6738026	115	110	102	74
Blank	110	109	87	85
LCS	107	110	98	95
LCSD	105	111	99	94
MS	108	115	101	87
Limits:	50-141	54-135	52-141	50-131

Analysis Name: PAH SIM 8270 Soil Microwave
Batch number: 12215SLA026

	Fluoranthene-d10	Benzo(a)pyrene-d12	1-Methylnaphthalene-d10
6738023	87	96	93
6738024	89	102	95
6738025	88	99	93
6738026	87	97	91
Blank	89	97	91
LCS	93	104	96
MS	102	105	97
MSD	103	106	98
Limits:	63-123	69-120	68-120

Analysis Name: NWTPH-Gx soil C7-C12
Batch number: 12212A31B

	Trifluorotoluene-F
6738023	157*
6738024	78
6738025	75
6738026	69
Blank	84
LCS	87
MS	90
MSD	81
Limits:	61-122

Analysis Name: NWTPH-Dx soil w/ 10g Si Gel
Batch number: 122130009A

	Orthoterphenyl
6738023	54
6738024	76
6738025	59
6738026	87

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

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Quality Control Summary

Client Name: Chevron Environmental Mgmt Co Group Number: 1325435
Reported: 08/07/12 at 01:59 PM

Surrogate Quality Control

Blank	88
DUP	62
LCS	105
Limits:	50-150

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Chevron Northwest Region Analysis Request/Chain of Custody

Lancaster Laboratories
Where quality is a science.

223893

For Lancaster Laboratories use only
Acct. #: 11964 Sample #: 6738023 - 26 SCR#:

1325435

Facility #: Edmonds Terminal
Site Address: 11720 Unocal Rd, Edmonds WA
Chevron PM: Kim Jolitz Lead Consultant: ARCADIS
Consultant/Office: ARCADIS / Seattle
Consultant Prj. Mgr.: Rebecca Andresen
Consultant Phone #: 206-926-4730 Fax #:
Sampler: RR / SLM
Service Order #: B0045382 ☐ Non SAR:

Analyses Requested

Preservation Codes

Preservative Codes
H = HCl T = Thiosulfate
N = HNO_3 B = NaOH
S = H_2SO_4 O = Other

☐ J value reporting needed
☐ Must meet lowest detection limits possible for 8260 compounds

8021 MTBE Confirmation
☐ Confirm MTBE + Naphthalene
☐ Confirm highest hit by 8260
☐ Confirm all hits by 8260
☐ Run ____ oxy s on highest hit
☐ Run ____ oxy s on all hits

Sample Identification	Date Collected	Time Collected	Grab	Composite	Matrix: Soil	Water	Oil ☐ Air ☐	Total Number of Containers	BTEX + ~~MTBE~~ 8021 ☐ 8260 ☒ Naphth ☐	8260 full scan	Oxygenates	NW TPH G	Extended Rng. ☒ Silica Gel Cleanup ☒ NW TPH D	Lead Total ☐ Diss. ☐ Method ____	~~VPHPH~~ Grain Size	NWTPH H HCID ☐ quantification	PAHs 8270 SIM	Zinc, copper, lead, arsenic	Ammonia	TOC
US-100	7/30/12	915		X	X			8	X			X	X		X		X	X	X	X
US-101	7/30/12	1045		X	X			8	X			X	X		X		X	X	X	X
US-102	7/30/12	1210		X	X			8	X			X	X		X		X	X	X	X
Dup-1	7/30/12	—		X	X			8	X			X	X		X		X	X	X	X

Comments / Remarks

48 hr. turn

Grain size will be reported separately.
JNP 7/31/12

Turnaround Time Requested (TAT) (please circle)
STD. TAT 72 hour (48 hour) 24 hour 4 day 5 day

Data Package Options (please circle if required)
QC Summary Type I - Full
Type VI (Raw Data) Disk / EDD
WIP (RWQCB) Standard Format
Disk _____ Other.

