CLEANUP ACTION PLAN (CAP)

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
CAP	Cleanup Action Plan
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
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 Cleanup Action Plan (CAP) for upland properties at the former Shell Oil Tank Farm Site (Site) generally located between 13th Street and 14th Street east of Commercial Avenue in Anacortes, Washington. This CAP was prepared as a collaborative effort by the Washington State Department of Ecology (Ecology) and the Port of Anacortes (Port) 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 CAP describes Ecology's selected 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, and was subsequently leased 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 from 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 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, diesel and heavy oil), carcinogenic polycyclic aromatic hydrocarbons (cPAHs), volatile organic compounds (benzene) and metals (cadmium) in soil at concentrations above preliminary cleanup levels. The 2012 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 CAP, 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) will 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 will 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 14th 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-, diesel- and heavy oil-range petroleum hydrocarbons, cPAHs, VOCs (benzene) and metals (chromium) do not exceed groundwater cleanup levels.
- Establish environmental covenants to restrict future development and control any future soil disturbance where contamination remains at the Site.

1.0 INTRODUCTION

This document presents the Cleanup Action Plan (CAP) 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 Former Shell Tank Farm (Ecology Facility/Site Identification No. 4781157) and is generally located between 13th Street and 14th Street east of Commercial Avenue in Anacortes, Washington (Figure 2). This CAP was prepared as a collaborative effort by Ecology and the Port of Anacortes (Port) 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 CAP 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. 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 CAP will complete the Scope of Work requirements described in the Agreed Order.

1.2 Purpose

The purpose of this CAP 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 selected 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 Remedial Investigation/Feasibility Study Work Plan (Work Plan; GeoEngineers, 2009) 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. Site facilities included three 25,000 gallon aboveground storage tanks (ASTs) that contained and gasoline and diesel, product lines that connected the ASTs and pump house to a historical pier

located east of the Site across Q Avenue, and a 2,000 gallon underground storage tank (UST). Historically, gasoline and diesel were pumped from the pier to the bulk fuel facility for storage and distribution to various distributors. In the 1950s, two additional 12,500 gallon ASTs were installed at the Site and the 2,000 gallon UST was reportedly replaced with a 4,000 gallon UST. Gasoline, diesel and stove oil were reportedly stored in the ASTs and dry cleaning solvent was stored in the UST.

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 was operated by shell and various bulk product distributors as a bulk fuel storage facility until 1987 at which time operations ceased and the facility reportedly decommissioned, including removal of all tanks, associated piping, and 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. 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 the Agreed Order, 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 GEI-23, CSM-12, CSM-13, SB-13 and SB-14 is not associated with the Shell Site. Soil contamination in this area is determined to be the result of historical actions at the Cap Sante Marine Site which is subject to cleanup action by the Port under Consent Decree No. 9917.

2.4 Summary of Environmental Conditions

This section summarizes environmental conditions at the Shell Tank Farm 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 and eastern portions of the former Shell Oil Tank Farm which are believed to extend beneath 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 which is believed to extend beneath 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 2.5 feet and 17 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 the petroleum hydrocarbon, benzene, cPAH and cadmium contaminated 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. Subsequent groundwater samples collected from permanent monitoring wells (GeoEngineers, 2013b) indicate that lead and diesel-range petroleum hydrocarbons as well as the other contaminants of concern (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 Report. 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 of 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 of 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 current petroleum hydrocarbon, 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 based on the current soil and groundwater conditions are summarized in the following section (Sections 2.5.1).

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 COCs 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 2.5and 17 ft bgs in the central and eastern portion of the former Shell Oil Tank Farm and are believed to 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 believed to extend beneath portions of 14th Street.

2.5.2 Groundwater

Because COCs 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, groundwater is not a media of concern.

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 is 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 the Site and is presented in the RI/FS Report. Because the Site is not located on or directly adjacent to a native or semi-native management area, threatened or endangered species are not present, threatened or sensitive plant species classified by the Washington State Department of Natural Resource are not present; there is less than ten acres of native vegetation within 500 feet of the Site, and there has been no determination that the Site may present a risk to significant wildlife populations, the Site qualified for a Simplified TEE. Results of the Simplified TEE exposure analysis (Table 749-1) indicated that the Site does not have a

substantial potential for posing a threat of significant adverse effects to terrestrial ecological receptors, therefore the Site is removed from further ecological consideration.

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. As outlined in Section 2.5, the list of COCs (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 COCs.

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. Because COCs were detected in soil at concentrations exceeding preliminary soil cleanup levels, soil is a media of concern. However, because COCs 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, groundwater is not a media of concern. Site-specific Soil cleanup levels are summarized below.

3.3.1 Soil

Cleanup levels for soil indicator hazardous substances used in this CAP are presented in Table 1. These cleanup levels were developed as part of the Ecology-approved Work Plan 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; WAC173-340-747[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 the Site does not have a substantial potential for posing a threat of significant adverse effects to terrestrial ecological receptors 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 soil cleanup levels.

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 impacted media.

3.4.1 Soil

The standard point of compliance for the soil cleanup levels summarized 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).

3.5 Applicable Regulatory Requirements

In addition to the cleanup standards developed through the MTCA process and presented in Section 3.3, 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 (WAC 173-340-710). Applicable or Relevant and Appropriate Requirements (ARARs) identified for the Site are presented in Table 2.

