DRAFT CLEANUP ACTION PLAN (DCAP)

FORMER SHELL OIL TANK FARM SITE
ANACORTES, WASHINGTON

WASHINGTON STATE DEPARTMENT OF ECOLOGY

TOXICS CLEANUP PROGRAM

LACEY, WASHINGTON

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ARAR	Applicable or relevant and appropriate requirement
bgs	Below ground surface
CFR	Code of Federal Regulations
COCs	Chemicals of concern
cPAHs	Carcinogenic polycyclic aromatic hydrocarbons
CSM	Conceptual Site Model
CWA	Clean Water Act
DCA	Disproportionate cost analysis
DCAP	Draft Cleanup Action Plan
DMMP	Dredged Material Management Program
Ecology	Washington State Department of Ecology
FS	Feasibility Study
ft	Feet
GeoEngineers	GeoEngineers Inc.
HPA	Hydraulic Project Approval
mg/kg	Milligram per kilogram
mg/L	Milligrams per liter
MLLW	Mean lower low water
MTCA	Model Toxics Control Act
NWP	Nationwide Permit
PAHs	Polycyclic aromatic hydrocarbons
PLP	Potentially liable parties
Port	Port of Anacortes
RCW	Revised Code of Washington
RI	Remedial Investigation
RI/FS	Remedial investigation/feasibility study
SEPA	State Environmental Policy Act
TCLP	Toxicity characteristic leaching procedure
TEE	Terrestrial Ecological Evaluation
TEQ	Toxicity equivalent
TPH	Total petroleum hydrocarbons
USACE	U.S. Army Corps of Engineers
UST	Underground Storage Tank
WAC	Washington Administrative Code

EXECUTIVE SUMMARY

This document presents the Draft Cleanup Action Plan (DCAP) for upland properties at the former Shell Oil Tank Farm Site (Site) generally located between 13th Street and 14th East of Commercial Avenue in Anacortes, Washington. This DCAP was prepared as a collaborative effort by the Washington State Department of Ecology (Ecology) and the Port of Anacortes (Port; entity responsible for cleanup) pursuant to an Agreed Order meeting the requirements of the Model Toxics Control Cleanup Act (MTCA) administered by Ecology under Chapter 173-340 of the Washington Administrative Code (WAC). This DCAP describes Ecology's proposed cleanup action for the Site and sets forth functional requirements that the cleanup must meet, including follow-up monitoring.

Site Background

The property was acquired by the Port in 1929 and in 1930, leased the property to the Shell Oil Company (Shell) who operated a bulk fuel storage and distribution facility. Fuel (primarily gasoline and diesel) was supplied to the facility from supply lines routed across Q Avenue to a historical fuel dock located within Fidalgo Bay. Prior to 1947, the fuel supply lines hung from a historical pier over the tide flats located east of Q Avenue bulkhead. In the late 1940s to early 1950s, the tide flats east of Q Avenue was filled with dredged material from the adjacent federal waterway behind a second bulkhead constructed near the current Fidalgo Bay shoreline. During this time, the hanging fuel lines were re-configured as underground lines. At the distribution facility, fuel was stored in one of four above ground storage tanks (ASTs) and delivered to fuel trucks from a centrally located fill stand.

In 1987, bulk fuel storage and distribution operations ended and the facility was reportedly decommissioned, including removal of all tanks, and associated piping and structures. Currently, the area occupied by the former Shell Oil Tank Farm is generally flat, surfaced with crushed rock, and is used by the Port as a short-term parking lot for vehicles and boat trailers. The area east of Q Avenue is paved with asphalt and is used by the Port for boat launching and general parking.

Study Background

In 2013, a detailed Remedial Investigation (RI) and Feasibility Study (FS) were prepared by the Port under Ecology's direction. The RI utilized information about the history and environmental conditions of the Site gathered during prior investigations, supplemented with additional environmental investigations, to characterize the nature and extent of contamination. The RI identified petroleum hydrocarbons (gasoline and diesel), carcinogenic polycyclic aromatic hydrocarbons (cPAHs), volatile organic compounds (benzene) and metals (cadmium) in soil at concentrations above preliminary cleanup levels. The RI groundwater sampling and analysis showed that there are no contaminants exceeding the preliminary cleanup levels at the Site.

The FS developed and evaluated cleanup action alternatives for addressing contamination identified at the Site.

Cleanup Action Plan Overview

Based on the findings of the RI/FS Ecology and the Port prepared this DCAP, which provides the following:

- Identifies cleanup levels for soil and groundwater;
- Recommends cleanup actions to achieve these cleanup levels from the options identified in the RI/FS, and describes these actions;
- Presents a schedule to carry out the cleanup; and
- Identifies monitoring activities to demonstrate the effectiveness of the cleanup action.

The following actions are proposed to address soil contamination at the Site:

- Excavate approximately 4,000 in-place cubic yards (cy) of contaminated soil within the readily accessible portion of the Site (i.e., gravel surface within the former Shell Oil Tank Farm) using commonly available excavation techniques. Existing infrastructure (utilities, sidewalks and roads) would remain undisturbed and protected in-place during construction.
- Obtain confirmation soil samples during remedial excavation activities to verify the successful removal of contaminants from within the accessible portion of the Site and document soil conditions at the property boundary.

- Transport and dispose contaminated soil to approved disposal facilities.
- Backfill excavated areas with clean soil. During backfilling activities, an oxygen releasing material would be placed in lifts throughout the saturated and/or smear zone of the backfill to stimulate naturally occurring microbes to enhance biological degradation of organic contaminants remaining in-place beneath the sidewalk and asphalt surfaces of the 14^{th} Street and the Q Avenue.
- Utilize existing engineering controls such as protective concrete, asphalt and/or topsoil caps combined with institutional controls (environmental covenants, signage, and/or other notification measures) to contain contamination and mitigate risk of direct human/terrestrial wildlife contact with contaminated soil.
- Monitor groundwater to confirm that the concentrations of gasoline- and diesel-range petroleum hydrocarbons, cPAHs and metals do not increase above the groundwater cleanup levels, current plume stability and attenuation performance.
- Establish environmental covenants as necessary to restrict future development and control any future soil disturbance where contamination may remain at the Site.

1.0 INTRODUCTION

This document presents the Draft Cleanup Action Plan (DCAP) for the former Shell Oil Tank Farm Site (Site), located in Anacortes, Washington (Figure 1). The Site is formally referenced in the Washington State Department of Ecology (Ecology) databases as the Cap Sante Marine Site (Ecology Facility/Site Identification No. 4781157) and is generally located between 13th Street and 14th East of Commercial Avenue in Anacortes, Washington (Figure 2). This DCAP was prepared as a collaborative effort by Ecology and the Port (entity responsible for cleanup) pursuant to the requirements of the Model Toxics Control Cleanup Act (MTCA) administered by Ecology under Chapter 173-340-360 of the Washington Administrative Code (WAC). Ecology is managing the Site as part of the Fidalgo and Padilla Bay component to the Puget Sound Initiative.

This DCAP provides a general description of the Site history and environmental conditions as well as the proposed site-wide cleanup action and sets forth functional requirements that the cleanup must meet to achieve the cleanup action objectives for the Site.

1.1 Regulatory Framework

In 2007, the Port entered into Agreed Order No. DE-08TCPHQ-5474 (Agreed Order; Ecology, 2008) with Ecology. Under the Agreed Order, the Port performed the scope of environmental investigation activities outlined in the Ecology-approved Remedial Investigation/Feasibility Study (RI/FS) Work Plan (Work Plan; GeoEngineers, 2009) in 2011 and 2012 to evaluate the nature and extent of contamination resulting from historical activities at the Site.

Pursuant to the Agreed Order, the Port completed a RI/FS to evaluate cleanup alternatives for addressing identified contamination at the Site. The RI/FS, when approved by Ecology and this DCAP will complete the Scope of Work requirements described in the Agreed Order.

1.2 Purpose

The purpose of this DCAP is to:

- Describe the Site, including a summary of its history and extent of contamination;

- Identify site-specific cleanup levels and points of compliance for each hazardous substance and medium of concern;
- Identify applicable state and federal laws for the proposed cleanup action;
- Identify and describe the selected cleanup action alternative for the Site;
- Summarize the other cleanup action alternatives evaluated in the RI/FS;
- Discuss environmental covenants and Site use restrictions;
- Discuss compliance monitoring requirements, and;
- Present the schedule for implementing the cleanup action plan.

2.0 SUMMARY OF SITE CONDITIONS

Several environmental investigations have been conducted at the Site, beginning with an initial soil investigation in 1987 (Hart Crowser, 1987), and culminating in the RI/FS completed in 2013 (GeoEngineers, 2013a). Environmental investigations completed at and/or adjacent to the Site include:

- Preliminary Environmental Site Assessment in 1987 (Hart Crowser, 1987);
- Limited Due Diligence Investigation in 2005 (Floyd|Snider, 2005);
- Soil and groundwater investigation related to the Cap Sante Marine Site in 2007 (Landau, 2007a);
- Soil Characterization Study in 2007 (GeoEngineers, 2008); and
- Soil and groundwater investigation related to the former Shell Oil Tank Farm Site in 2011 and 2012 (GeoEngineers, 2013b).

The results of these environmental investigations are presented in the RI/FS Report (GeoEngineers, 2013a) and provided sufficient information to allow the development and selection of an appropriate cleanup action for the Site. The media investigated as part of these studies included soil and groundwater. Environmental investigation sampling locations for soil and groundwater are shown on Figure 3.

The following sections summarize pertinent environmental conditions at the Site (i.e., nature and extent of contamination) and an overview of the Conceptual Site Model (CSM) for contamination of the Site. More detailed descriptions of Site conditions are provided in the Work Plan and RI/FS report.

2.1 Site History

The Tank Farm area was originally a portion of the Fidalgo Bay tide flats, which were filled to the current grade (up to the former bulkhead just east of Q Avenue shown in Figure 2) between 1925 and 1929. The property was acquired by the Port in 1929 and leased to Shell Oil Company in 1930 for use as a bulk fuel storage and distribution facility that primarily handled gasoline and diesel-range fuels. During operation, up to four 25,000 gallon aboveground storage tanks (ASTs) located in the south portion of the Site were reportedly used to store gasoline, diesel and stove oil. One 2,000/4,000 gallon underground storage tank (UST) located north of the ASTs was reportedly used to store dry cleaning solvent. Historically, gasoline and diesel were pumped to the facility from a historical pier/fuel float located east of the Tank Farm across Q Avenue he pier via the fuel supply lines. The historic fuel supply lines connected the ASTs and pump house for storage and distribution to various distributors.

Prior to 1947, the area east of Q Avenue (east of the former Tank Farm) consisted of tide flats (GeoEngineers, 2008b) and from 1930 to approximately 1947, the historic fuel supply lines hung from joists below the fuel pier. In the late 1940s to early 1950s, the area east of Q Avenue was filled with dredged material from the adjacent federal waterway behind a second bulkhead constructed near the current shore of Fidalgo Bay. During the filling activities in the late 1940s and early 1950s, the fuel supply lines east of Q Avenue were reportedly re-configured as underground lines.

The Site operated as a bulk fuel storage facility under Shell and various bulk product distributors until 1987 at which time operations ceased and the facility reportedly decommissioned, including removal of all tanks, associated piping, and site structures. At this time, an unknown volume of soil was excavated from one or more of the areas in which surface staining was observed. Currently, the former Shell Oil Tank Farm is used by the Port as a vehicle and boat trailer parking lot supporting the trailer boat launch facility located to the east of Cap Sante Boat Haven. The alignment of the historical fuel supply lines east of former Shell Oil Tank farm is across Q Avenue which serves as a major thoroughfare and truck route for the City of Anacortes (City) and an asphalt-paved road that provides access to the Former Cap Sante Marine Lease Area and Cap Sante Boat Haven.

The approximate locations of the historical facilities, including USTs, ASTs, fuel supply lines, and areas of observed surface staining are shown relative to the Site on Figures 2 and 3.

2.2 Area Redevelopment

The current and anticipated future use of the former Shell Oil Tank Farm is as a vehicle and boat trailer parking lot supporting the trailer boat launch facility located to the east of Cap Sante Boat Haven. Q Avenue serves as a major thoroughfare and truck route for the City of Anacortes. The alignment of the historic fuel supply lines east of Q Avenue is an asphalt-paved road that provides access to the Former Cap Sante Marine Lease Area and Cap Sante Boat Haven. There currently are no plans to change the uses of the Site for the foreseeable future.

2.3 Prior Environmental Investigations

Investigation activities were first conducted at the Site in 1987 to evaluate soil and groundwater conditions at the former Shell Oil Tank Farm (Hart Crowser, 1987). The findings of this investigation indicated the presence of petroleum-related contaminants in the central portion of the property. Subsequent subsurface investigations were conducted by Floyd|Snider and Landau on behalf of the Port in 2005 and 2007 to further evaluate the extent of soil and groundwater contamination in the vicinity of the former Shell Oil Tank Farm and historical fuel supply lines located to the east of the former Shell Tank Farm facilities (Floyd|Snider, 2005 and Landau, 2007, respectively). Under an agreed order with Ecology, investigation activities were conducted by GeoEngineers on behalf of the Port in 2011 and 2012 to delineate the nature and extent of Site contamination.