Relinquished by:	Date	Time	Received by:	Date	Time
[signature]	7/30/12	1600	FedEx	7/30/12	1600
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by Commercial Carrier: UPS (FedEx) Other ____			Received by: [signature]	7/31/12	0940
Temperature Upon Receipt 3.6 C°			Custody Seals Intact? (Yes) No		

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		**Inorganic Qualifiers**	
A	TIC is a possible aldol-condensation product	**B**	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	**E**	Estimated due to interference
C	Pesticide result confirmed by GC/MS	**M**	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	**N**	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	**S**	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	**U**	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	**W**	Post digestion spike out of control limits
U	Compound was not detected	*****	Duplicate analysis not within control limits
X,Y,Z	Defined in case narrative	**+**	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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Analysis Report

ANALYTICAL RESULTS

Prepared by:

Lancaster Laboratories
2425 New Holland Pike
Lancaster, PA 17605-2425

Prepared for:

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

August 23, 2012

Project: Edmonds Terminal

Submittal Date: 07/31/2012
Group Number: 1325436
PO Number: 0015093389
Release Number: ALBAN
State of Sample Origin: WA

Client Sample Description	Lancaster Labs (LLI) #
US-100 Composite Soil Sample	6738027
US-101 Composite Soil Sample	6738028
US-102 Composite Soil Sample	6738029
DUP-1 Composite Soil Sample	6738030

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

ELECTRONIC COPY TO	Arcadis	Attn: Rebecca Andresen
ELECTRONIC COPY TO	Arcadis	Attn: Scott Zorn
ELECTRONIC COPY TO	Arcadis	Attn: Dave Rasar

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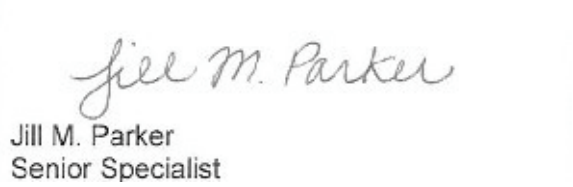
Respectfully Submitted,



Jill M. Parker
Senior Specialist

(717) 556-7262

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Analysis Report

Sample Description: US-100 Composite Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6738027
LLI Group # 1325436
Account # 11964

Project Name: Edmonds Terminal

Collected: 07/30/2012 09:15 by DR

Submitted: 07/31/2012 09:40
Reported: 08/23/2012 12:08

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
Wet Chemistry	**ASTM D422**		% Passing	% Passing	
07103	75 mm	n.a.	100	0.50	1
07103	37.5 mm	n.a.	100	0.50	1
07103	19 mm	n.a.	100	0.50	1
07103	4.75 mm	n.a.	100	0.50	1
07103	3.35 mm	n.a.	99.9	0.50	1
07103	2.36 mm	n.a.	99.8	0.50	1
07103	1.18 mm	n.a.	97.1	0.50	1
07103	0.6 mm	n.a.	84.6	0.50	1
07103	0.3 mm	n.a.	45.9	0.50	1
07103	0.15 mm	n.a.	26.2	0.50	1
07103	0.075 mm	n.a.	20.3	0.50	1
07103	0.064 mm	n.a.	18.5	0.50	1
07103	0.05 mm	n.a.	17.0	0.50	1
07103	0.02 mm	n.a.	9.5	0.50	1
07103	0.005 mm	n.a.	4.0	0.50	1
07103	0.002 mm	n.a.	2.5	0.50	1
07103	0.001 mm	n.a.	1.0	0.50	1

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07103	Grain Size to 1 um	ASTM D422	1	12213710301A	07/31/2012 22:30	Luz M Groff	1

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Analysis Report

Sample Description: US-101 Composite Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6738028
LLI Group # 1325436
Account # 11964

Project Name: Edmonds Terminal

Collected: 07/30/2012 10:45 by DR

Submitted: 07/31/2012 09:40
Reported: 08/23/2012 12:08

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
Wet Chemistry	**ASTM D422**		% Passing	% Passing	
07103	75 mm	n.a.	100	0.50	1
07103	37.5 mm	n.a.	100	0.50	1
07103	19 mm	n.a.	100	0.50	1
07103	4.75 mm	n.a.	99.8	0.50	1
07103	3.35 mm	n.a.	99.6	0.50	1
07103	2.36 mm	n.a.	99.3	0.50	1
07103	1.18 mm	n.a.	96.7	0.50	1
07103	0.6 mm	n.a.	92.9	0.50	1
07103	0.3 mm	n.a.	86.7	0.50	1
07103	0.15 mm	n.a.	82.0	0.50	1
07103	0.075 mm	n.a.	78.7	0.50	1
07103	0.064 mm	n.a.	77.0	0.50	1
07103	0.05 mm	n.a.	73.0	0.50	1
07103	0.02 mm	n.a.	57.0	0.50	1
07103	0.005 mm	n.a.	17.0	0.50	1
07103	0.002 mm	n.a.	8.0	0.50	1
07103	0.001 mm	n.a.	6.0	0.50	1