4.0 ALTERNATIVES CONSIDERED AND BASIS FOR REMEDY SELECTION

This section summarizes the results of the development and evaluation of remedial action alternatives performed in the RI/FS.

4.1 Remedial Alternatives Considered

A range of potential cleanup action alternatives were evaluated in the RI/FS report (GeoEngineers, 2013a). The process of developing remedial alternatives for evaluation involved screening applicable remediation technologies for inclusion in a reasonable set of complete remedial action alternatives. Each remedial action alternative addresses the contaminated media present at the Site. The screening and assembly of remedial technologies resulted in four complete remedial action alternatives that were evaluated in the RI/FS Report. The four remedial alternatives are listed below and described in more detail in Table 3.

- Alternative 1 – Engineering and Institutional Controls;
- Alternative 2 – In-Situ Soil Treatment;
- Alternative 3 – Partial Removal with In-Situ Soil Treatment, and;
- Alternative 4 – Complete Removal.

4.2 Evaluation Methodology

The four remedial alternatives (Alternatives 1 through 4) developed in the FS were evaluated in accordance with the process outlined in MTCA. 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.

As a first step, the alternatives were evaluated with respect to the threshold requirements. Remedial action alternatives that do not comply with the threshold requirements are not considered suitable cleanup actions under MTCA. As provided in WAC 173-340-360(2)(a), the four threshold requirements for cleanup actions are:

- Protect human health and the environment;
- Comply with cleanup standards;

- Comply with applicable state and federal laws; and
- Provide for compliance monitoring.

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) include:

- 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 sections and are presented in Tables 4 and 5.

4.2.1 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.

4.2.2 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.

4.2.3 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.

4.2.4 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.

4.2.5 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.

4.2.6 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.

4.2.7 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.

4.3 Evaluation and Comparison of the Cleanup Action Alternatives

The evaluation of remedial alternatives performed in the FS showed that all four alternatives met the MTCA threshold requirements and warranted inclusion in the DCA evaluation process. The evaluation of disproportionate cost is based on a comparative analysis of costs against the six MTCA evaluation criteria identified above. Relative rankings of each alternative for these criteria using a numeric scoring scale of 1 (lowest) to 10 (highest) are summarized in Table 4. Table 5 summarizes how each alternative scored with respect to each of the DCA criterion and presents the estimated cost for each of the alternatives. Figure 7 presents the results of the alternative scores according to the DCA criteria and how the relative benefit corresponds to the relative cost of each alternative. The conclusions of DCA evaluation are summarized in the following sections.

4.3.1 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.

4.3.2 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.

4.3.3 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.

4.3.4 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).

4.3.5 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.

4.3.6 Consideration of Public Comments

Alternative 4 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.

4.3.7 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.

4.4 Overall Comparison of Remedy Costs and Benefits

Table 5 and Figure 7 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 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 4 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. In addition, Alternative 3 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.

5.0 SELECTED SITE CLEANUP ACTION

Based on the comparative analysis presented in the FS, the selected remedial action alternative for the Site is Remedial Alternative 3. This alternative for the Site relies on the existing empirical data that groundwater located downgradient of the impacted soils is not adversely impacted (i.e., does not exceed MTCA cleanup levels) by the presence of the identified contamination. The selected alternative (Alternative 3) reduces risk to potential human and ecological receptors through:

- Removal of contaminated soil within the readily accessible portion of the Site (i.e., gravel surface within the former Shell Oil Tank Farm) exceeding soil cleanup levels;
- 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);
- Utilizes existing engineering controls such as concrete and asphalt surfaces isolate remaining soil contamination at the Site from human and ecological receptors;
- Monitoring of groundwater to confirm plume stability and attenuation performance, and;
- Implementation of institutional controls (Environmental Covenant).

The following sections provide additional detail on the preferred remedial action alternative.

5.1 Excavation and Off-Site Disposal of Contaminated Soil

Soil in which concentrations of petroleum hydrocarbons, benzene, cadmium and cPAHs will be excavated within the portion of the Site that is readily accessible (i.e., gravel surface within the former Shell Oil Tank Farm) and transported from the Site for disposal at a permitted landfill facility. Based on the results of previous environmental investigations, approximately 1,000 in-place cubic yards of overburden soil will be excavated to access approximately 3,000 in-place cubic yards of contaminated soil (approximately 75% of the total volume) within the readily accessible portion of the Site 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), all excavated soil will be transported from the Site for permitted disposal. During remedial excavation activities existing utility infrastructure (power, phone, sewer, water, etc.) will remain undisturbed

and protected in-place. In addition, excavation slopes and/or shoring will be required to protect adjacent utilities, sidewalks and roads.

Soil generated by the remedial excavation will be transported from the Site to an approved landfill facility for permitted disposal. Landfill disposal authorization will be obtained using the chemical analytical results from previous environmental studies. Chemical analytical results from previous RI studies indicate that soil generated from the Site will designate as non-dangerous and will be suitable for disposal at a Subtitle D landfill.

During backfilling activities, an oxygen releasing material will 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 will 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 remedial excavation.

5.2 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 completion of the cleanup action, contamination is believed to remain in-place beneath portions of 14th Street and Q Avenue at concentrations exceeding the soil cleanup levels.