Based on the results of these investigations, elevated concentrations of petroleum hydrocarbons, benzene, cPAHs, and cadmium were identified in soil in the eastern and southern portions of the former Shell Oil Tank Farm. In addition, historical sample results identified PAHs and petroleum hydrocarbons in soil east of the former Shell facility near the historical fuel supply lines. However, sampling results of the 2011 soil investigation indicate that the identified soil contamination east of Q Avenue in the vicinity of CSM-13, SB-13 and SB-14 is not associated with the Shell Site due to the lack of evidence that the historical fuel supply lines acted as a potential source. Soil contamination at these locations are likely the result of historical property use from an adjacent site (Cap Sante Marine Site) which is subject to cleanup actions by the Port under a separate Agreed Order between the Port and Ecology.

2.4 Summary of Environmental Conditions

This section summarizes environmental conditions at the Site for soil and groundwater media, based on the previous environmental studies completed at the Site. Further details and sources of the information presented in this section are provided in the RI/FS report.

2.4.1 Soils

Subsurface geology at the Site consists of dredged fill material overlying native marine sediment (silt and silty sand) and glacial deposits. The dredged fill material generally consist of fine to medium sand with varying amounts of silt and gravel and extend from the ground surface to depths of approximately 5 feet to 12 feet below ground surface (bgs).

Based on the results of previous RI studies (Hart Crowser, 1987; Floyd|Snider, 2005; Landau, 2007; GeoEngineers, 2007 and GeoEngineers, 2013b), gasoline-, diesel- and heavy oil-range petroleum hydrocarbons, benzene, cPAHs, and/or cadmium are present in soil at the southern and eastern portions of the former Shell Oil Tank Farm. In general, two areas with petroleum hydrocarbons and benzene contamination were identified; one generally located in the central/southeastern portions of the former Shell Oil Tank Farm extending beneath the Q Avenue, and other located in the southwestern corner of the former Shell Oil Tank Farm. Additionally, an isolated area of cPAH contamination was identified in the southern portion of the former Shell Oil Tank Farm extending underneath the 14th Street, and an isolated area of cadmium contamination was identified in the southwest corner of the former Shell Oil Tank Farm. Petroleum hydrocarbon and benzene contaminated soil is present between approximately 0.5 feet and 13 feet below ground surface (bgs), cPAHs contaminated soil is present between approximately 9 feet and 14 feet bgs, and cadmium contaminated soil is present between approximately 5 feet and 8 feet bgs. The approximate extent of COCs in soil is shown on Figure 4 and in geologic cross-section on Figures 5 and 6.

2.4.2 Groundwater

Three hydrogeologic units have been identified in the vicinity of the Site, including: (1) a shallow, unconfined aquifer occurring in the dredged fill; (2) a native silt confining unit; and (3) a deeper, confined aquifer. Measured depth to groundwater at the Site ranges from approximately 3 feet to 6 feet bgs (approximately elevation 6.5 to 9.5 feet mean lower low water [MLLW]). Observed groundwater flow direction is generally to the east toward Fidalgo Bay. Based on the results of tidal studies completed in the vicinity of the Site (i.e. Former Cap Sante Marine Lease Area; Landau, 2007), tidal influence on groundwater levels and flow direction at the Site appears to be limited with a 0.8-foot fluctuation in groundwater levels in near shore wells during a high-low tide cycle. Measured fluctuation in groundwater levels away from the shore (approximately 100 to 200 feet) is on the order of approximately 0.1 foot.

Based on the results of the 1987 and 2005 investigations (Hart Crowser, 1987 and Floyd|Snider, 2005), elevated concentrations of lead and diesel-range petroleum hydrocarbons were identified in the central portion of the former Shell Oil Tank Farm in a grab sample collected from a temporary well. However, subsequent groundwater samples collected from permanent monitoring wells (GeoEngineers, 2013b) indicate that lead and diesel-range petroleum hydrocarbons as well as the other COCs are not present in groundwater within and downgradient of the Site at concentrations exceeding preliminary groundwater cleanup levels.

2.5 Conceptual Site Model (CSM)

This section summarizes the conceptual model for the fate and transport of contamination at the Site as described in the RI/FS (GeoEngineers, 2013a). The CSM also describes the contaminant exposure pathways identified for the Site and the potential risks posed to human health and the environment by hazardous and/or deleterious substances in soil and groundwater.

The Site was historically a tidal mudflat which was later in filled with dredge materials from the adjacent federal waterway. Previous Site use included operations to support bulk fuel storage and distribution. Petroleum-related contamination at the Site was likely the result of releases associated with historical Site operations and uses. The source of the localized areas cPAH and cadmium impacted soil at the Site is not known but are either suspected to have been deposited during the 1940s and 1950s when the tide flat was in filled with dredge material or the result of historic Site operations. The approximate location soil contamination at the Site is shown on Figure 4.

Vertical and horizontal transport of COCs in soil may have been facilitated by groundwater flow and water level fluctuations at the Site however, groundwater within and downgradient of the currently petroleum, benzene, cPAH and cadmium contaminated soil is not adversely impacted based on the results of recent groundwater samples obtained from the Site as discussed in Section 2.4.

Potential exposure pathways and receptors are summarized in the following sections (Sections 2.5.1 through 2.5.3).

2.5.1 Soil

Potential upland soil exposure pathways at the Site include:

- Contact (dermal, incidental ingestion, or inhalation) by visitors, workers (including excavation workers), and potential future residents or other Site users with hazardous substances in soil;
- Contact (dermal, incidental ingestion, or inhalation) by terrestrial wildlife with hazardous substances in soil; and
- Contact by terrestrial plants and soil biota and/or food-web exposure to hazardous substances in soil.

Site areas where contaminants of potential concern (COPCs) were detected in soils at concentrations above preliminary cleanup levels for protection of human and terrestrial ecological receptors are shown on Figure 4. Soil exceedances occur between approximately 1 and 13 ft bgs in the central and northern portion of the former Shell Oil Tank Farm and are estimated to likely extend beneath portions of Q Avenue. In the southern portion of the former Shell Oil Tank Farm, soil exceedances occur between 5 and 14 ft. bgs and are estimated to likely extend beneath portions of 14^{th} Street.

2.5.2 Groundwater

Contaminants of potential concern were not detected in monitoring wells located within and/or downgradient of the identified soil exceedances at concentrations above levels protective of marine surface water.

Human ingestion of hazardous substances in groundwater is not a potential exposure pathway because groundwater at the Site or potentially affected by the Site is not a current or reasonable future source of drinking water. The MTCA regulation (WAC 173-340-720[2][d]) states that even if groundwater is classified as a potential future source of drinking water because it is present in sufficient quantity, contains less than 10,000 milligrams per liter (mg/L) total dissolved solids, and is not too deep to recover, the groundwater may still be classified as non-potable due to its proximity to marine surface water. To be classified as non-potable on the basis of its proximity to marine surface water, the following conditions must also be met:

- The groundwater does not serve as a current source of drinking water;
- Contaminated groundwater will not migrate to groundwater that is a current or potential future source of drinking water;
- There are known points of entry of the groundwater into surface water;
- The surface water is not classified as a suitable domestic water supply source; and
- The groundwater is sufficiently hydraulically connected the surface water that the groundwater is not practicable to use as a drinking water source.

The shallow groundwater at the Site meets at least four, and likely all five, of the non-potable classification conditions. First, groundwater at the Site is not a current source of drinking water. Second, the groundwater migrates toward marine surface water and discharges at seeps in the intertidal and/or subtidal zone. Third, the marine surface water offshore of the Site is not classified as a suitable domestic water supply. Fourth, the Site groundwater is hydraulically connected to marine surface water, as evidenced by the tidal influence on groundwater levels in wells near the shoreline. Finally, migration of shallow groundwater to a lower aquifer that is a current or potential future source of drinking water is unlikely, due to the presence of a confining native silt/clay unit at the base of the shallow water-bearing unit at the Site (see the RI/FS report for further information regarding Site hydrogeology). Consequently, the Site groundwater qualifies as a non-potable water source.

3.0 CLEANUP REQUIREMENTS

The MTCA cleanup regulations provide that a cleanup action must comply with cleanup levels for identified COPCs, points of compliance, and applicable or relevant and appropriate requirements (ARARs) based on federal and state laws (WAC 173-340-710). The Site cleanup levels, points of compliance, and ARARs for the selected cleanup remedy are briefly summarized in the following sections.

3.1 Human Health and Environmental Concerns

Because Site groundwater is not a current or reasonably likely future source of drinking water, cleanup levels for Site soil need not be protective of groundwater as drinking water. Additionally, an empirical demonstration presented in the RI/FS verified that existing chemical concentrations in Site soils are protective of groundwater and marine surface water receptors.

3.1.1 Future Land Use Considerations

Soil cleanup levels for unrestricted land use were developed in accordance with WAC 173-340-740. The Site currently zoned Commercial (C), which provides for a mix of commercial and recreational uses. Currently there are no plans to change the uses of the Site in the foreseeable future. Because the Site is not zoned for industrial use, soil cleanup levels were developed based on unrestricted land use, including the more stringent MTCA Method B cleanup levels that assume ground floor residential land use (WAC 173 340 740[3]).

3.1.2 Ecological Risk Considerations

A terrestrial ecological evaluation (TEE) was performed for Site and is presented in the RI/FS. Based on the current and future land use, the Site qualifies for exclusion under WAC 173-340-7491(1) because there is less than 1.5 acres of contiguous undeveloped land on the Site are within 500 ft of any area of the Site and because all contaminated soil is covered by buildings, pavement, or other physical barriers (i.e., compact crush gravel surface) that will prevent plants or wildlife from being exposed to the soil contamination.

3.2 Indicator Hazardous Substances

Under MTCA, "indicator hazardous substances" means the subset of hazardous substances present at a Site for monitoring and analysis during any phase of remedial action for the purpose of characterizing the Site or establishing cleanup requirements for that Site. Consistent with WAC 173-340-703, when defining cleanup requirements at a Site that is contaminated with a relatively large number of COPCs, Ecology may eliminate from consideration those hazardous substances that contribute a small percentage of the overall threat to human health and the environment. The remaining COPCs can then serve as indicator hazardous substances for purposes of defining Site cleanup requirements.

As outlined in Section 2.5, the list of COPCs (hazardous and/or deleterious substances) identified at the Site includes:

- Gasoline-range petroleum hydrocarbons;
- Diesel- and heavy oil-range petroleum hydrocarbons;
- Benzene;
- Cadmium; and
- cPAHs.

Indicator hazardous substances selected by Ecology for the Site include all of the above COPCs.

3.3 Cleanup Levels

Cleanup standards consist of 1) cleanup levels that are protective of human health and the environment; and 2) the point of compliance at which the cleanup levels must be met. Preliminary site-specific cleanup standards were developed in the RI/FS and detailed information regarding the derivation of cleanup levels can be found in the RI/FS report (GeoEngineers, 2013). Final media-specific cleanup levels and points of compliance are summarized below.

Site-specific cleanup levels for soil that are protective of human health and cleanup levels for groundwater that are protective of marine surface water, were developed in accordance with MTCA requirements.

Because Site groundwater is not a current or reasonably likely future source of drinking water, cleanup levels for Site soil need not be protective of groundwater as drinking water. Additionally, an empirical demonstration was used in the RI/FS and showed that existing chemical concentrations in Site soil are protective of groundwater as marine surface water at the proposed conditional point of compliance for groundwater.

Media-specific cleanup levels are discussed in the sections below.

3.3.1 Soil

Cleanup levels for soil indicator hazardous substances used in this DCAP are presented in Table 1. These cleanup levels were developed as part of the Ecology-approved Work Plan (GeoEngineers, 2009) and are based on MTCA Method A values for unrestricted land use, MTCA Method B standard formula values for the protection of human health and MTCA Method B soil concentrations protective of groundwater calculated using Ecology's fixed-parameter, three-phase partitioning model (MTCASGL Workbook; WAC 173-340-747[4][b]). Preliminary soil cleanup levels developed for the Work Plan considered:

- Concentrations established under applicable state and federal laws;
- Concentrations protective of terrestrial ecological receptors;
- Concentrations protective of direct human contact with soil;
- Concentrations protective of groundwater; and
- Concentrations protective of marine surface water.

Details regarding the sources/derivation of each of the regulatory criteria are provided in the Work Plan. Because Site is exempt from a TEE as described in Section 3.1.2, cleanup levels protective of ecological receptors were not considered when developing soil cleanup levels. In addition, natural background soil metals concentrations in Washington State (Ecology, 1994) were considered in accordance with (WAC) 173-340-705(6) and WAC 173-340-709 where the lowest applicable regulatory criteria, adjusted for natural background metals concentrations, were selected as the preliminary soil cleanup levels.