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07103	Grain Size to 1 um	ASTM D422	1	12213710301A	07/31/2012 22:30	Luz M Groff	1

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Analysis Report

Sample Description: US-102 Composite Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6738029
LLI Group # 1325436
Account # 11964

Project Name: Edmonds Terminal

Collected: 07/30/2012 12:10 by DR

Submitted: 07/31/2012 09:40
Reported: 08/23/2012 12:08

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
Wet Chemistry	**ASTM D422**		% Passing	% Passing	
07103	75 mm	n.a.	100	0.50	1
07103	37.5 mm	n.a.	100	0.50	1
07103	19 mm	n.a.	100	0.50	1
07103	4.75 mm	n.a.	99.9	0.50	1
07103	3.35 mm	n.a.	99.6	0.50	1
07103	2.36 mm	n.a.	99.3	0.50	1
07103	1.18 mm	n.a.	96.5	0.50	1
07103	0.6 mm	n.a.	87.7	0.50	1
07103	0.3 mm	n.a.	56.4	0.50	1
07103	0.15 mm	n.a.	38.7	0.50	1
07103	0.075 mm	n.a.	32.3	0.50	1
07103	0.064 mm	n.a.	31.0	0.50	1
07103	0.05 mm	n.a.	28.0	0.50	1
07103	0.02 mm	n.a.	17.0	0.50	1
07103	0.005 mm	n.a.	8.0	0.50	1
07103	0.002 mm	n.a.	3.5	0.50	1
07103	0.001 mm	n.a.	2.5	0.50	1

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07103	Grain Size to 1 um	ASTM D422	1	12213710301A	07/31/2012 22:30	Luz M Groff	1

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Analysis Report

Sample Description: DUP-1 Composite Soil Sample
Unocal Edmonds Terminal
11720 Unoco Road - Edmonds, WA

LLI Sample # SW 6738030
LLI Group # 1325436
Account # 11964

Project Name: Edmonds Terminal

Collected: 07/30/2012 by DR

Submitted: 07/31/2012 09:40
Reported: 08/23/2012 12:08

Chevron Environmental Mgmt Co
BR1 X5139C
6101 Bollinger Canyon Road
San Ramon CA 94583

CAT No.	Analysis Name	CAS Number	As Received Result	As Received Method Detection Limit	Dilution Factor
Wet Chemistry	**ASTM D422**		% Passing	% Passing	
07103	75 mm	n.a.	100	0.50	1
07103	37.5 mm	n.a.	100	0.50	1
07103	19 mm	n.a.	100	0.50	1
07103	4.75 mm	n.a.	100	0.50	1
07103	3.35 mm	n.a.	99.8	0.50	1
07103	2.36 mm	n.a.	99.5	0.50	1
07103	1.18 mm	n.a.	96.2	0.50	1
07103	0.6 mm	n.a.	84.0	0.50	1
07103	0.3 mm	n.a.	45.6	0.50	1
07103	0.15 mm	n.a.	26.0	0.50	1
07103	0.075 mm	n.a.	20.1	0.50	1
07103	0.064 mm	n.a.	18.0	0.50	1
07103	0.05 mm	n.a.	15.0	0.50	1
07103	0.02 mm	n.a.	9.0	0.50	1
07103	0.005 mm	n.a.	4.0	0.50	1
07103	0.002 mm	n.a.	2.5	0.50	1
07103	0.001 mm	n.a.	1.0	0.50	1

General Sample Comments

State of Washington Lab Certification No. C259

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07103	Grain Size to 1 um	ASTM D422	1	12213710301A	07/31/2012 22:30	Luz M Groff	1

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Quality Control Summary

Client Name: Chevron Environmental Mgmt Co Group Number: 1325436
Reported: 08/23/12 at 12:08 PM

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Laboratory Compliance Quality Control

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.

Chevron Northwest Region Analysis Request/Chain of Custody

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Acct. #: 11964 Sample #: 673827-30 SCR#: 223803

1325436

Facility #: Edmonds Terminal
Site Address: 11720 Unocal Rd, Edmonds WA
Chevron PM: Kim Jolitz Lead Consultant: ARCADIS
Consultant/Office: ARCADIS / Seattle
Consultant Prj. Mgr.: Rebecca Andresen
Consultant Phone #: 206-726-4730 Fax #:
Sampler: RR / SLM
Service Order #: B0045302 ☐ Non SAR:

Sample Identification	Date Collected	Time Collected	Grab	Composite	Matrix: Soil	Matrix: Water	Matrix: Oil ☐ Air ☐	Total Number of Containers	Analyses Requested / Preservation Codes: BTEX + ~~TBE~~ 8021 ☐ 8260 ☒ Naphth ☐	8260 full scan	Oxygenates	NW TPH G	NW TPH D ☒ Extended Rng. ☒ Silica Gel Cleanup	Lead Total ☐ Diss. ☐ Method ____	~~VPHEPH~~ Grain Size	NWTPH H HCID ☐ quantification	PAHs 8270 SIM	Zinc, copper, lead, arsenic	ammonia	TOC
US-100	7/30/12	915		X	X			8	X			X	X		X		X	X	X	X
US-101	7/30/12	1045		X	X			8	X			X	X		X		X	X	X	X
US-102	7/30/12	1210		X	X			8	X			X	X		X		X	X	X	X
Dup-1	7/30/12	—		X	X			8	X			X	X		X		X	X	X	X

Preservative Codes
H = HCl T = Thiosulfate
N = HNO_3 B = NaOH
S = H_2SO_4 O = Other

☐ J value reporting needed
☐ Must meet lowest detection limits possible for 8260 compounds

8021 MTBE Confirmation
☐ Confirm MTBE + Naphthalene
☐ Confirm highest hit by 8260
☐ Confirm all hits by 8260
☐ Run ____ oxy s on highest hit
☐ Run ____ oxy s on all hits

Comments / Remarks

48 hr. turn

Only grain size (on a std. TAT) reported in this sample group
SMP 8/2/12

Turnaround Time Requested (TAT) (please circle)
STD. TAT 72 hour (48 hour) 24 hour 4 day 5 day

Data Package Options (please circle if required)
QC Summary Type I - Full
Type VI (Raw Data) Disk / EDD
WIP (RWQCB) Standard Format
Disk _____ Other.

Relinquished by:	Date	Time	Received by:	Date	Time
DNL	7/30/12	1600	FedEx	7/30/12	1600
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by:	Date	Time	Received by:	Date	Time
Relinquished by Commercial Carrier: UPS (FedEx) Other			Received by:	Date	Time
Temperature Upon Receipt 3.6 C°			Custody Seals Intact? (Yes) No	7/31/12	0940

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

< less than - The number following the sign is the limit of quantitation, the smallest amount of analyte which can be reliably determined using this specific test.

> greater than

ppm parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg), or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter of gas per liter of gas.

ppb parts per billion

Dry weight basis Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Data Qualifiers:

C – result confirmed by reanalysis.

J - estimated value – The result is ≥ the Method Detection Limit (MDL) and < the Limit of Quantitation (LOQ).

U.S. EPA CLP Data Qualifiers:

Organic Qualifiers		**Inorganic Qualifiers**	
A	TIC is a possible aldol-condensation product	**B**	Value is <CRDL, but ≥IDL
B	Analyte was also detected in the blank	**E**	Estimated due to interference
C	Pesticide result confirmed by GC/MS	**M**	Duplicate injection precision not met
D	Compound quantitated on a diluted sample	**N**	Spike sample not within control limits
E	Concentration exceeds the calibration range of the instrument	**S**	Method of standard additions (MSA) used for calculation
N	Presumptive evidence of a compound (TICs only)	**U**	Compound was not detected
P	Concentration difference between primary and confirmation columns >25%	**W**	Post digestion spike out of control limits
U	Compound was not detected	*****	Duplicate analysis not within control limits
X,Y,Z	Defined in case narrative	**+**	Correlation coefficient for MSA <0.995

Analytical test results meet all requirements of NELAC unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff. This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR part 136 Table II as “analyze immediately” are not performed within 15 minutes.

ARCADIS

Appendix F

Groundwater Linear Regression Analysis

TABLE 8
Groundwater Linear Regression Analysis Summary
Unocal Edmonds Bulk Fuel Terminal Lower Yard
11720 Unoco Road
Edmonds, Washington