As described above, the selected cleanup alternative relies on utilizing existing engineering controls (i.e., asphalt and concrete surfaces) 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 as described in Sections 5.3 and 5.6, respectively. The areas where contaminated soil is believed to remain in-place include:

- Q Avenue Right-of-Way – Soil contaminated with petroleum hydrocarbons and benzene is believed to 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. Soil samples will be obtained during the remedial excavation to characterize the nature and extent of remaining contamination at this location. Soil sampling activities are further discussed in Section 5.3.

- 14th Street Right-of-Way – Soil contaminated with cPAHs is believed to 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. Soil samples will be obtained during the remedial excavation to characterize the nature and extent of remaining contamination at this location. Soil sampling activities are further discussed in Section 5.3.

Section 5.6 below discusses environmental covenants required for the portions of the Site where contaminated soil exceeding cleanup levels (Table 1) remains in place.

5.3 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 the remedial design. The objective of the CMP 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.

Compliance monitoring activities are described in Sections 5.3.1 through 5.3.3 below.

5.3.1 Protection Monitoring

Protection monitoring will include monitoring of worker health and safety and environmental protection practices such as stormwater, erosion, and sediment controls. The purpose of protection monitoring is to confirm that human health and the environment are adequately protected during the cleanup action. Personnel engaged in work that involves hazardous material excavation and handling shall comply with the provisions of WAC 173-340-810 (MTCA Cleanup Regulation, Worker Safety and Health) and be HAZWOPER, OSHA, and WISHA certified. In addition, spill prevention and pollution control (SPCC) measures will be implemented and maintained throughout the duration of the cleanup action including all necessary stormwater management, surface water runoff control, temporary erosion and sediment control measures to meet the substantive requirements of the applicable local, state and federal regulations.

5.3.2 Performance Monitoring

Performance monitoring will involve collecting soil samples from the base and sidewalls of the remedial excavation to confirm that the soil cleanup levels presented in Table 1 have been achieved and/or to document contaminant concentrations remaining at the Site. Performance monitoring activities will include the collection discrete grab samples from the final limits of the remedial excavations, with the sampling density appropriately tailored to the location and size of the excavation. The confirmatory soil samples will be submitted for analysis of indicator hazardous substances on a short turnaround to verify whether the final limits of the remedial excavation has been achieved or to document remaining contaminant mass at the Site in portions of the Site that are not accessible (i.e., beneath portions of 14th Street and Q Avenue).

5.3.3 Confirmation Monitoring

To verify that the selected cleanup action is protective of groundwater, existing and/or new monitoring wells will be installed at the Site and sampled for Site indicator hazardous substances. The exact number and location of the monitoring wells will be determined following the completion of remedial actions based on the final dimensions of the excavation area.

Groundwater will be sampled on a quarterly basis at each of the monitoring well locations (either retained or installed following remedial activities) for a minimum of four consecutive quarters. Groundwater samples will be analyzed indicator hazardous substances (see Table 1), including total and dissolved metals, gasoline-, diesel- and heavy oil-range hydrocarbons, VOCs (benzene) and PAHs to ensure that groundwater within and/or downgradient of areas in which contaminated soils remains in place meet the cleanup standards for the Site (see Table 1).

5.4 Contingency Actions

Groundwater monitoring will ensure that contaminated soils left in place do not pose a hazard to marine surface water through the soil to groundwater exposure pathway. Environmental investigations completed during the RI/FS demonstrated that groundwater within and/or downgradient of the contaminant plumes complies with the groundwater cleanup levels presented in Table 1, 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 consecutive 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 response actions will be considered.

5.5 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.

5.6 Environmental Covenants

The selected cleanup action is anticipated to leave soil exceeding soil cleanup levels presented in Table 1 in place below portions of Q Avenue and 14th Street. While the contaminated soil will be isolated and will not pose a direct threat for exposure to human health and terrestrial ecological receptors, future development within areas of the remaining 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 presented in 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 instructing property owners of 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.

5.7 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, habitat restoration opportunities have not been identified for the selected cleanup action.

6.0 IMPLEMENTATION OF THE CLEANUP ACTION

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 5.0 of this CAP 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. The selected cleanup action will require development of remedial design documents, permit applications, and contract documents prior to construction. The following sections describe the necessary steps to construct the selected cleanup action.

6.1 Permits/Other Requirements

The remedial action will be conducted under a Consent Decree. The Consent Decree will be entered in Skagit County Superior Court, and will become effective once entered. Accordingly, the remedial action meets the permit exemption provisions of MTCA (WAC 173-340-710[9]), obviating the need to follow the procedural requirements of most federal, state and local laws that would otherwise apply to the action. The remedial action will, however, comply with the substantive requirements of the applicable federal, state and local laws presented in Table 2. The exemption is not applicable if Ecology determines that the exemption would result in the loss of approval from a federal agency that may be necessary for the state to administer any federal law. Permits and authorizations required to implement the selected cleanup action are discussed below.

6.1.1 Solid and Hazardous Waste Management

The Washington Hazardous Waste Management Act and the implementing regulations, the Dangerous Waste Regulations (Chapter 173-303 WAC), will apply if dangerous wastes are generated during the cleanup action. There is no indication of listed wastes will be 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).

Prior to the disposal of material generated by the selected cleanup action, landfill use authorizations will be obtained for the acceptance of this material to each receiving facility utilized.

6.1.2 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.

A SEPA checklist will be prepared as part of the permitting process for the remedial action. The Port will be the lead SEPA agency for this action.

6.1.3 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.

Construction activities that disturb one 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).

6.1.4 Health and Safety

Site cleanup-related activities will 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.