3.3.2 Groundwater

Cleanup levels for groundwater indicator hazardous substances used in this DCAP are presented in Table 2. As discussed in Section 2.5.2, human ingestion of hazardous substances in groundwater is not a potential exposure pathway because groundwater at the Site or potentially affected by the Site is not a current or reasonable future source of drinking water. Consequently, the Site groundwater qualifies as a non-potable water source. Therefore, the following potential exposure pathways for Site groundwater were considered for developing preliminary cleanup levels:

- Human ingestion of marine organisms contaminated by releases of affected Site groundwater to adjacent marine surface water, and
- Acute or chronic effects to aquatic organisms contaminated by releases from exposure to constituents in groundwater discharging to adjacent marine surface water.

Groundwater cleanup criteria were developed to be adequately protective of aquatic organisms and of humans that ingest these marine organisms. Except for petroleum hydrocarbons (gasoline, diesel and heavy oil), MTCA Method B marine surface water preliminary cleanup levels were developed in accordance with WAC 173-340-730(3). Because cleanup levels protective of marine surface water have not been established for petroleum hydrocarbons, gasoline-, diesel- and heavy oil-range hydrocarbon cleanup levels for groundwater were referenced from MTCA Table 720-1 (MTCA Method A), in accordance with WAC 173-340-730(3)(b)(iii)(C).

3.4 Points of Compliance

Under MTCA, the point of compliance is the point or location on a site where the cleanup levels must be attained. This section describes the points of compliance for soil and groundwater.

3.4.1 Soil

The standard point of compliance for the soil cleanup levels shown in Table 1 will be throughout the soil column from the ground surface to 15 ft bgs, in accordance with WAC 173-340-740(6)(d) and WAC 173-340-7490(4)(b).

3.4.2 Groundwater

Because groundwater cleanup levels are based on protection of marine surface water and not protection of groundwater as drinking water, the conditional point of compliance for the groundwater cleanup levels is the point of groundwater discharge to the Cap Sante Waterway and Fidalgo Bay. This corresponds to the groundwater/surface water interface at the Site. At the Site, downgradient wells upland of the groundwater/surface water interface will be used to evaluate compliance.

3.5 Applicable Regulatory Requirements

In addition to the cleanup standards developed through the MTCA process and presented in Section 3.1, other regulatory requirements must be considered in the selection and implementation of the cleanup action. MTCA requires the cleanup standards to be "at least as stringent as all applicable state and federal laws" (WAC 173-340-700[6][a]). Besides establishing minimum requirements for cleanup standards, applicable state and federal laws may also impose certain technical and procedural requirements for performing cleanup actions. These requirements are described in WAC 173-340-710. Applicable state and federal laws are discussed below.

The cleanup action at the Site will be completed pursuant to MTCA under the terms of a Consent Decree between Ecology and the implementing Potentially Liable Parties (PLPs). Accordingly, the selected cleanup action meets the permit exemption provisions of MTCA, obviating the need to follow most procedural requirements of the various local and state regulations that would otherwise apply to the action. Ecology will determine the substantive provisions of state and local laws and regulations that are applicable to this project, following consultation with appropriate state and local regulators.

3.5.1 Solid and Hazardous Waste Management

The Washington Hazardous Waste Management Act and the implementing regulations, the Dangerous Waste Regulations (Chapter 173-303 WAC), would apply if dangerous wastes are generated during the cleanup action. There is no indication of listed wastes being generated or disposed of at the Site. The Dangerous Waste Regulations would be applicable only if excavation were to occur as part of the cleanup action and sampling of excavated material (e.g., toxicity characteristic leaching procedure [TCLP] sampling, if required by the receiving landfill) or confirmation soil sampling indicated contaminant concentrations exceeding levels associated with dangerous waste characteristics or criteria. Related regulations include state and federal requirements for solid waste handling and disposal facilities (40 Code of Federal Regulations [CFR] 241, 257; Chapter 173-350 and -351 WAC) and land disposal restrictions (40 CFR 268; WAC 173-303-340).

3.5.2 State Environmental Policy Act

The State Environmental Policy Act (SEPA) (Revised Code of Washington [RCW] 43.21C; WAC 197-11) and the SEPA procedures (WAC 173-802) are intended to ensure that state and local government officials consider environmental values when making decisions. The SEPA process begins when an application for a permit is submitted to an agency, or an agency proposes to take some official action such as implementing a MTCA cleanup action. Prior to taking any action on a proposal, agencies must follow specific procedures to ensure that appropriate consideration has been given to the environment. The severity of potential environmental impacts associated with a project determines whether an Environmental Impact Statement is required. If excavation were to occur as part of the cleanup action, a SEPA checklist would be required prior remedial construction activities. Because the Site cleanup action will be performed under a Consent Decree, SEPA and MTCA requirements will be coordinated, if possible. The Port is the lead SEPA agency for this action.

3.5.3 Water Quality Management

The Clean Water Act (CWA) is the primary federal law for protecting water quality from pollution. In addition to federal law, water quality is regulated by Ecology under the state water quality act, RCW 90.48. The CWA regulations prescribe requirements for point source and non-point source discharges. Section 401 of the CWA requires the state to certify that federal permits are consistent with state water quality standards. Because applicable provisions of state water quality standards are reflected in the Section 401 certification, the certification generally stands in the stead of a stand-alone determination by Ecology of state water quality provisions applicable to the cleanup action. The substantive requirements of a certification determination are applicable. State and federal standards for marine waters will be applicable if there are any discharges to surface water during implementation of the cleanup action.

If excavation were to occur as part of the cleanup action, construction activities that disturb 1 acre or more of land need to comply with the provisions of state construction stormwater regulations, and a stormwater permit will be required for the cleanup action (RCW 90.48.260; 40 CFR 122.26; Chapter 173-226 WAC).

3.5.4 Health and Safety

Site cleanup-related activities would need to be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (RCW 49.17) and the federal Occupational Safety and Health Act (29 CFR 1910, 1926). These applicable regulations include requirements that workers are to be protected from exposure to contaminants and that excavations are to be properly shored.

3.5.5 Other Potentially Applicable Regulatory Requirements

The following is a list of other potentially applicable regulations for the cleanup action:

- Potential location-specific ARARs if excavation activities were to occur as part of the cleanup action:

- Endangered Species Act, 16 USC 1531-1543, 50 CFR 402, 50 CFR 17;
- Fish and Wildlife Conservation Act, 16 USC 2901; 50 CFR 83 Federal Coastal Zone Management Act (CZMA), 16 USC 1451-1464; RCW 90.58; WAC 173-27-060, 15 CFR 923-930;
- Archaeological and Historic Preservation Act, 16 USC 469; and
- Archaeological Resources Protection Act, 16 USC 470aa; 43 CFR 7.

- Potential action-specific ARARs if excavation activities were to occur as part of the cleanup action:
  - Temporary Modification of Water Quality Criteria and Other Requirements to Modify Water Quality Criteria, RCW 90.48; WAC 173- 201A-410 through –450. Chapters 173-201A-400 through -450;
  - Regulation and Licensing of Well Contractors and Operators, Chapter 18.104 RCW; WAC 173-162-020, -030;
  - General Regulations for Air Contaminant Source, Chapter 70.94 RCW, WAC 173-400-040(8); and
  - Puget Sound Clean Air Agency (PSCAA) Regulation 1, Section 9.15.

- Potential Local Requirements if excavation activities were to occur as part of the cleanup action:
  - City of Anacortes land disturbance/grading permit;
  - City of Anacortes noise ordinance;
  - City of Anacortes Publicly Owned Treatment Water (POTW) discharge authorization;
  - City of Anacortes traffic codes; and
  - City of Anacortes stormwater management program.

4.0 SELECTED SITE CLEANUP ACTION

The cleanup action selected by Ecology for the Site relies on the existing empirical data that groundwater located downgradient of the impacted soils is not adversely impacted by the presence of the identified contamination. The selected alternative (Alternative 3) consists of excavating and off-site disposal of contaminated soil within the readily accessible portion of the Site (i.e., gravel surface within the former Shell Oil Tank Farm) followed by placement of a chemical reagent within the backfill to enhance attenuation of petroleum-related compounds in the less accessible portions of the Site (i.e., beneath the sidewalk and asphalt surfaces of the Q Avenue and the 14th Street). Engineering controls (currently present) combined with institutional controls would be used prevent human exposure to the remaining contaminated soil and groundwater monitoring would be used to confirm plume stability and attenuation performance. Alternative 3 meets the cleanup action objective of human health and environmental protection (Section 3.1) by:

- Excavating approximately 3,000 in-place cubic yards of contaminated soil (approximately 75% of the total volume) in addition to approximately 1,000 in-place cubic yards of overburden within the readily accessible portion of the Site (i.e., gravel surface within the former Shell Oil Tank Farm) boundary using commonly available excavation techniques. Due to insufficient space to cost effectively segregate, stockpile and test the overburden soil for reuse and geotechnically unsuitable nature of the material (i.e., high silt content), it is assumed that all excavated soil will be transported from the Site for permitted disposal.
- Existing utility infrastructure (power, phone, sewer, water, etc.) would remain undisturbed and protected in-place during remedial excavation activities. In addition, excavation slopes and/or shoring would be required to protect adjacent utilities, sidewalks and roads.
- Confirmation soil samples will be obtained during remedial excavation activities to verify the successful removal of contaminants in accessible portions of the Site and to document residual contaminant concentrations along the excavation sidewall along 14th Street and Q Avenue.
- Transporting excavated soil to an approved landfill facility. Excavated soil would be characterized for disposal as required by MTCA and the selected disposal facility. The contaminated soil is expected to designate as non-dangerous waste suitable for disposal at a Subtitle D landfill.

- During backfilling activities, an oxygen releasing material would be placed in lifts throughout the saturated and/or smear zone to stimulate naturally occurring microbes to enhance biological degradation of organic contaminants remaining in-place beneath the sidewalk and asphalt surfaces of the 14th Street and the Q Avenue. Treatment of organic contaminants in these inaccessible portions of the Site would rely on groundwater as a transport mechanism to carry the chemical reagent and/or to expand the zone of bioremediation conditions beyond the limits of excavation.
- Confirmational groundwater monitoring will be performed following the cleanup action to verify that contaminant concentrations do not exceed groundwater cleanup levels, confirm plume stability and monitor natural attenuation performance.
- Institutional controls in the form of environmental covenants, signage, and other notification measures would be utilized as appropriate to address residual inorganic contaminants and any remaining organic contaminants remaining in-place in areas of the Site following in-situ treatment.

4.1 Contamination Remaining On-Site Following Remedy

The selected cleanup action for the Site is expected to remove a significant amount of contamination from the Site while causing minimal disturbance to existing infrastructure (roads, sidewalks and utilities). Following implantation of the cleanup action, contamination may remain in-place beneath portions of 14th Street and Q Avenue at concentrations exceeding the soil cleanup levels.

As described above, the cleanup strategy relies on utilizing existing engineering controls for the purpose of removing exposure pathways. Areas in which residual soil contamination remains in-place will continue to be addressed through the use of confirmational groundwater monitoring and environmental covenants implemented at the Site, as described in Sections 4.2 and 4.5 below. The areas where contaminated soil will be contained in place include the following:

- Q Avenue Right-of-Way – Soil contaminated with petroleum hydrocarbons benzene is estimated to likely underlie existing utility infrastructure including buried power, phone and water lines as well as concrete and asphalt paved surfaces. The contaminated soil at this location is between approximately 1 and 13 feet bgs based on data collected from previous environmental studies.

- 14^{th} Street Right-of-Way – Soil contaminated with cPAHs is estimated to likely underlie existing utility infrastructure including buried power, phone and water lines as well as concrete and asphalt paved surfaces. The contaminated soil at this location is between approximately 10 and 14 feet bgs based on data collected from previous environmental studies.

Section 4.5 below discusses environmental covenants required for the portions of the Site where complete soil exceeding cleanup levels (Table 1) remains in place.

4.2 Confirmational Groundwater Monitoring

To verify that the proposed cleanup action is protective of groundwater, existing Site monitoring wells and/or replacement monitoring wells will be sampled for Site indicator hazardous substances (Table 2). Groundwater will be sampled on a quarterly basis at each monitoring well for a minimum of four consecutive quarters. Groundwater samples will be analyzed for each of the soil indicator hazardous substances including gasoline-, diesel- and heavy oil-range petroleum hydrocarbons, benzene, cadmium and cPAHs. Following completion of four consecutive quarters of groundwater sampling that confirm cleanup levels are being met, the quarterly groundwater sampling schedule will be discontinued. Additional groundwater monitoring may be necessary if initial groundwater monitoring indicates the potential for contaminant transfer from remaining contaminated soil to groundwater over time.