		Groundwater Data					Linear Regression Analysis							
Well	Constituent	Minimum Concentration (µg/L)	Maximum Concentration (µg/L)	Most Recent Concentration (µg/L)	Percent of Results below Detection (%)	Average CUL (µg/L) [1]	Start Date	End Date	Correlation Coefficient, R^2	p-value of Correlation	Trend Direction	Significant Trend? [2]	Attenuation Rate ($days^{-1}$)	Comments
Point of Compliance Monitoring Wells														
LM-2	Total TPH	72	5,925	78	29	517	10/23/2008	6/29/2012	0.04	4.6E-01	Decreasing	No	NA	less than the average CUL in June 2012
MW-101	Total TPH	72	400	73	41	550	10/22/2008	6/29/2012	0.58	4.0E-04	Decreasing	Yes	1.10E-03	less than the average CUL since 2008
MW-104	Total TPH	73	3,105	131	6	689	10/22/2008	6/28/2012	0.16	1.1E-01	Decreasing	No	NA	less than the average CUL in June 2012
MW-108	Total TPH	72	389	76	53	560	10/23/2008	6/29/2012	NA	NA	NA	NA	NA	53% non-detects; less than the average CUL since 2008
MW-109	Total TPH	73	404	75	82	560	10/23/2008	6/29/2012	NA	NA	NA	NA	NA	82% non-detects; less than the average CUL since 2008
MW-129R	Total TPH	103	4,425	103	0	513	10/24/2008	7/2/2012	0.07	2.9E-01	Decreasing	No	NA	less than the average CUL in July 2012
MW-135	Total TPH	73	2,625	74	29	519	10/27/2008	7/2/2012	0.35	1.3E-02	Decreasing	Yes	1.71E-03	less than the average CUL since Sept. 2011 (4 data points)
MW-136	Total TPH	77	3,725	77	12	516	10/27/2008	7/3/2012	0.37	9.5E-03	Decreasing	Yes	1.70E-03	less than the average CUL in July 2012
MW-139R	Total TPH	72	951	77	47	550	10/22/2008	6/29/2012	0.11	1.9E-01	Decreasing	No	NA	less than the average CUL since Sept. 2011 (4 data points)
MW-147	Total TPH	72	2,720	107	12	589	10/21/2008	6/28/2012	0.44	3.9E-03	Decreasing	Yes	1.77E-03	less than the average CUL since Sept. 2011 (4 data points)
MW-149R	Total TPH	72	775	308	41	540	10/21/2008	6/28/2012	0.17	9.8E-02	Decreasing	Yes	7.42E-04	less than the average CUL since March 2011 (6 data points)
MW-150	Total TPH	73	715	74	35	542	10/21/2008	6/28/2012	0.51	1.2E-03	Decreasing	Yes	1.25E-03	less than the average CUL since Jan. 2010 (10 data points)
MW-20R	Total TPH	74	1,087	74	12	558	10/22/2008	6/28/2012	0.51	1.3E-03	Decreasing	Yes	1.37E-03	less than the average CUL since June 2011 (5 data points)
	Benzene	0.3	55	0.3	12	51	10/22/2008	6/28/2012	0.08	2.7E-01	Decreasing	No	NA	less than the average CUL since April 2009 (14 data points)
MW-500	Total TPH	72	3,000	74	24	542	10/27/2008	7/2/2012	0.48	2.2E-03	Decreasing	Yes	2.01E-03	less than the average CUL since Nov. 2010 (7 data points)
MW-501	Total TPH	72	8,327	77	29	529	10/24/2008	7/2/2012	0.53	8.8E-04	Decreasing	Yes	2.39E-03	less than the average CUL since Nov. 2010 (7 data points)
MW-510	Total TPH	3,980	25,090	LNAPL	0	506	10/23/2008	6/29/2012	NA	NA	NA	NA	NA	LNAPL since Oct. 2010
MW-518	Total TPH	72	1,403	142	6	648	10/22/2008	6/29/2012	0.70	3.0E-05	Decreasing	Yes	1.53E-03	less than the average CUL since June 2011 (5 data points)
MW-522	Total TPH	72	955	72	18	548	10/21/2008	6/28/2012	0.67	6.4E-05	Decreasing	Yes	1.75E-03	less than the average CUL since Jan. 2010 (10 data points)
MW-523	Total TPH	72	431	72	47	550	10/21/2008	6/28/2012	0.34	1.3E-02	Decreasing	Yes	7.93E-04	less than the average CUL since 2008
MW-524	Total TPH	72	445	75	88	561	10/21/2008	6/28/2012	NA	NA	NA	NA	NA	88% non-detects; less than the average CUL since 2008
MW-8R	Total TPH	72	509	75	35	554	10/21/2008	6/28/2012	0.30	2.2E-02	Decreasing	Yes	9.20E-04	less than the average CUL since 2008
Interior Monitoring Wells														