6.2 Engineering Design Report

An Engineering Design Report will be prepared that includes construction plans and specifications that document the engineering concepts and design criteria for the remedial action to be performed at the Site. The information required under WAC 173-340-400(4)(a) will be included in the Engineering Design Report. The Engineering Design Report will include an Operations, Maintenance, and Monitoring Plan describing long-term operations, maintenance, and monitoring required following completion of remedial action construction. The Engineering Design Report will also include the proposed language of environmental covenants required to be implemented as institutional controls.

6.3 Construction Plans and Specifications

Construction plans and specifications will be prepared that detail the design criteria and construction requirements to perform the remedial actions at the Site. As required by

WAC 173-340-400(4)(b), the documents will include the following information, as applicable:

- A description of the work to be performed, and a summary of the engineering design criteria from the Engineering Design Report;
- A site location map and a map of existing conditions;
- A copy of applicable permit applications and/or approvals;
- Detailed plans, procedures, and specifications necessary for the remedial action;
- Specific quality control tests to be performed to document the construction, including specifications for testing or reference to specific testing methods, frequency of testing, acceptable results, and other documentation methods; and
- Provisions to ensure that the health and safety requirements of WAC 173-340-810 are met.

All aspects of construction will be performed and documented in accordance with WAC 173-340-400(6). These aspects include approval of all of the plans listed above prior to commencement of work, oversight of construction by a Professional Engineer licensed in the State of Washington, and submittal of a Construction Completion Report that documents all aspects of the cleanup and includes an opinion of the engineer as to whether the cleanup was conducted in substantial compliance with the CAP, the Engineering Design Report, and the Construction Plans and Specifications.

6.4 Anticipated Schedule for Design and Implementation

Preliminary design of the cleanup remedy and the selected cleanup action described in this CAP was initiated in April 2012 under Agreed Order DE-08TCPHQ-5474 between Ecology and the Port. Remedial actions are currently targeted to begin in the fall of 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.

The anticipated schedule for implementation of the cleanup action includes the following:

- Draft Engineering Design Report – Submitted to Ecology for review within 60 days of the Consent Decree effective date.
- Final Engineering Design Report – Submitted to Ecology 45 days after receipt of comments from Ecology on the Draft Engineering Design Report.
- Draft Compliance Monitoring Plan – Submitted to Ecology for review within 60 days of the Consent Decree effective date.
- Final Compliance Monitoring Plan – Submitted to Ecology 45 days after receipt of comments from Ecology on the Draft Compliance Monitoring Plan.
- Cleanup Action Construction – Commence within 120 days of Ecology approval of the Final Engineering Design Report and Final Compliance Monitoring Plan, and estimated to occur over a period of 3 to 6 months beginning in the fall of 2014.
- Draft Construction Completion (As-Built) Report – Submitted to Ecology within 90 days of completion of cleanup action construction.
- Final Construction Completion (As-Built) Report – Submitted to Ecology 45 days after receipt of comments from Ecology on the Draft Construction Completion (As-Built) Report.

The cleanup action construction is tentatively planned to commence in the fall of 2014 to correspond to the Port's use of the property for short-term trailer storage during the boating season (i.e., spring and summer months). The cleanup action construction may be delayed with approval from Ecology.

7.0 FIVE-YEAR REVIEW

Because the cleanup action described in Section 5.0 will result in contamination remaining at the Site at concentrations exceeding Site cleanup levels, and because environmental covenants are included as part of the remedy, Ecology will review the selected cleanup action described in this CAP 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.

8.0 REFERENCES

Floyd|Snider, "Limited Environmental Due Diligence Investigation Report, Former Shell Oil Tank Farm, Cap Sante Marine Lease Area," prepared for the Port of Anacortes, November 8, 2005

GeoEngineers, Inc., "Independent Remedial Action Completion Report, Former Shell Tank Farm, Storm Drain Re-Route, 13th Street and Q Avenue, Anacortes, Washington," GEI File No. 5147-012-00 prepared for the Port of Anacortes, April 18, 2008.

GeoEngineers, Inc., "Work Plan, Remedial Investigation/Feasibility Study, Former Shell Oil Tank Farm," GEI File No. 5147-012-01 prepared for the Washington State Department of Ecology on behalf of Port of Anacortes, September 1, 2009.

GeoEngineers, Inc. (2013a), "Draft Remedial Investigation Data Report, Former Shell Tank Farm, Anacortes, Washington," GEI File No. 5147-012-02, prepared for the Washington State Department of Ecology on behalf of Port of Anacortes, January 17, 2013.

GeoEngineers, Inc. (2013b), "Draft Remedial Investigation/Feasibility Study, Former Shell Oil Tank Farm, Anacortes, Washington, Ecology Agreed Order No. DE-08TCPHQ-5474," GEI File No. 5147 012-02, prepared for the Washington State Department of Ecology on behalf of Port of Anacortes, January 17, 2013.

Hart Crowser & Associates, Inc., "Preliminary Environmental Site Assessment, Petroleum Bulk Storage Facility, Anacortes Washington," prepared for Port of Anacortes, May 27, 1987.

Landau Associates (2007a), "Work Plan, Remedial Investigation/Feasibility Study and Interim Action, Cap Sante Marine Lease Area, Anacortes, Washington," prepared for the Port of Anacortes, June 19, 2007.