4.3 Contingency Actions

Groundwater monitoring will ensure that contaminated soils left in place do not pose a hazard to marine surface water via soil to groundwater migration. Environmental investigations completed during the RI/FS demonstrated that groundwater within and/or downgradient of the contaminant plumes complies with the proposed groundwater cleanup levels (Table 2), indicating that leaching of soil contaminants to groundwater is not an exposure pathway of concern. However, if contaminants exceed the cleanup levels in groundwater samples after four quarters of confirmational monitoring, semi-annual groundwater monitoring will be conducted for an additional two years. If the groundwater samples continue to exceed the groundwater cleanup levels after two years without abating, additional actions will be considered.

4.4 Future Site Use

The selected cleanup action is compatible with future expected land use for by the Port and causes minimal disturbance to existing and surrounding property infrastructure, Site use and operations. The future expected land use of the property is as a vehicle and boat trailer parking lot supporting the Cap Sante Boat Haven trailer boat launch facility located east of Q Avenue. The selected cleanup action allows for this expected future Site use.

4.5 Environmental Covenants

The proposed cleanup action is anticipated to leave soil exceeding soil cleanup levels (Table 1) in place below in portions of Q Avenue and 14th Street. While the contaminated soil in isolated and does not pose direct threat for exposure to human health and terrestrial ecological receptors, future development within areas of the contaminated soil could potentially generate conditions requiring appropriate safe handling procedures, stormwater controls, and consideration of disposal options for the specific indicator hazardous substances and concentrations encountered.

Environmental covenants will be required for the portions of the Site where soil exceeding cleanup levels (Table 1) remain in place. The covenants will identify specific contaminated soil locations and depths that will require special management if disturbed, unless the soil contamination is removed at a later time. Soil management plans will be required that instruct property owners on Ecology's requirements for performing invasive work in areas of remaining contaminated soil. The environmental covenants will be recorded following completion of excavation activities described in the CAP.

4.6 Potential Habitat Restoration Opportunities

Under the Puget Sound Initiative, MTCA cleanup actions are expected, where appropriate, to coincidentally enhance and/or restore habitat. Given the physical nature of the Site and that no critical habitat is present, no habitat restoration opportunities are identified for the cleanup action.

5.0 ALTERNATIVES CONSIDERED AND BASIS FOR REMEDY SELECTION

A range of potential cleanup action alternatives were evaluated in the RI/FS report (GeoEngineers, 2013). This section summarizes the cleanup technologies and alternatives considered, and the basis for selection of the cleanup remedy.

5.1 Cleanup Technologies

The RI/FS report presents a detailed screening evaluation of potentially applicable general response actions and remediation technologies. The screening evaluation was carried out for each of the environmental media requiring cleanup action evaluation. During the development of the RI/FS, cleanup action alternatives were developed by assembling the technologies that were carried forward from this screening evaluation.

5.2 Feasibility Study Alternatives

The RI/FS presents a detailed evaluation of a range of potential cleanup action alternatives (Alternatives 1 through 4) for the Site which are summarized in Table 3. The RI/FS also presents detailed evaluations of each alternative, which are summarized in Section 5.3 below.

5.3 MTCA Disproportionate Cost Analysis

The MTCA disproportionate cost analysis (DCA) is used to evaluate which of the alternatives that meet MTCA threshold requirements are permanent to the maximum extent practicable. This analysis compares the relative benefits and costs of cleanup alternatives in selecting the alternative whose incremental cost is not disproportionate to the incremental benefits. Seven criteria are used in the disproportionate cost analysis as specified in WAC 173-340-360(2) and (3):

- Protectiveness
- Permanence
- Cost
- Long-Term Effectiveness

- Management of Short-Term Risks
- Implementability
- Consideration of Public Concerns

The comparison of benefits relative to costs may be quantitative, but will often be qualitative. Costs are disproportionate to the benefits if the incremental costs of a more permanent alternative exceed the incremental degree of benefits achieved by a lower-cost alternative (WAC 173-340-360[3][e][i]). When two or more alternatives are equal in benefits, Ecology shall select the less costly alternative (WAC 173-340-360[3][e][ii][C]).

The comparison of benefits relative to costs may be quantitative or qualitative based on the availability of quantitative data, such as mass of contaminants removed, estimated areas that will be contained, and volume of contaminated soils remaining on the Site. However, the benefits for some of the categories will be qualitative. For this reason, Ecology's analysis of which alternative is permanent to the maximum extent practicable is largely qualitative. The MTCA regulation allows Ecology to use best professional judgment to assess benefits qualitatively, and use its discretion to favor or disfavor qualitative benefits and use that information in selecting a cleanup action (WAC 173-340-360 [3][e][ii][C]). In order to document Ecology's qualitative analysis for the Site, Ecology assigned weighing factors to each of the six non-cost benefits criteria. The weighting factors represent Ecology's opinion on the importance of each benefit criterion at the Site, relative to protection of human health and the environment. The factors weighed for each of the criteria are briefly discussed in the following section and presented in Tables 4 and 5.

5.3.1 Protectiveness

The overall protectiveness of a cleanup action alternative is evaluated based on several factors, including the extent to which human health and the environment are protected and the degree to which overall risk at a site is reduced (WAC 173-340-360[3][f][i]). Both on-site and off-site reductions in risk resulting from implementing the alternative are considered. Protectiveness is determined by evaluating the degree of improvement in overall environmental quality. At this Site, Ecology believes a weighting factor of 30 percent is appropriate for protectiveness. This represents the greatest value of all categories and is necessary based on the overall importance of protection of human health and the environment, especially in relation to Ecology's goal of restoring the health of Puget Sound.

5.3.2 Permanence

Under MTCA, the permanence of an alternative is evaluated based on the degree to which the remedy permanently reduces the toxicity, mobility, or mass of hazardous substances, including the effectiveness of the alternative in destroying hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment processes, and the characteristics and quantity of treatment residuals generated (WAC 173-340-360[3][f][ii]). Based on the importance of the restoration of Puget Sound, Ecology believes this factor to be second only to protectiveness in importance and used a weighting factor of 20 percent for this evaluation criterion.

5.3.3 Cost

The analysis of cleanup action alternative costs under MTCA includes consideration of all costs associated with implementing an alternative, including design, construction, confirmational monitoring, and environmental covenants (WAC 173-340-360[3][f][iii]). Costs are intended to be comparable among different alternatives to assist in the overall analysis of relative costs and benefits of the alternatives. Costs are compared against benefits to assess cost-effectiveness and practicability of the cleanup action alternatives. No weighting factor is applied to this quantitative category, as costs are compared against the numeric analysis.

5.3.4 Long-Term Effectiveness

Long-term effectiveness expresses the degree of certainty that the alternative will be successful in maintaining compliance with cleanup standards over the long-term (WAC 173-340-360[3][f][iv]). The MTCA regulations contain a specific preference ranking for different types of technologies that is to be considered as part of the comparative analysis. The ranking places the highest preference on technologies such as reuse/recycling, treatment, immobilization/solidification, and disposal in an engineered, lined, and monitored facility. Lower preference rankings are applied to technologies such as on-site isolation/containment with attendant engineered controls, and environmental covenants and monitoring. The regulations recognize that, in most cases, the selected cleanup remedy will combine multiple technologies. The MTCA preference ranking must be considered along with other site-specific factors in the evaluation of long-term effectiveness. Ecology considers a weighting for this factor of 20 percent to be appropriate at this Site.

5.3.5 Management of Short-term Risks

This criterion is a measure of the relative magnitude and complexity of actions required to maintain protection of human health and the environment during implementation of the cleanup action (WAC 173-340-360[3][f][v]). Cleanup actions carry short-term risks, such as potential mobilization of contaminants during construction, or safety risks typical of large construction projects. Excavation of contaminated soils along the shoreline carries a risk of temporary water quality degradation and potential sediment recontamination. Some short-term risks can be managed through the use of best management practices during the project design and construction, while other risks are inherent to certain project alternatives. A weighting factor of 10 percent is being used for this Site. This lower rating is based on the limited timeframe associated with the risks and the general ability to modify any alternative to reduce short-term risks during construction without significant effect on human health and the environment.

5.3.6 Implementability

Implementability is the ability to implement the selected remedy. It measures the overall relative difficulty and uncertainty of implementing the cleanup action. It includes technical factors such as the availability of proven technologies and experienced contractors to accomplish the cleanup work (WAC 173-340-360[3][f][vi]). It also includes administrative factors associated with permitting and completing the cleanup. The weighting factor Ecology used for implementability is 10 percent. Implementability is less associated with the primary goal of the cleanup action, protection of human health and the environment, and therefore has a lower weighting factor. In addition, the issues associated with the implementability of a remedy are often duplicated in the remedy costs. Engineering design considerations are often of primary importance in this category and often refined during the development of the engineering design report.

5.3.7 Consideration of Public Concerns

The public involvement process under MTCA is used to identify potential public concerns regarding cleanup action alternatives (WAC 173-340-360[3][f][vi]). The extent to which an alternative addresses those concerns is considered as part of the remedy selection process. This includes concerns raised by individuals, community groups, local governments, tribes, federal and state agencies, and other organizations that may have an interest in or knowledge of the Site. A weighting factor of 10 percent is being used for the evaluation of this category. The public concerns voiced during the public involvement process can also be included in the other categories identified above such as protectiveness and long-term effectiveness. Public concerns that can be incorporated into alternative categories are more appropriately considered in the scoring of those other categories. In particular, the public concerns for this Site would generally be associated with environmental concerns and performance of the cleanup action, which are addressed under other criteria such as protectiveness and permanence.

5.4 Evaluation and Comparison of the Cleanup Action Alternatives

This section provides a comparative analysis of the remedial alternatives considered for the Site. The MTCA evaluation criteria discussed in Section 5.3 were used to evaluate the each remedial alternative, with the alternatives then ranked based on their expected performance under each criterion. Table 3 presents the details about the remedial alternatives. The details of evaluation and their results are presented in Tables 4 and 5, respectively.

5.4.1 Threshold Requirements

Based on the review of RI/FS report (GeoEngineers, 2013), Ecology determined that each of the cleanup alternatives (Alternatives 1 through 4) meet MTCA threshold requirements, because they provide for the protection of human health and the environment, comply with the cleanup standards and applicable state and federal regulations and have provisions for compliance monitoring. Alternative details and costs are presented in Table 3.

5.4.2 Comparison of the Cleanup Action Alternatives by Criteria

The evaluation of disproportionate cost is based on a comparative analysis of costs against the remaining six MTCA evaluation criteria. Relative rankings of each alternative for these six criteria are summarized in Table 4. These rankings are briefly discussed below:

5.4.2.1 Protectiveness

Alternatives 3 and to a lesser degree, Alternative 2 are less protective than Alternative 4. Alternative 4 is the most protective because it removes all contaminated soils to the maximum extent practicable. Alternative 3 has a lower ranking than Alternative 4 due to the lower degree of contaminant mass removal. Alternative 2 has a lower ranking than Alternative 3 due to uncertainty in short-term and long-term risks associated with in-situ treatment technologies. Alternative 1 is the least protective of each of the alternatives evaluated because contamination would remain in place at the Site following implementation.

5.4.2.2 Permanence

Alternative 4 achieves the highest level of performance relative to other three alternatives, since it includes the removal of soil contamination to the maximum extent practicable. Alternative 3 has a lower ranking than Alternative 4 due to the lower degree of contaminant mass removal. Alternative 2 has a lower ranking than Alternative 3 due to uncertainty in short-term and long-term risks associated with in-situ treatment technologies. Alternative 1 is the least permanent of each of the alternatives evaluated because contamination would remain in place at the Site following implementation.

5.4.2.3 Long-Term Effectiveness

Alternative 4 achieves a higher degree of long-term effectiveness than the other three alternatives as a result of the greater amount of contaminated removed under that alternative. Alternative 2 and 3 have lower rankings than Alternative 4 either due to the lower degree of immediate contaminant mass removal and uncertainty in short-term and long-term risks associated with in-situ treatment technologies and like Alternative 1, Alternatives 2 and 3 might eventually rely on use of institutional controls to reduce the risk to human health and the environment from the residual contamination left in place.

5.4.2.4 Management of Short Term-Risks

Alternative 1 receives the highest ranking due to the lack of construction activities involved in completing the components of the alternative (i.e., capping components are already in place). Alternative 3 and to a lesser degree, Alternative 2 have lower rankings than Alternative 1 either due to the uncertainty associated with in-situ treatment technologies or the level of Site disturbance that would be required. Alternative 4 has the lowest ranking due to the high level of Site disturbance that would be required (i.e., elective structure modification of the surface roads and buried utilities to access contaminated soil).

5.4.2.5 Implementability

The lowest score for implementability was assigned to Alternative 4. This is as a result of the high degree of Site disturbance that would be required to implement this alternative, and the design and coordination associated with shoring and rerouting of utilities in adjacent rights-of-way. Alternative 2 receives a slightly higher ranking due to the lesser degree of Site disturbance and uncertainty associated with in-situ treatment technologies (i.e., potential for multiple rounds of treatment to achieve the cleanup objectives). Alternatives 1 and 3 both receive the highest ranking either due to the lack of construction activities involved in completing the components of the alternative (i.e., capping components are already in place) as with Alternative 1 or by excavation of a large volume of easily assessable contaminated soil utilizing standard excavation methods.