MW-143	Total TPH	77	2,005	77	21	516	10/22/2008	6/29/2012	0.21	9.8E-02	Decreasing	Yes	1.21E-03	less than the average CUL since Dec. 2011 (2 data points)
MW-502	Total TPH	74	1,697	74	7	607	10/24/2008	7/2/2012	0.75	5.8E-05	Decreasing	Yes	2.35E-03	less than the average CUL since July 2010 (5 data points)
MW-503	Total TPH	72	389	74	36	531	10/27/2008	7/2/2012	0.40	1.5E-02	Decreasing	Yes	9.25E-04	less than the average CUL since 2008
MW-504	Total TPH	72	701	75	43	549	10/24/2008	7/2/2012	0.33	3.3E-02	Decreasing	Yes	9.99E-04	less than the average CUL since 2008
MW-505	Total TPH	73	404	77	29	538	10/24/2008	7/2/2012	0.27	5.9E-02	Decreasing	Yes	7.20E-04	less than the average CUL since 2008
MW-506	Total TPH	72	397	75	36	546	10/24/2008	6/29/2012	0.33	3.0E-02	Decreasing	Yes	7.93E-04	less than the average CUL since 2008
MW-507	Total TPH	72	1,142	73	14	536	10/24/2008	6/29/2012	0.75	6.7E-05	Decreasing	Yes	1.81E-03	less than the average CUL since June 2011 (3 data points)
MW-508	Total TPH	73	745	73	43	538	10/24/2008	6/29/2012	0.32	3.5E-02	Decreasing	Yes	1.01E-03	less than the average CUL since Aug. 2009 (9 data points)
MW-509	Total TPH	72	389	74	57	555	10/23/2008	6/29/2012	NA	NA	NA	NA	NA	57% non-detects; less than CUL since 2008
MW-511	Total TPH	72	400	75	64	559	10/24/2008	6/28/2012	NA	NA	NA	NA	NA	64% non-detects; less than CUL since 2008
MW-512	Total TPH	187	748	281	0	585	10/23/2008	6/29/2012	0.46	7.3E-03	Decreasing	Yes	6.84E-04	less than the average CUL since July 2010 (5 data points)
MW-513	Total TPH	159	932	159	0	599	10/23/2008	6/29/2012	0.89	4.4E-07	Decreasing	Yes	1.20E-03	less than the average CUL since Oct. 2009 (8 data points)
MW-514	Total TPH	173	1,578	173	0	634	10/23/2008	6/29/2012	0.94	1.4E-08	Decreasing	Yes	1.50E-03	less than the average CUL since July 2010 (5 data points)
MW-515	Total TPH	72	947	73	14	565	10/22/2008	6/29/2012	0.46	7.3E-03	Decreasing	Yes	1.21E-03	less than the average CUL since 2008
MW-516	Total TPH	72	801	72	43	554	10/22/2008	6/29/2012	0.24	7.4E-02	Decreasing	Yes	9.55E-04	less than the average CUL since 2008
MW-517	Total TPH	72	647	72	13	547	10/22/2008	6/29/2012	0.50	3.3E-03	Decreasing	Yes	1.26E-03	less than the average CUL since Aug. 2009 (10 data points)
MW-519	Total TPH	73	451	76	14	534	10/22/2008	6/28/2012	0.40	1.5E-02	Decreasing	Yes	9.56E-04	less than the average CUL since 2008
MW-520	Total TPH	73	731	73	21	547	10/21/2008	6/28/2012	0.50	4.9E-03	Decreasing	Yes	1.20E-03	less than the average CUL since 2008
MW-521	Total TPH	72	473	72	36	550	10/21/2008	6/28/2012	0.36	2.4E-02	Decreasing	Yes	8.92E-04	less than the average CUL since 2008

Notes:
TPH = Total petroleum hydrocarbons
Total TPH calculated by summing the concentrations of gasoline (GRO), diesel (DRO) and heavy oil (HO); for results that did not exceed method reporting limits, half of the reporting limit was added to determine Total TPH
µg/L = Micrograms per liter
CUL = Cleanup level
NA = Not applicable due to > 50% non-detect results in the data set and/or a trend that is not statistically significant

[1]Average CUL based on calculated CUL values for each location from 2008 through 2012. Sample specific Total TPH CULs are developed by setting a hazard index for all TPH mixtures (GRO, DRO, HO) to 1 and adjusting the compositions relative to their mixtures and MTCA A CULs for groundwater. The calculation used is from Section 5.3 of the Interim Action Report (SLR, 2007) and is as follows: Total TPH CUL = 1/(%GRO/800+%DRO/500+%HO/500). For constituents that are less than detection limits, half of the detection limit was used in the calculation.

[2]Significant trend defined as p-value of 0.10 or less