Landau Associates (2007b), "Landau Associates, Investigation Data Report, Cap Sante Marine Lease Area, Anacortes, Washington," prepared for the Port of Anacortes, August 21, 2007.

Table 1

Cleanup Levels for Indicator Hazardous Substances

Former Shell Oil Tank Farm

Anacortes, Washington

Indicator Hazardous Substances	Soil Cleanup Level (mg/kg)	Groundwater Cleanup Level (µg/L)
Petroleum Hydrocarbons		
Gasoline-Range	30/100[1]	800/1,000[2]
Diesel-Range	2,000	500
Heavy Oil-Range	2,000	500
Volatile Organic Compound (VOC)		
Benzene	0.13	23.00
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)		
Benzo(a)anthracene	0.13	0.02
Chrysene	0.14	0.02
Benzo(b)fluoranthene	0.43	0.02
Benzo(k)fluoranthene	0.43	0.018
Benzo(a)pyrene	0.137	0.018
Indeno(1,2,3-cd)pyrene	1.3	0.0
Dibenz(a,h)anthracene	0.65	0.018
Total cPAHs (TEQ)	0.137	0.100
Metals		
Cadmium	1.2	8.0

Notes:

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

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

mg/kg = milligrams per kilogram

µg/L = microgram per liter

TEQ = toxicity equivalency

Table 2

Summary of Applicable or Relevant and Appropriate Requirements

Former Shell Oil Tank Farm

Anacortes, Washington

Standard, Requirement, Criterion, or Limitation	Citation	Description	ARAR
Federal			
Resource Conservation and Recovery Act (RCRA), Identification and Management of Hazardous Wastes	40 CFR 261 et seq.	Specifies how to determine whether a solid waste is considered hazardous (whether listed or based on characteristic) and how to manage hazardous wastes.	Relevant and appropriate (state is authorized for RCRA)
Hazardous Materials Transportation Act	49 USC 1801-1813 49 CFR 107, 171-177	Regulates the transportation of hazardous waste.	Applicable (if offsite disposal included in cleanup action).
Clean Air Act (CAA), National Ambient Air Quality Standards	42 USC 7401 et seq. 40 CFR 50	Provides air quality standards for six criteria pollutants, including particulate matter, to protect public health and welfare.	Applicable
Clean Water Act--National Pollution Discharge Elimination System (NPDES)	33 USC § 1342	Prohibits discharge of pollutants to waters of the U.S. without a permit issued by EPA or a delegated state agency. In the State of Washington, WDOE has delegated authority to issue NPDES permits, including Construction Stormwater General Permits. Construction Stormwater General Permits are required where a proposed project involving clearing, grading, or evacating may disturb one or more acres of land, and result in discharge of stormwater to surface waters of the State.	Substantive requirements, including substantive elements of a Construction Stormwater General Permit, are applicable for any point source discharge of pollutants to surface water, including stormwater runoff in the Site.
Endangered Species Act (ESA)	16 U.S.C. §§ 1531 – 1544 50 CFR Parts 17, 402	Provides for the protection of species of fish, wildlife, and plants that are listed as threatened or endangered with extinction. It also protects designated critical habitat for listed species. The Act outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species, including consultation with resource agencies.	Applicable to the site for listed and proposed to be listed threatened or endangered species and their habitat areas which will, or could, be impacted by cleanup action.

Standard, Requirement, Criterion, or Limitation	Citation	Description	ARAR
Fish and Wildlife Coordination Act	16 U.S.C. § 661 et seq	Requires that adequate provision must be made for the conservation, maintenance, and management of wildlife resources and habitat and requires consultation with the U.S. Fish and Wildlife service and appropriate state agencies.	Applicable to the site if listed threatened or endangered species habitat areas will, or could, be impacted by cleanup action.
Migratory Bird Treaty Act (MBTA)	16 USC § 703 et seq	Makes it unlawful to "hunt, take, capture, kill" or take various other actions adversely affecting a broad range of migratory birds, including tundra swans, hawks, falcons, songbirds, without prior approval by the U.S. Fish and Wildlife Service.	Applicable for protecting migratory bird species if identified. The selected response action must be carried out in a manner that avoids the taking of protected migratory bird species, including individual birds or their nests or eggs.
Federal Coastal Zone Management Act (CZMA)	16 USC 1451-1464 15 CFR 923-930	Requires that construction activities near the shoreline must be consistent with the State's Coastal Zone Management Program.	Applicable if construction is completed within 200 feet of the shoreline.
Archaeological Resources Protection Act	16 USC § 470aa et seq.; 43 CFR Part 7	Prohibits the unauthorized disturbance of archaeological resources on public or Indian lands. Archaeological resources are "any material remains of past human life and activities which are of archaeological interest," including pottery, baskets, tools, and human skeletal remains. The unauthorized removal of archaeological resources from public or Indian lands is prohibited without a permit, and any archaeological investigations at a site must be conducted by a professional archeologist.	Applicable for the conduct of any selected cleanup actions that may result in ground disturbance.
American Indian Religious Freedom Act	42 USC § 1996 et seq	The American Indian Religious Freedom Act and implementing regulations are intended to protect Native American religious, ceremonial, and burial sites, and the free practice of religions by Native American groups. The requirements of this Act must be followed if sacred sites graves are discovered in the course of ground-disturbing activities.	Potentially applicable to a site where response actions involve disturbance/alteration of the ground and/or site terrain.