5.4.2.6 Consideration of Public Comments

Alternative4 may result in concerns by the public and nearby property owners resulting from the temporary closure and rerouting of surface streets and buried utilities. However, closure and rerouting of surface streets and buried utilities would be on a short term basis. Alternative 3 would result in immediate contaminant mass removal without the temporary closure and rerouting of surface streets and buried utilities. Subsequently, Alternatives 3 and 4 are ranked equally. Because Alternative 2 requires the injection of strong surfactants and/or oxidation products in the vicinity of marine surface water which lead to public concern, Alterative 2 ranks lower than Alternatives 3 and 4. Alternative 1 has the lowest ranking due to long term public concern resulting from leaving contamination in place.

5.4.3 Reasonable Restoration Time Frame

The restoration time pertains to the time required to meet cleanup levels. The restoration time for all three alternatives is in the order of 1 to 3 years. This includes project design, permitting, construction, and closure activities. Alternatives 1 through 3 would leave residual contamination in place requiring confirmational monitoring and consequently could extend the duration of time for monitoring to confirm that cleanup levels are being maintained.

5.4.4 Overall Comparison of Remedy Costs and Benefits

Table 5 and Figure 6 summarize costs and remedy benefits for each alternative. The estimated costs of the alternatives range from $400,000 to 4.1 million. The RI/FS report (GeoEngineers, 2013) presents detailed cost estimates for the alternatives. These costs are expressed in 2012 dollars without adjustment to future cost inflation and without present value discount of future costs. The probable remedy costs are expected to vary with a range of +50 percent to -30 percent.

Using the MTCA DCA methodology, the alternatives were evaluated to determine which cleanup action provided the greatest benefits relative to cost. The calculated benefits integrate the rankings for each evaluation criterion discussed above, multiplied by the weighting within that category and summed to reach the benefits total. The calculated benefits using the categorical weighting factors are presented in Table 5 and summarized below:

- Alternative 1: The benefit ranking for Alternative 1 is 4.2 (out of 10) and has an estimated cleanup cost of $400,000.
- Alternative 2: The benefit ranking for Alternative 2 is 6.5 (out of 10) and has an estimated cleanup cost of $2,120,000.
- Alternative 3: The benefit ranking for Alternative 3 is 7.8 (out of 10) and has an estimated cleanup cost of $3,000,000.
- Alternative 4: The benefit ranking for Alternative 3 is 8.6 (out of 10) and has an estimated cleanup cost of $4,130,000.

The relatively high ranking of Alternative 4, in comparison to Alternatives 3 and 2, is due to the higher level of contaminant mass removal achieved through excavation and disposal of contaminated soil. Alternative 3 has a slightly lower ranking than Alternative 4 due to the lower degree of contaminant mass removal. Alternative 2 has a lower ranking than Alternative 3 due to the uncertainty in short-term and long-term risks associated with in-situ treatment technologies. Alternative 1 involves the lowest degree of removal or treatment and so is scored lower relative to the other alternatives evaluated given the potential short- and long-term risks associated with leaving the contaminant mass in place. However, the marginal gains in protectiveness and permanence resulting from Alternative 4 are determined to be disproportionately more costly given the higher potential for short-term risks and greater complexities related to implementability in comparison to Alternative 3. As a result, Alternative 3 is the alternative with the highest overall ranking.

5.3.1 Conclusions

Based on the above DCA evaluation per MTCA requirements, Alternative 1 is identified as the preferred alternative for the Cap Sante Marine Site. This alternative minimizes disturbances to infrastructure and operations while providing a high level of calculated ranking and high degree of environmental benefits for the unit of incremental cost while still remaining practical.

6.0 IMPLEMENTATION OF THE CLEANUP ACTION

Preliminary design of the cleanup remedy and the selected cleanup action described in this DCAP was initiated in April 2012 under Agreed Order DE-08TCPHQ-5474 between Ecology and the Port. Remedial actions are currently targeted to begin in early 2014, subject to issuance of a Consent Decree. When completed, the Consent Decree will contain an outline of the schedule to complete selected cleanup action. The Consent Decree will be entered in Skagit County Superior Court, and will become effective once entered.

Consistent with Chapter 70.105D RCW, as implemented by Chapter 173-340 WAC (MTCA Cleanup Regulation), Ecology has determined that the selected Site cleanup action described in Section 4.0 of this DCAP is protective of human health and the environment, will attain federal and state requirements that are applicable or relevant and appropriate, complies with cleanup standards, and provides for compliance monitoring. The selected cleanup action satisfies the preference expressed in WAC 173-340-360 for the use of permanent solutions to the maximum extent practicable, and provides for a reasonable restoration timeframe.

7.0 COMPLIANCE MONITORING

Compliance monitoring and contingency responses (as needed) will be implemented in accordance with WAC 173-340-410, Compliance Monitoring Requirements. Detailed requirements will be described in the Compliance Monitoring Plan (CMP) to be prepared as a part of cleanup action. Compliance monitoring of the interim action has been completed and Ecology has determined that no further monitoring of the interim action is required (See Section 2.3). The objective of this plan is to confirm that cleanup standards have been achieved, and also to confirm the long-term effectiveness of cleanup actions at the Site. The plan will contain discussions on duration and frequency of monitoring, the trigger for contingency response actions, and the rationale for terminating monitoring. The three types of compliance monitoring to be conducted include:

- **Protection Monitoring** to confirm that human health and the environment are adequately protected during the implementation of the cleanup action;
- **Performance Monitoring** to confirm that the cleanup action has attained cleanup standards and other performance standards; and
- **Confirmation Monitoring** to confirm the long-term effectiveness of the cleanup action once performance standards have been attained.

Cleanup levels and associated points of compliance for the cleanup action are described above in Section 3.

7.1 Monitoring Objectives and Rationale

The cleanup action incorporates monitoring to determine whether cleanup standards have been achieved during and after the cleanup action. As discussed in Section 4.0, performance monitoring consisting of collecting soil samples from the base and/or sidewalls of excavations will be completed to verify the successful removal of contaminants in accessible portions of the Site and to document residual contaminant concentrations along the excavation sidewall along 14th Street and Q Avenue. In addition, as discussed in Section 4.2, following completion of remedial actions, groundwater will be sampled on a quarterly basis at retained or newly constructed groundwater monitoring wells for a minimum of four consecutive quarters following completion of remedial actions. After four consecutive quarters of confirmation groundwater sampling, the subsequent sampling frequency will be determined by the Port in consultation with Ecology. If the groundwater samples continue to exceed the groundwater cleanup levels after two years without abating, additional actions will be considered.

8.0 FIVE-YEAR REVIEW

Because the cleanup action described in Section 4.0 will result in hazardous substances remaining at the Site at concentrations exceeding cleanup levels, and because environmental covenants are included as part of the remedy, Ecology will review the selected cleanup action described in this DCAP every 5 years to ensure protection of human health and the environment. Consistent with the requirements of WAC 173-340-420, the 5-year review shall include the following:

- A review of the title of the real property subject to the environmental covenant to verify that the covenant is properly recorded;
- A review of available monitoring data to verify the effectiveness of completed cleanup actions, including engineered and institutional controls, in limiting exposure to hazardous substances remaining at the Site;
- A review of new scientific information for individual hazardous substances or mixtures present at the Site;
- A review of new applicable state and federal laws for hazardous substances present at the Site;
- A review of current and projected future land and resource uses at the Site;
- A review of the availability and practicability of more permanent remedies; and
- A review of the availability of improved analytical techniques to evaluate compliance with cleanup levels.

Ecology will publish a notice of all periodic reviews in the Site Register and will provide an opportunity for review and comment by the potentially liable persons and the public. If Ecology determines that substantial changes in the cleanup action are necessary to protect human health and the environment at the Site, a revised CAP will be prepared and provided for public review and comment in accordance with WAC 173-340-380 and 173-340-600.

9.0 REFERENCES

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Table 1

Final Soil Cleanup Levels

Former Shell Oil Tank Farm
Anacortes, Washington

Soil Contaminants of Concern (COCs)	Soil Cleanup Level (mg/kg)
Petroleum Hydrocarbons	
Gasoline-Range	30/100[1]
Diesel-Range	2,000
Heavy Oil-Range	2,000
Volatile Organic Compound (VOC)	
Benzene	0.13
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)	
Benzo(a)anthracene	0.13
Chrysene	0.14
Benzo(b)fluoranthene	0.43
Benzo(k)fluoranthene	0.43
Benzo(a)pyrene	0.137
Indeno(1,2,3-cd)pyrene	1.3
Dibenz(a,h)anthracene	0.65
Total cPAHs (TEQ)	0.137
Metals	
Cadmium	1.2

Notes:

[1]Cleanup level is 30 mg/kg when benzene is present.

mg/kg = milligrams per kilogram

TEQ = toxicity equivalency

Table 2

Final Groundwater Cleanup Levels

Former Shell Oil Tank Farm
Anacortes, Washington

Groundwater Contaminants of Concern (COCs)	Groundwater Cleanup Level (μg/L)
Petroleum Hydrocarbons	
Gasoline-Range	800/1,000[1]
Diesel-Range	500
Heavy Oil-Range	500
Volatile Organic Compound (VOC)	
Benzene	23.00
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)	
Benzo(a)anthracene	0.018
Chrysene	0.018
Benzo(b)fluoranthene	0.018
Benzo(k)fluoranthene	0.018
Benzo(a)pyrene	0.018
Indeno(1,2,3-cd)pyrene	0.018
Dibenz(a,h)anthracene	0.018
Total cPAHs (TEQ)	0.100
Metals	
Arsenic	8

Notes:

[1]Cleanup level is 800 μg/L when benzene is present.

μg/L = microgram per liter

TEQ = toxicity equivalency

Table 3
Description of Cleanup Action Alternatives
Former Shell Oil Tank Farm
Anacortes, Washington

Contaminants of Concern	Matrix	Objective	Cleanup Action Alternative Components			
			Alternative 1 - Engineering and Institutional Controls	Alternative 2 - In-Situ Soil Treatment	Alternative 3 - Partial Removal with In-Situ Soil Treatment	Alternative 4 - Complete Removal
Gasoline-, Diesel-, Heavy Oil-Range Hydrocarbons, Benzene, cPAHs and Cadmium	Soil	■ Prevent direct human contact with soil containing contaminants exceeding proposed cleanup levels. ■ Prevent potential leaching/migration of soil contaminants into groundwater.	■ Leave in place soil with contaminant concentrations exceeding cleanup levels. ■ Maintain existing protective concrete, asphalt and/or soil surfaces isolating Site contaminants from human contact. ■ Monitor groundwater conditions quarterly for at least one year and annually (or as agreed upon with Ecology) for approximately ten years to evaluate contaminant concentrations, plume stability and natural attenuation performance. ■ Implement deed notifications to inform future owners of the presence of potentially hazardous substances at the Property and /or Implement deed restrictions to restrict certain specific site activities.	■ Maintain existing protective concrete, asphalt and/or soil surfaces outside of the in-situ treatment area to isolate Site contaminants from human contact. ■ Injection of a chemical oxidant and an oxygen releasing material to break down and/or enhance bioremediation/degradation of organic contaminants and/or immobilize inorganic contaminants. ■ Monitor groundwater conditions quarterly for at least one year following treatment and then annually (or as agreed upon with Ecology) for approximately ten years to evaluate contaminant concentrations, plume stability and natural attenuation performance. ■ Develop institutional controls in the form of environmental covenants, signage, and other notification measures to address any remaining contaminated soil remaining in place in areas of the Site following in-situ treatment.	■ Excavate contaminated soil within the property boundary to the extent practicable using commonly available excavation techniques. ■ Transport excavated soil to an approved landfill facility. ■ Protect or relocate existing utility infrastructure (power, phone, sewer, water, etc.) during construction. ■ Placement of an oxygen releasing material within backfill layers to enhances bioremediation/ degradation of organic contaminants remaining in-place in adjacent rights-or-way. ■ Monitor groundwater conditions quarterly for at least one year following treatment and then annually (or as agreed upon with Ecology) for approximately ten years to evaluate contaminant concentrations, plume stability and natural attenuation performance. ■ Develop institutional controls in the form of environmental covenants, signage, and other notification measures to address any remaining contaminated soil remaining in place in areas of the Site following remedial excavation and in-situ treatment.	■ Excavate contaminated soil using commonly available excavation techniques. ■ Transport excavated soil to an approved landfill facility. ■ Protect or relocate existing utility infrastructure (power, phone, sewer, water, etc.) during construction. ■ Reroute vehicular and pedestrian traffic around the Site during construction. ■ Backfill and restore the Site to current conditions.
Estimated Alternative Cost (+50%/-30%, rounded)[1]			$400,000	$2,120,000	$3,000,000	$4,130,000
Estimated Volume of Contaminated Soil Removed			0 Cubic Yards	0 Cubic Yards	4,500 In-Place Cubic Yards	9,000 In-Place Cubic Yards
Estimated Timeframe to Closure			5-10 Years	5-10 Years	5-10 Years	2-3 Years

Notes:
[1] Alternative cost estimates are presented in Appendix B.