Standard, Requirement, Criterion, or Limitation	Citation	Description	ARAR
Native American Graves Protection and Repatriation Act	25 USC § 3001 et seq 43 CFR Part 10 25 USC 3001 et seq. 43 CFR 10	Intended to protect Native American graves from desecration through the removal and trafficking of human remains and "cultural items" including funerary and sacred objects. The requirements of this Act must be followed when graves are discovered or ground-disturbing activities encounter Native American burial sites.	Potentially applicable to a site where response actions involve disturbance/ alteration of the ground and/or site terrain.
Occupational Safety and Health Act	29 CFR 1904, 1910, 1926	Specifies minimum requirements to maintain worker health and safety during hazardous waste operations, including training and construction safety requirements.	Appropriate
State of Washington			
State Environmental Policy Act (SEPA)	RCW 43.21C WAC 197-11 WAC 173-802	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.	Applicable (a SEPA checklist is required prior remedial construction activities).
Shoreline Management Act	RCW 90.58 WAC 173-27-060	Provides requirments for the development and management of shorelines of the state.	Substantive requirements are applicable for construction within 200 feet of the shoreline.
Model Toxics Control Act (MTCA), Cleanup Standards	WAC 173-340-700 through 173-340-760	Provides standards for cleanup of contamination in soils, surface water and groundwater.	Applicable
MTCA, Site Cleanup and Monitoring	WAC 173-340-400 through 173-340-440	Provides requirements for implementation of the cleanup action, compliance monitoring, periodic review, interim action and institutional controls.	Applicable
Washington Clean Air Act	RCW 70.94, 43.21A WAC 173-400	Requires all sources of air contaminants to meet emission standards for visible, particulate, fugitive, odors, and hazardous air emissions. Requires use of reasonably available control technology.	Substantive requirements are applicable for any response actions in the project area that may create fugitive dust or other regulated air emissions.
Puget Sound Clean Air Agency (PSCAA)	Regulation 1, Section 9.15.	Provides regulation for the visible emissions of fugitive dust and reasonable precautions that should be employed to minimize these emissions.	Substantive requirements are applicable for any response actions in the project area that may create fugitive dust or other regulated air emissions.

Standard, Requirement, Criterion, or Limitation	Citation	Description	ARAR
Hazardous Waste Management Act, Dangerous Waste Regulations	RCW 70.105 WAC 173-303	Governs handling and disposition of dangerous waste, including identification, accumulation, storage, transport, treatment, and disposal.	Substantive requirements are applicable handling, storage, and disposal of hazardous material.
Solid Waste Handling Standards	WAC 173-350 WAC 173-351	Regulates the handling and disposal of solid waste.	Applicable
Regulation and Licensing of Well Contractors and Operators	RCW 18.104 WAC 173-162-020 and -030	Provides regulation and licensing of well contractors and operators and for the regulation of well design and construction.	Applicable
City of Anacortes			
City of Anacortes land disturbance/grading permit	Chapter 17.54.090 Chapter 18.12	Provides the criterial or standards for the land clearing and grading.	Permit Exempt (the substantive requirements are applicable).
City of Anacortes noise ordinance	Chapter 17.54.010 Ordinance 2316 (part), 1994	Establishes noise levels and standerds.	Applicable
City of Anacortes Publicly Owned Treatment Water (POTW) discharge authorization	Chapert 13.40.060	Establishes the requirments and limitatoins for dishcarges to the POTW.	Permit Exempt (the substantive requirements are applicable).
City of Anacortes stormwater management program	Chapter 13.36 Chapert 17.54.050	Provides the necessary measures to control the quantity and quality of stormwater produced by new development and redevelopment such that they comply with water quality standards and contribute to the protection of beneficial uses of the receiving waters.	Applicable

Notes:

ARAR = Applicable or Relevant and Appropriate Requirement

CFR = Code of Federal Regulations

RCW = Revised Code of Washington

WAC = Washington Administrative Code

USC = United States Code

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.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: ESRI Data & Maps