Table 4
Evaluation of Cleanup Action Alternatives
Former Shell Oil Tank Farm
Anacortes, Washington

Evaluation Criteria	Alternative 1 - Engineering and Institutional Controls	Alternative 2 - In-Situ Soil Treatment	Alternative 3 - Partial Removal with In-Situ Soil Treatment	Alternative 4 - Complete Removal
Compliance with MTCA Threshold Criteria				
Protection of Human Health and the Environment	Yes - Alternative would protect human health and the environment through a combination of engineering and institutional controls.	Yes - Alternative would protect human health and the environment through a combination of engineering and institutional controls and soil treatment.	Yes - Alternative would protect human health and the environment through a combination of engineering and institutional controls, source removal and limited soil treatment.	Yes - Alternative would protect human health and the environment through complete source removal.
Compliance With Cleanup Standards	Yes - Alternative is expected to comply with cleanup standards. This alternative utilizes institutional controls to prevent exposure to contaminants in the subsurface. Compliance would rely on long-term monitoring and maintenance of institutional controls. Future development of property could potentially require additional environmental cleanup or special provisions.	Yes - Alternative is expected to comply with cleanup standards. This alternative utilizes in-situ soil treatment and institutional controls (if necessary) to prevent exposure to contaminants in the subsurface. Compliance would rely on verification soil sampling, long-term groundwater monitoring and maintenance of institutional controls. Future development of property could potentially require additional environmental cleanup or special provisions.	Yes - Alternative is expected to comply with cleanup standards. This alternative utilizes partial source removal, in-situ soil treatment and institutional controls (if necessary) to prevent exposure to contaminants. Compliance would rely on verification soil sampling, long-term groundwater monitoring and maintenance of institutional controls. Future development of property could potentially require additional environmental cleanup or special provisions.	Yes - Alternative is expected to comply with cleanup standards to the greatest extent practicable. All contaminant exceedance will be removed to the extent practical.
Compliance With Applicable State and Federal Regulations	Yes - Alternative complies with applicable state and federal regulations.	Yes - Alternative complies with applicable state and federal regulations.	Yes - Alternative complies with applicable state and federal regulations.	Yes - Alternative complies with applicable state and federal regulations.
Provision for Compliance Monitoring	Yes - Alternative includes provisions for compliance monitoring.	Yes - Alternative includes provisions for compliance monitoring.	Yes - Alternative includes provisions for compliance monitoring.	Yes - Alternative includes provisions for compliance monitoring.
Restoration Time Frame				
Restoration Time Frame	Restoration time frame is short. Primary cleanup action components have already been implemented. The time frame for long-term groundwater monitoring is unknown. Potential future maintenance of institutional controls will extend the restoration time frame of this alternative.	Restoration time frame is moderate. Primary cleanup action components have already been implemented. In-situ soil treatment is expected to achieve cleanup objectives in 3-5 years. The time frame for long-term monitoring is unknown and depends on the effectiveness of the treatment. Potential future maintenance of institutional controls may extend the restoration time frame of this alternative.	Restoration time frame is moderate. Primary cleanup action components have already been implemented. Partial source removal followed by in-situ soil treatment is expected to achieve cleanup objectives in 3-5 years. Potential future maintenance of institutional controls may extend the restoration time frame of this alternative.	Restoration time frame is short. Full source removal is expected to achieve cleanup objectives in 2-3 years
Relative Benefits Ranking (Scored from 1-lowest to 10-highest)				
Protectiveness	Score = 3 Achieves a moderate-low level of overall protectiveness as a result of institutional and engineering controls. Protectiveness would rely on maintenance of institutional and engineering controls to prevent exposure. Existing environmental risks are not significantly reduced.	Score = 7 Achieves a medium-high level of overall protectiveness as a result of in-situ soil treatment. However, this alternative would leave in place both organic and inorganic contaminants in soil, and protectiveness would rely on maintenance of institutional controls to prevent the overall exposure.	Score = 8 Achieves a medium-high level of overall protectiveness as a result of partial soil removal followed by in-situ soil treatment. However, this alternative would leave contaminants in soil, and overall protectiveness would rely on maintenance of institutional controls to prevent exposure.	Score = 10 Achieves a high level of overall protectiveness as a result of full source removal of the soil that poses risk to human and ecological receptors at the Site.

Evaluation Criteria	Alternative 1 - Engineering and Institutional Controls	Alternative 2 - In-Situ Soil Treatment	Alternative 3 - Partial Removal with In-Situ Soil Treatment	Alternative 4 - Complete Removal
Permanence	Score = 3 Achieves a medium-low level of permanence, primarily through the use of the paved road surfaces and soil cap. This alternative relies on natural attenuation methods to achieve a reduction of mass. Future development may require modification of the remedy.	Score = 7 Achieves a medium-high level of permanence through permanent reduction of toxicity and mobility of Site contaminants through the use of capping beneath paved surfaces, as with Alternative 1, and in-situ soil treatment within the property boundary. This alternative provides for reduction of mass in accessible portions of the Site. Inorganic contaminants would require maintenance of institutional controls to prevent exposure.	Score = 8 Achieves a medium-high level of permanence through permanent reduction of toxicity and mobility of Site contaminants through the removal and capping. This alternative provides for enhanced reduction of mass across the Site.	Score = 10 Achieves a high level of permanent reduction of mass, toxicity, and mobility of hazardous substances at the Site through soil excavation. This alternative would reduce to the extent feasible the need to perform additional actions.
Relative Benefits Ranking (Scored from 1-lowest to 10-highest) Continued				
Long-Term Effectiveness	Score = 3 This Alternative achieves a medium-low level of long-term effectiveness. The use of existing paved surfaced and soil cap provide for long-term reduction of risk to human health, but leaves soil at the Site exceeding cleanup levels. The use of institutional controls reduces the risk to human health and the environment from the residual contamination left in place. Future development may require modification of the remedy.	Score = 6 This Alternative achieves a medium level of long-term effectiveness. The use of in-situ soil treatment within the property boundary provides for long-term reduction of risk to human health and the environment. However, this alternative would leave in place inorganic contaminants in soil within the property boundary and in soil beneath the adjacent rights-of-way exceeding cleanup levels and potentially leave organic contaminants in place due to incomplete treatment. The use of institutional controls reduces the risk to human health and the environment from the residual contamination left in place. Future development may require modification of the remedy.	Score = 7 This Alternative achieves a medium level of long-term effectiveness. Source removal within the property boundary provides for immediate reduction of risk to human health and the environment and in-situ soil treatment allows for further reduction of contaminant mass over time.. However, this alternative leaves contamination in soil beneath the adjacent rights-of-way exceeding cleanup levels. The use of institutional controls reduces the risk to human health and the environment from the residual contamination left in place. Future development may require modification of the remedy.	Score = 10 Removes hazardous substances from the Site to the greatest degree feasible and utilizes approved off-site disposal facilities for final disposition.
Management of Short-Term Risks	Score = 10 Short-term risks are low with this alternative due to the lack of construction activities involved in completing the components of the alternative. The capping components are already in place.	Score = 5 Short-term risks are moderately-high with this alternative. The in-situ soil treatment included in this Alternative is not expected to pose significant risks to the public. However, may require multiple rounds of treatment to meet the cleanup objectives.	Score = 8 Short-term risks are moderately low with this alternative. The soil removal included in this Alternative involves is not expected to pose significant risks to the public.	Score = 4 Short-term risks associated with this alternative would be moderately high. This alternative involves selective structure modification of the surface roads and buried utilities to access contaminated soil.
Technical and Admin. Implementability	Score = 8 Readily implemented. No active cleanup activities required. Administrative implementability of institutional controls is high.	Score = 7 Moderate challenge to implement. No active cleanup activities required beyond the property boundary. Administrative implementability of institutional controls is high.	Score = 8 Moderate challenge to implement. No active cleanup activities required beyond the property boundary. Excavation of contaminated soil a large volume of soil, but utilizes standard excavation methods. Administrative implementability of institutional controls is high.	Score = 4 Difficult to implement due to the design and coordination associated with shoring and rerouting of utilities in adjacent rights-of-way. Cleanup alternative does not require development of institutional controls.
Consideration of Public Concerns	Score = 3 Residual contamination remaining in place could result in concerns by the public and nearby property owners.	Score = 6 Organic soil contamination within the property boundary is addressed by this Alternative. However, residual organic contaminants beneath the adjacent rights-of-way and inorganic contaminants (metals) within the property boundary following implementation of the cleanup action could result in concerns by the public and nearby property owners. In addition, use of an oxidation product in the vicinity of marine water may cause public concern. The remaining contaminated soil left in place would require maintenance of institutional controls and impose limitations on future use and development of the property.	Score = 8 Soil contamination within the property boundary is addressed by this Alternative. However, residual organic contaminants beneath the adjacent rights-of-way following implementation of the clean action could result in concerns by the public and nearby property owners. The remaining contaminated soil left in place would require maintenance of institutional controls and impose limitations on future use and development of the property.	Score = 8 Soil contamination would be removed to the extent practical under this alterative. Concerns by the public and nearby property owners could result from the temporary closure and rerouting of surface streets and buried utilities. However, closure and rerouting of surface streets and buried utilities would be on a short term basis.

Table 5

Summary of MTCA Evaluation and Ranking of Cleanup Action Alternatives

Former Shell Oil Tank Farm

Anacortes, Washington

Remedial Alternative	Alternative 1 - Engineering and Institutional Controls	Alternative 2 - In-Situ Soil Treatment	Alternative 3 - Partial Removal with In-Situ Soil Treatment	Alternative 4 - Complete Removal
Evaluation				
Compliance with MTCA Threshold Criteria	Yes	Yes	Yes	Yes
Restoration Time Frame	1-2 years	2-3 years	2-3 years	2-3 years
Relative Benefits Ranking				
Protectiveness (weighted as 30%)	0.9	2.1	2.4	3
Permanence (weighted as 20%)	0.6	1.4	1.6	2
Long-Term Effectiveness (weighted as 20%)	0.6	1.2	1.4	2
Management of Short-Term Risks (weighted as 10%)	1	0.5	0.8	0.4
Technical and Administrative Implementability (weighted as 10%)	0.8	0.7	0.8	0.4
Consideration of Public Concerns (weighted as 10%)	0.3	0.6	0.8	0.8
Total of Scores	4.2	6.5	7.8	8.6
Disproportionate Cost Analysis				
Probable Remedy Cost (+50%/-30%, rounded)	$400,000	$2,120,000	$3,000,000	$4,130,000
Costs Disproportionate to Incremental Benefits	No	No	No	Yes
Practicability of Remedy	Practicable	Practicable	Practicable	Practicable
Remedy Permanent to Maximum Extent Practicable	Yes	Yes	Yes	Yes
Overall Alternative Ranking	3rd	2nd	1st	--

N
W E
S

2,000 0 2,000

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
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Data Sources: ESRI Data & Maps