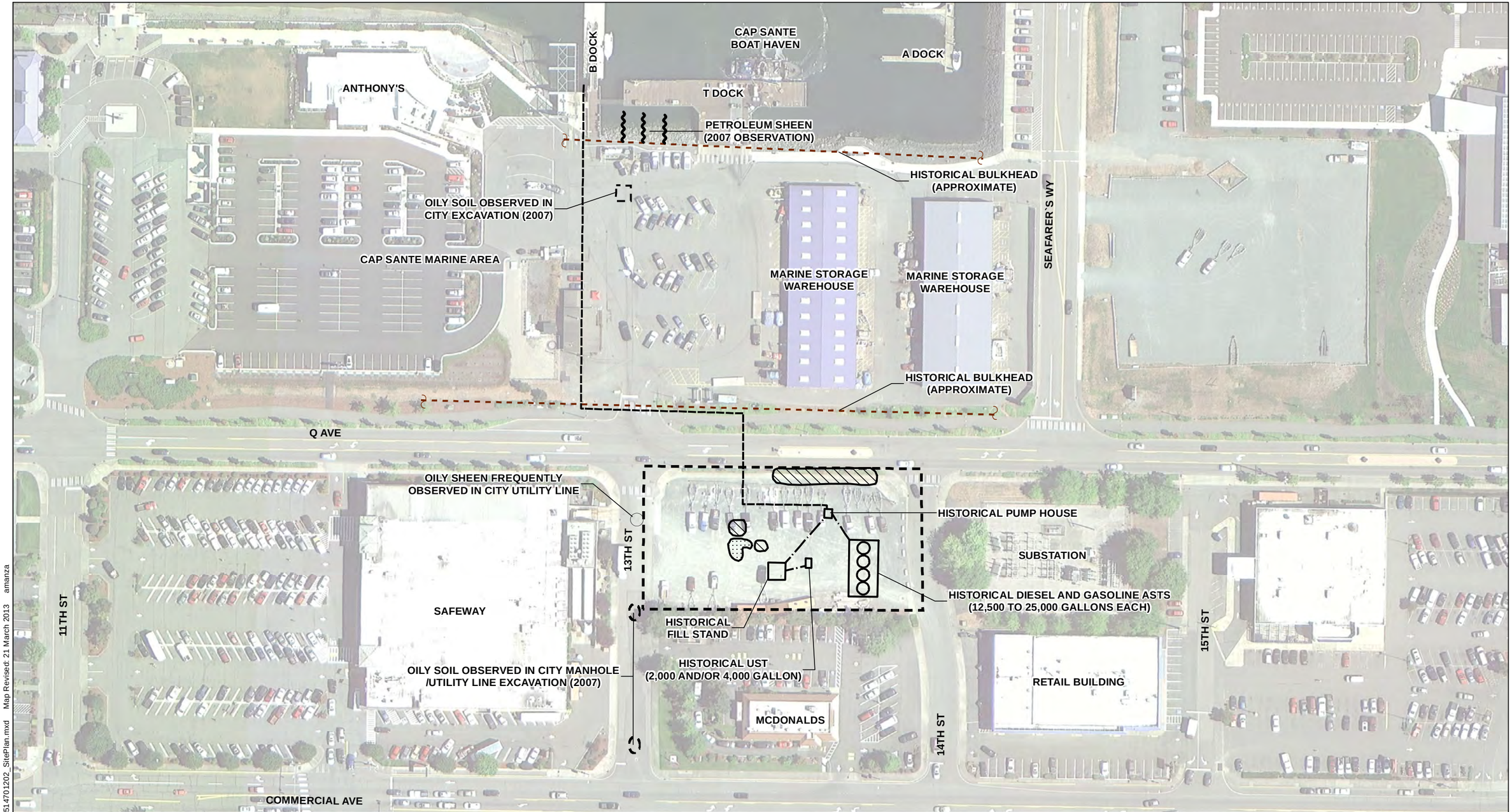
Projection: NAD 1983 UTM Zone 10N

Vicinity Map

Former Shell Oil Tank Farm Site
Anacortes, Washington

Figure 1

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



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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

N E S W

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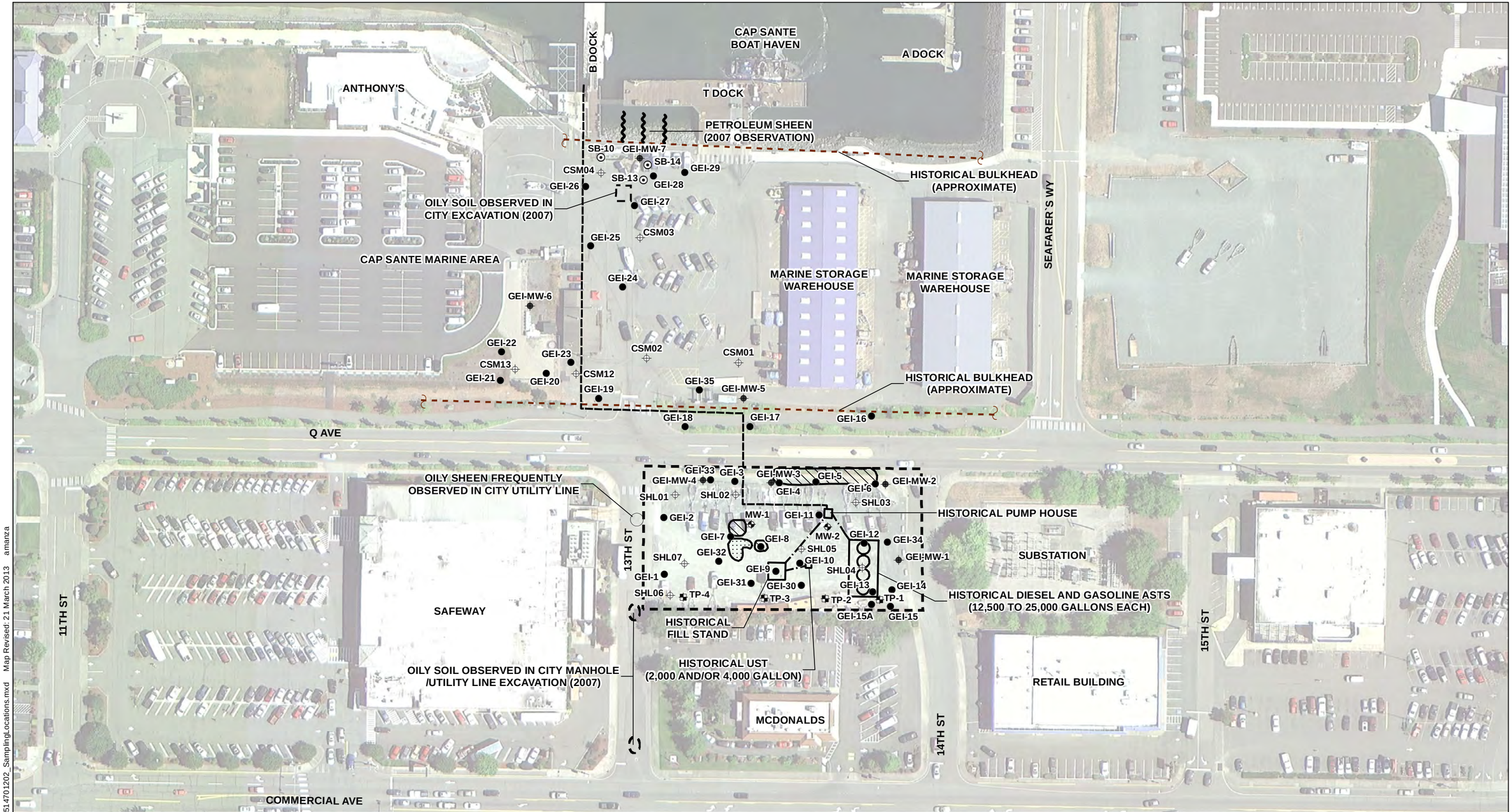
Feet