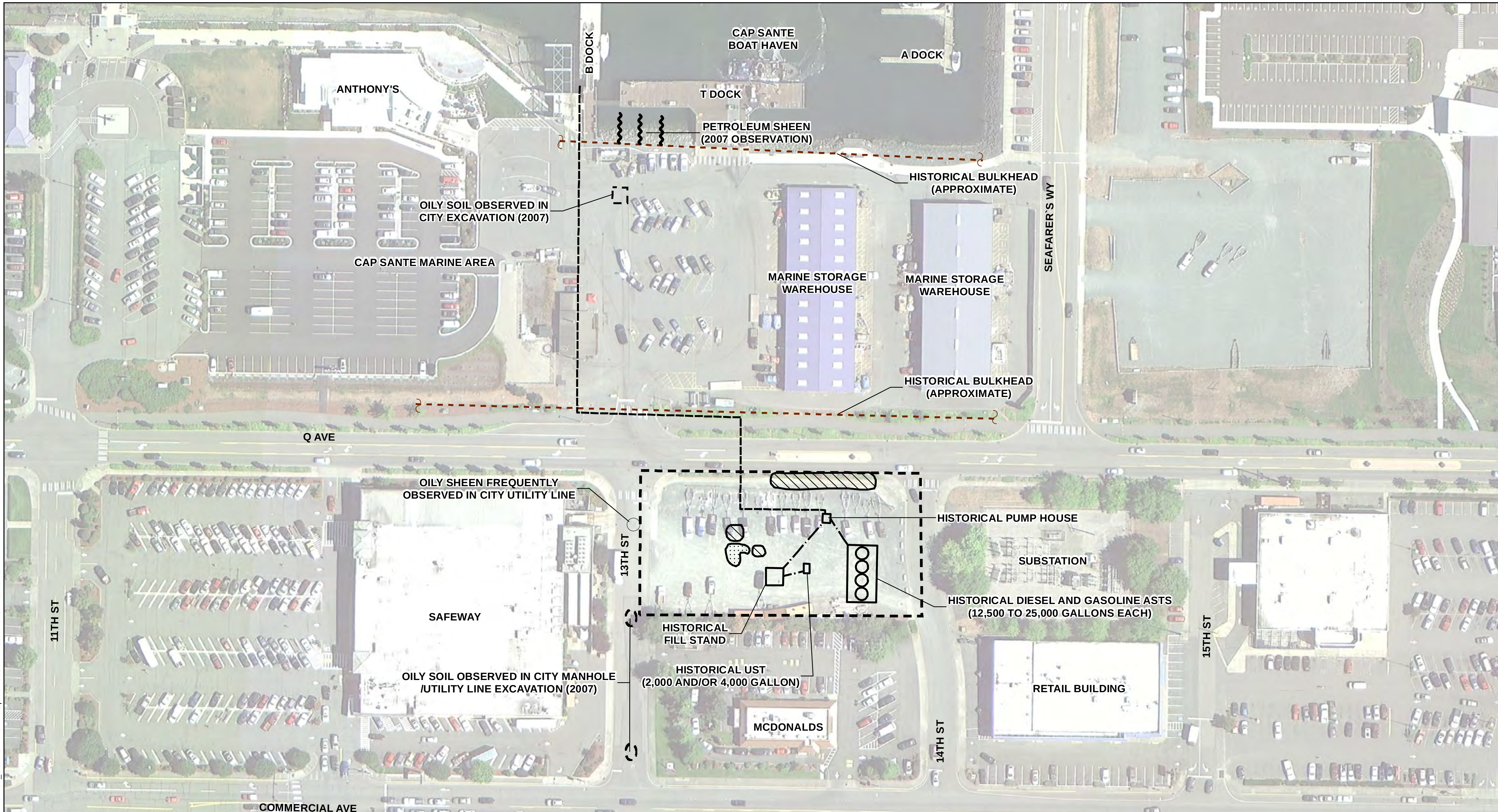
Projection: NAD 1983 UTM Zone 10N

Vicinity Map

Former Shell Oil Tank Farm Site
Anacortes, Washington

Figure 1

Path: \\seal\projects\5\5147012\GIS\DCAP\514701202_VicinityMap.mxd Map Revised: 21 March 2013 amanza



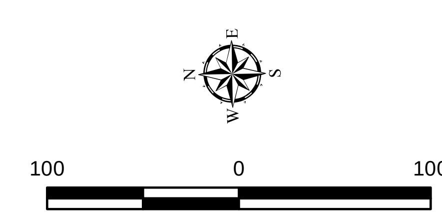
Path: \\sea\projects\5\5147012\GIS\DCAP\514701202_SitePlan.mxd Map Revised: 21 March 2013 amanza

Notes:
1. AST = Above Ground Storage Tank. UST = Underground Storage Tank
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Roads from Skagit County. Point, line and polygon features digitized from figures 5.1 and 6.1 of November 2006 and Figure 2 of September 2005 by Floyd Snider. Imagery date: 2011.

Legend

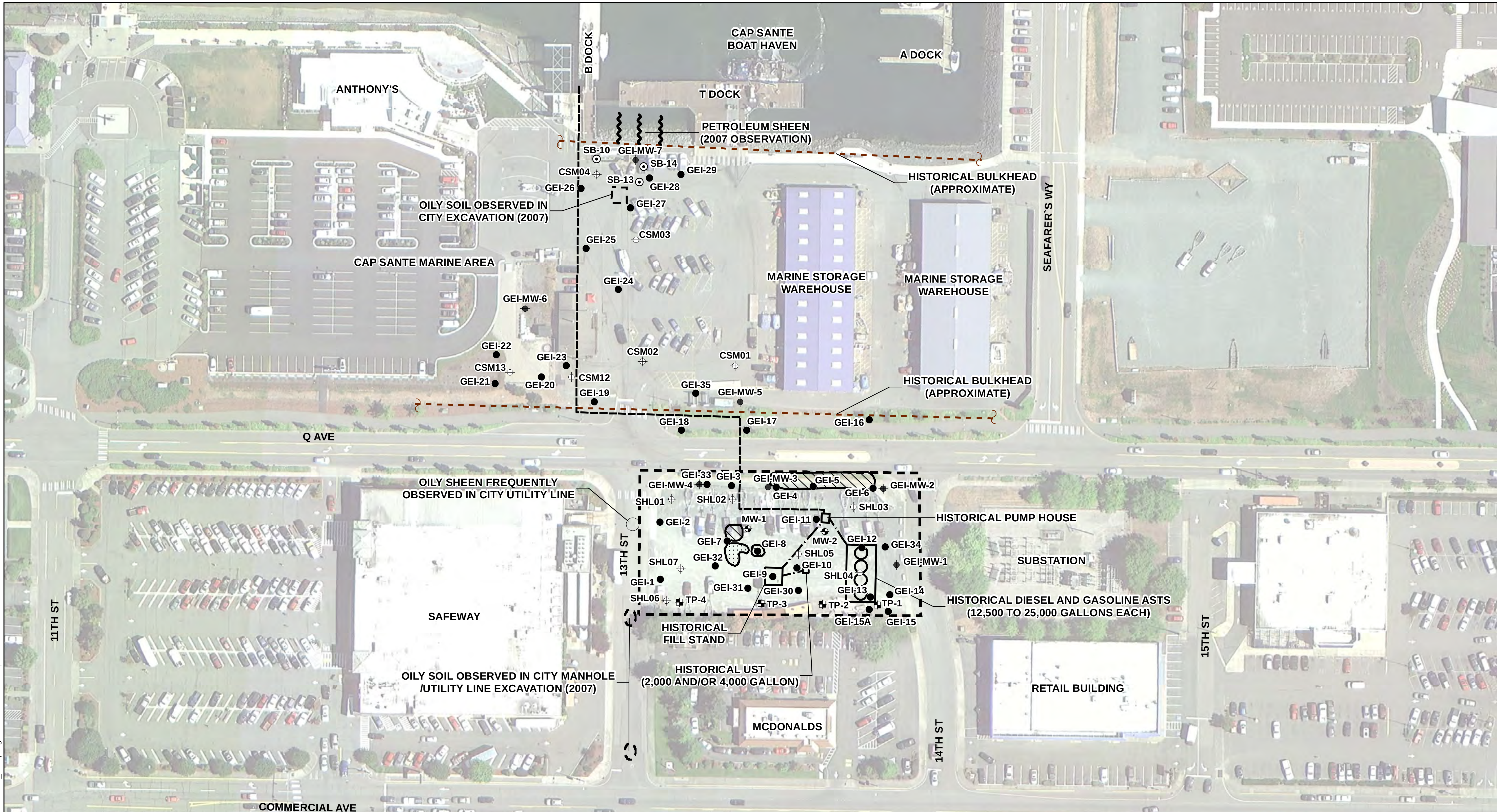
- Former Shell Oil Tank Farm
- Historical Features
- Surface Oil (1987 Observation)
- White Powder (1987 Observation)
- Historical Fuel Supply Line
- Historical Product Line



Site Plan

Former Shell Oil Tank Farm Site
Anacortes, Washington

Figure 2



Path: \\seal\projects\5\5147012\GIS\DCAP\514701202_SamplingLocations.mxd Map Revised: 21 March 2013 amanza

Notes:
1. AST = Above Ground Storage Tank. UST = Underground Storage Tank
2. The locations of all features shown are approximate.
3. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Roads from Skagit County. Point, line and polygon features digitized from figures 5.1 and 6.1 of November 2006 and Figure 2 of September 2005 by Floyd Snider. Imagery date: 2011.

Environmental Investigation Locations

- GeoEngineers (2012)
- GeoEngineers (2011)
- GeoEngineers (2007)
- Landau (2007)
- Floyd Snider (2005)
- Hart Crowser (1987)

Legend

- Former Shell Oil Tank Farm
- Historical Features
- Surface Oil (1987 Observation)
- White Powder (1987 Observation)
- Historical Fuel Supply Line
- Historical Product Line

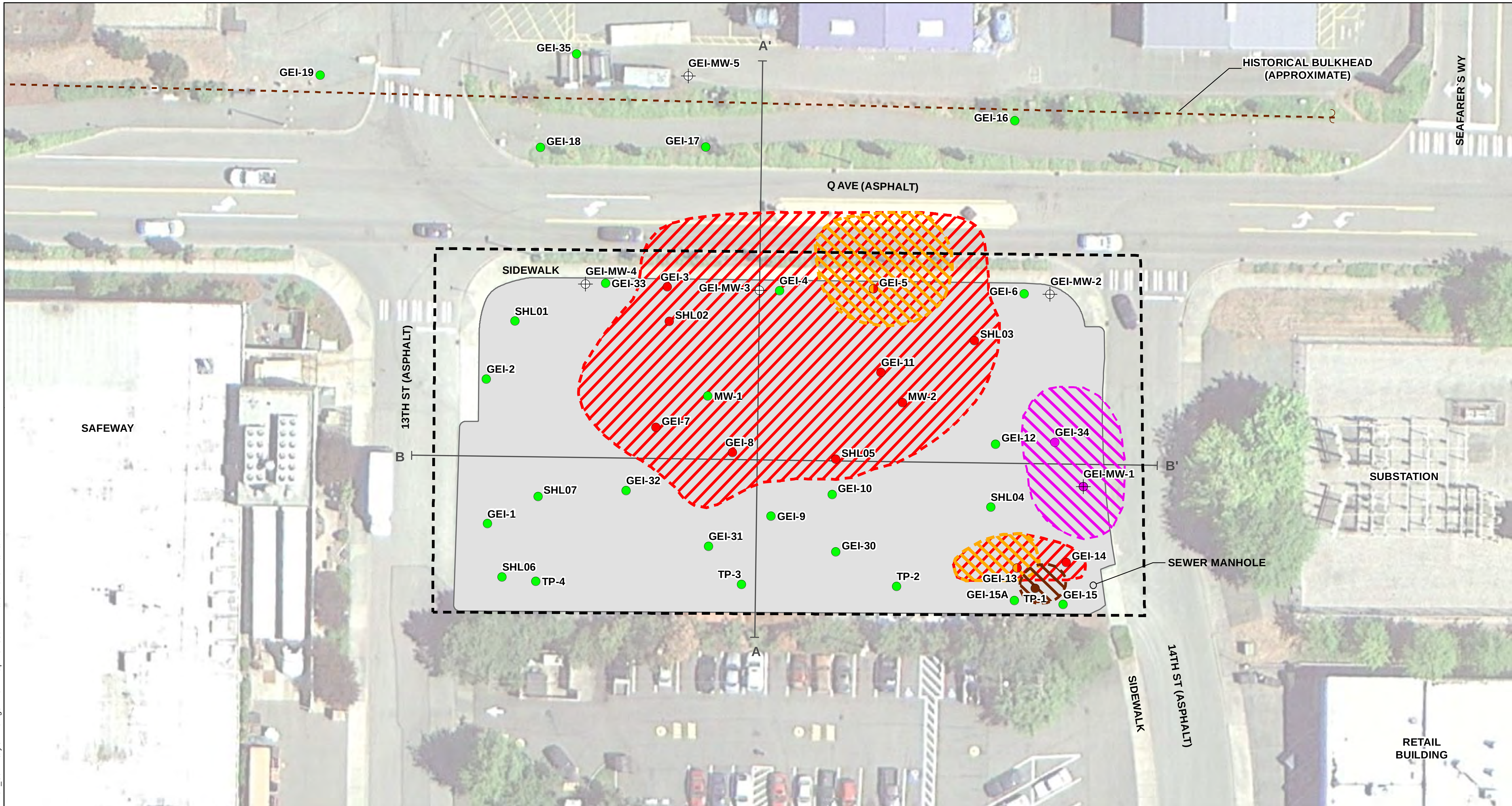
N E S W

100 0 100
Feet

Environmental Investigation Sampling Locations

Former Shell Oil Tank Farm Site
Anacortes, Washington

Figure 3



40 0 40
Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Reference: Roads from Skagit County. Point, line and polygon features digitized from figures 5.1 and 6.1 of November 2006 and Figure 2 of September 2005 by Floyd Snider. Imagery date: 2011.

Legend

- Soil Exploration Location
- Monitoring Well Location
- TPH Exceeds Soil Cleanup Level
- Benzene Exceeds Soil Cleanup Level
- cPAH Exceeds Soil Cleanup Level
- Cadmium Exceeds Soil Cleanup Level
- COCs (TPH, Benzene, cPAHs, and/or Cadmium) Less Than Soil Cleanup Level
- Cross Section
- Former Shell Oil Tank Farm
- Gravel Surface

Area With Contaminants of Concern (COCs) Exceeding Soil Cleanup Level

- Approximate Area of TPH Exceedance in Soil
- Approximate Area of Benzene Exceedance in Soil
- Approximate Area of cPAH Exceedance in Soil
- Approximate Area of Metals (Cadmium) Exceedance in Soil

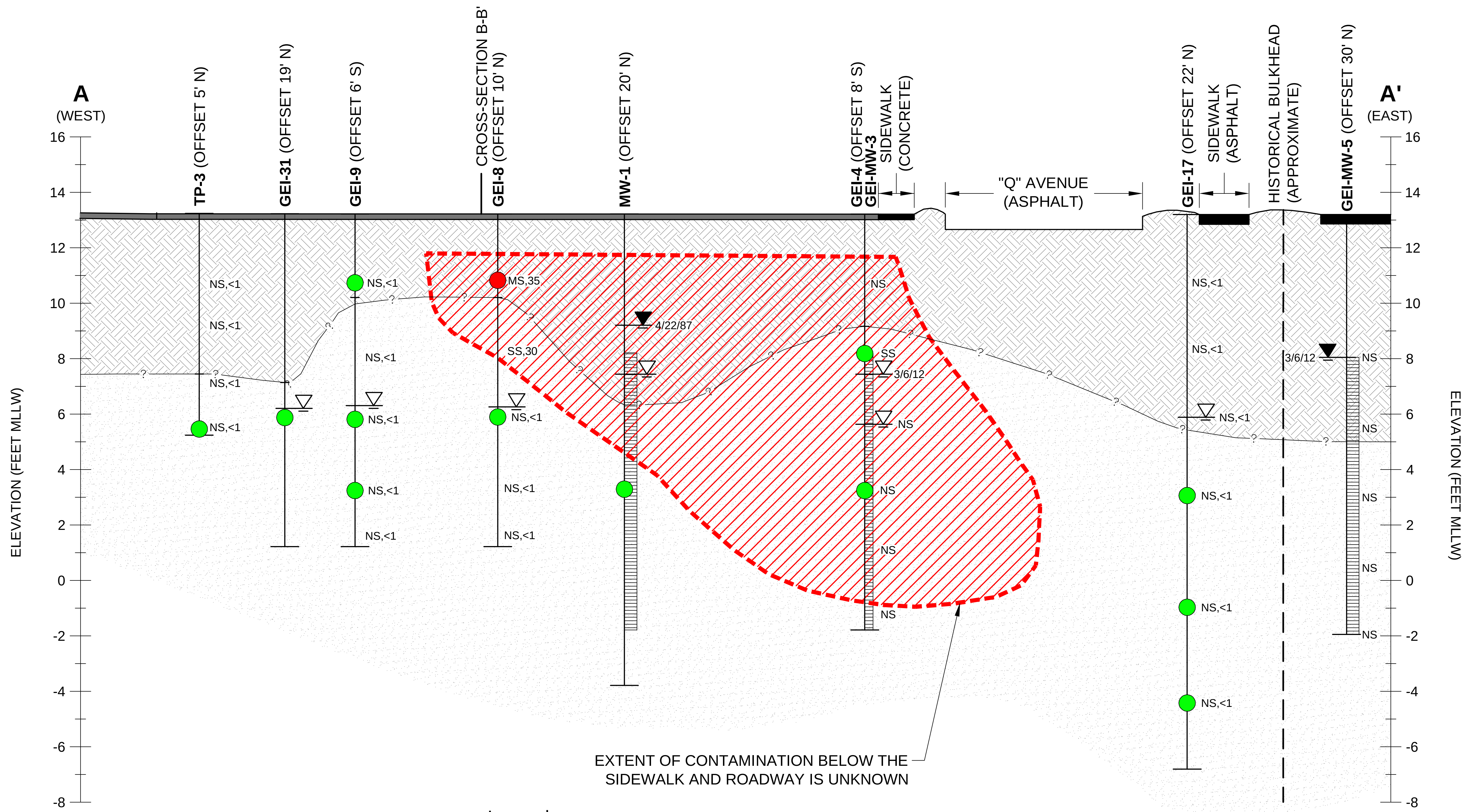
cPAH Carcinogenic Polycyclic Aromatic Hydrocarbons
TPH Petroleum Hydrocarbons (Gasoline, Diesel and/or Heavy Oil)

Current Site Conditions

Former Shell Oil Tank Farm Site
Anacortes, Washington

Figure 4

Path: \\seal\projects\5\5147012\GIS\DCAP\514701202_SummaryOfFindings.mxd Map Revised: 21 March 2013 amanza



Legend

GEI-8

Boring

Inferred Soil Contact

Groundwater Level Observed During Drilling

Measured Ground Water Level and Date

NS,<1 Field Screening Results (Sheen, Headspace Vapor)

Well Screen Interval

Gravel Surface

Fill Material (Silty Sand with varying amounts of Silt and Gravel)

Native Marine Sediment (Silt and Silty Sand)

Soil Sample Location

TPH Exceed Soil Cleanup Level

COCs (TPH, Benzene, cPAHs and/or Cadium) Less than Soil Cleanup Level

Approximate Area of TPH Exceedance in Soil

MLLW	Mean Lower Low Water
COCs	Contaminants of Concern
TPH	Petroleum Hydrocarbons (Gasoline, Diesel and/or Heavy Oil)
cPAHs	Carcinogenic Polycyclic Aromatic Hydrocarbons

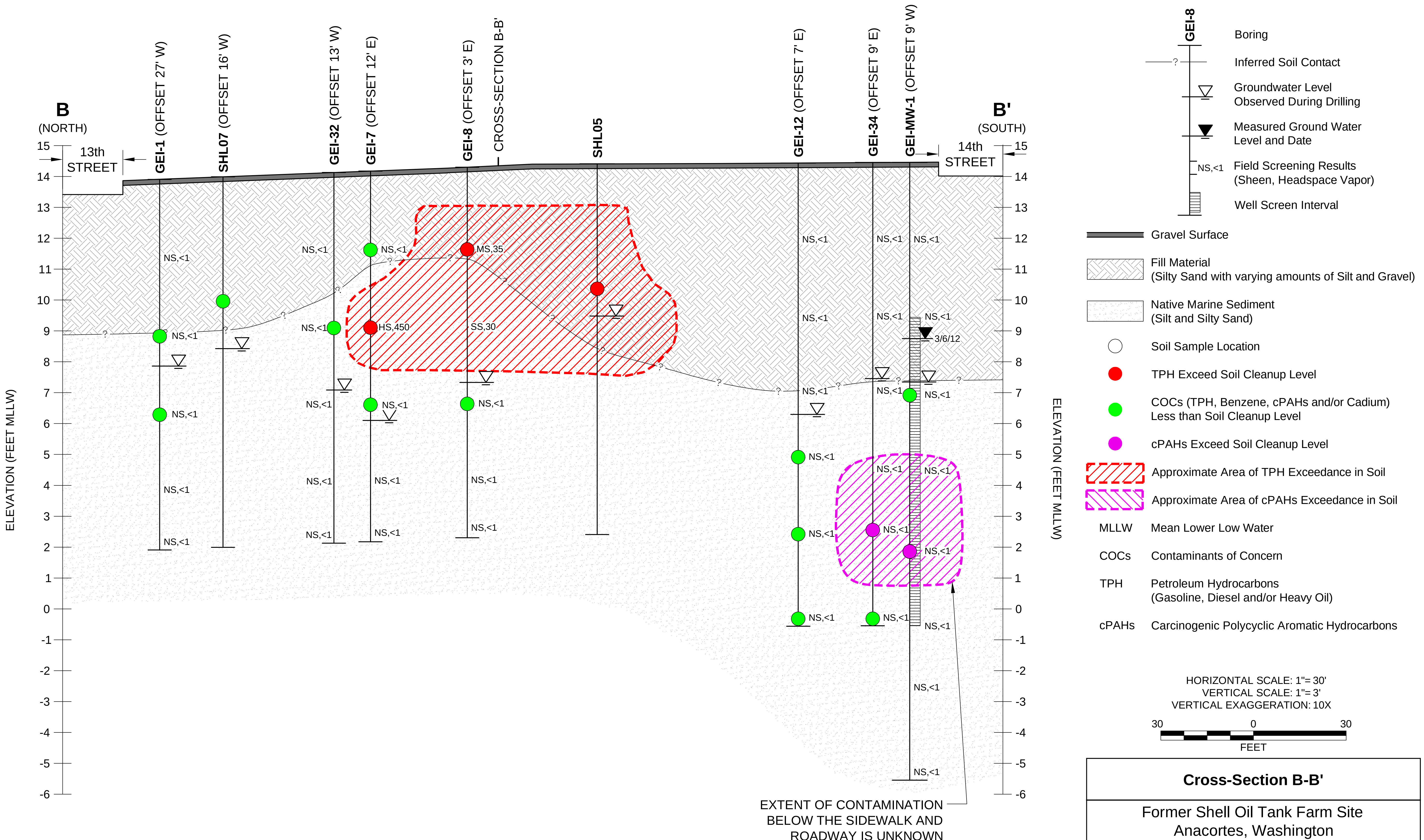
HORIZONTAL SCALE: 1"= 20'
VERTICAL SCALE: 1"= 4'
VERTICAL EXAGGERATION: 5X

20 0 20
FEET

Cross-Section A-A'

Former Shell Oil Tank Farm Site
Anacortes, Washington

Figure 5



Cross-Section B-B'

Former Shell Oil Tank Farm Site
Anacortes, Washington

Figure 6

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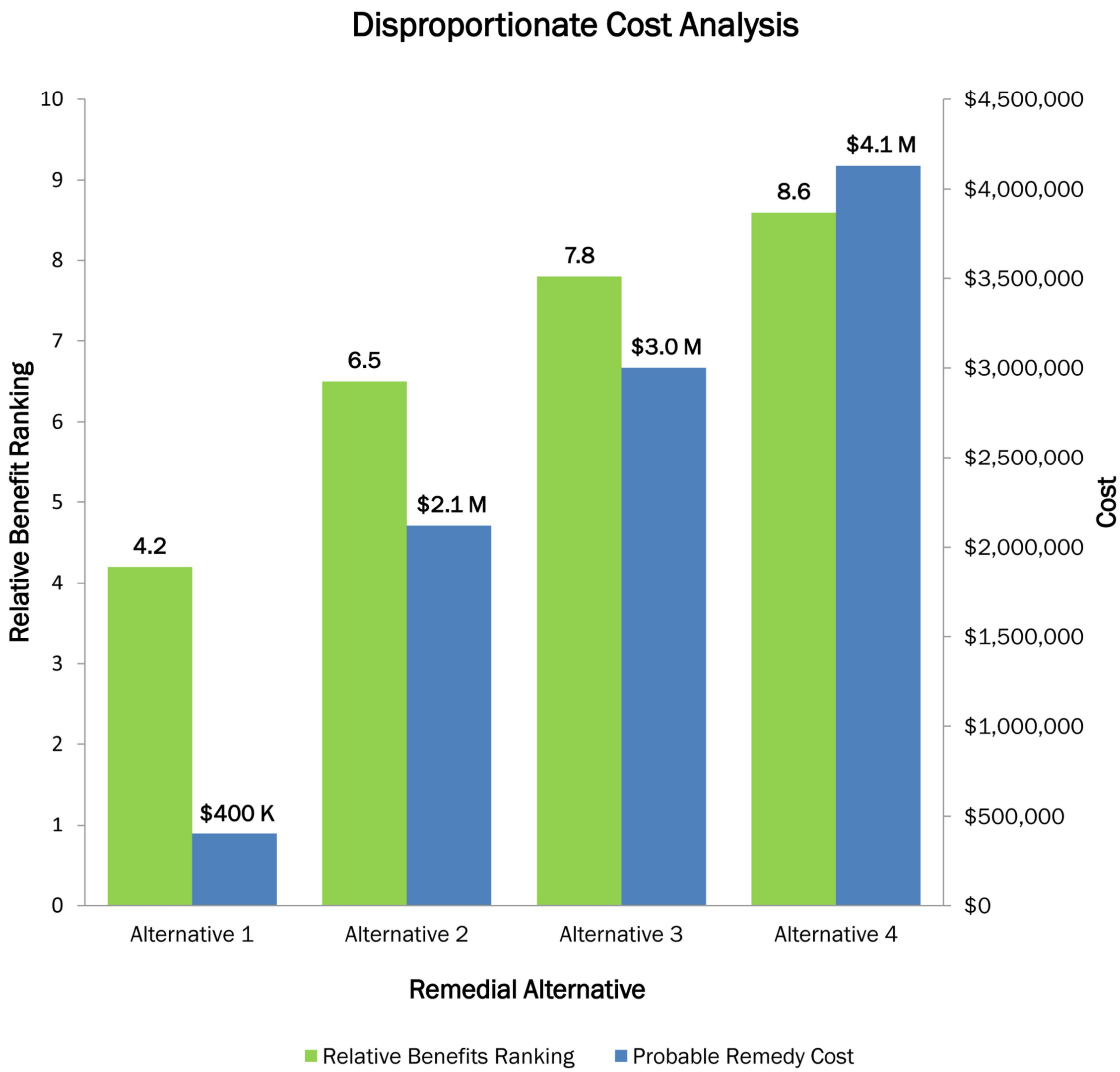

Disproportionate Cost Analysis

Former Shell Oil Tank Farm Site
Anacortes, Washington

Figure 7

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