Site Plan

Former Shell Oil Tank Farm Site
Anacortes, Washington

Figure 2



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

100 0 100
Feet

Environmental Investigation Sampling Locations

Former Shell Oil Tank Farm Site
Anacortes, Washington

Figure 3

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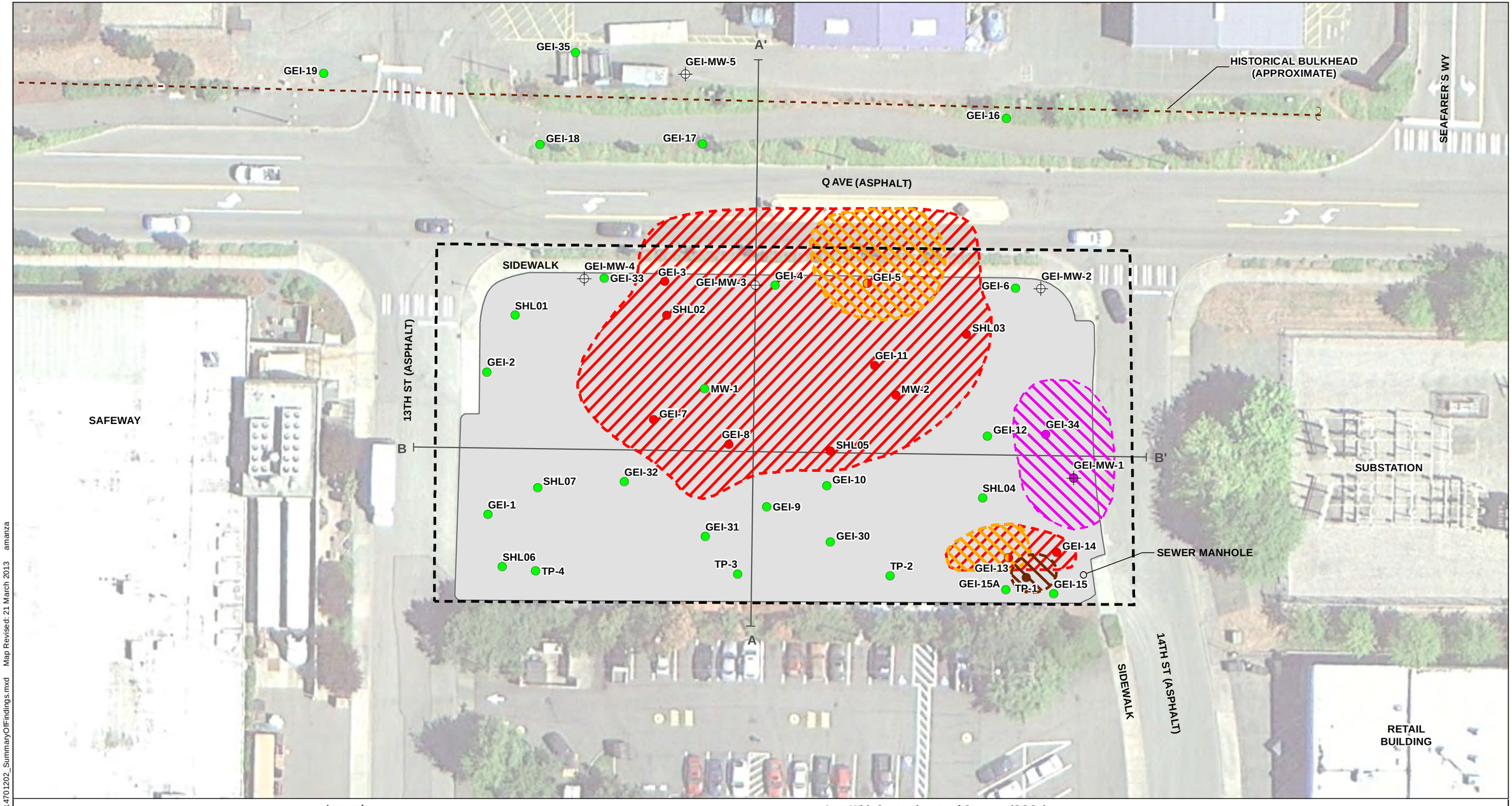

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Feet

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

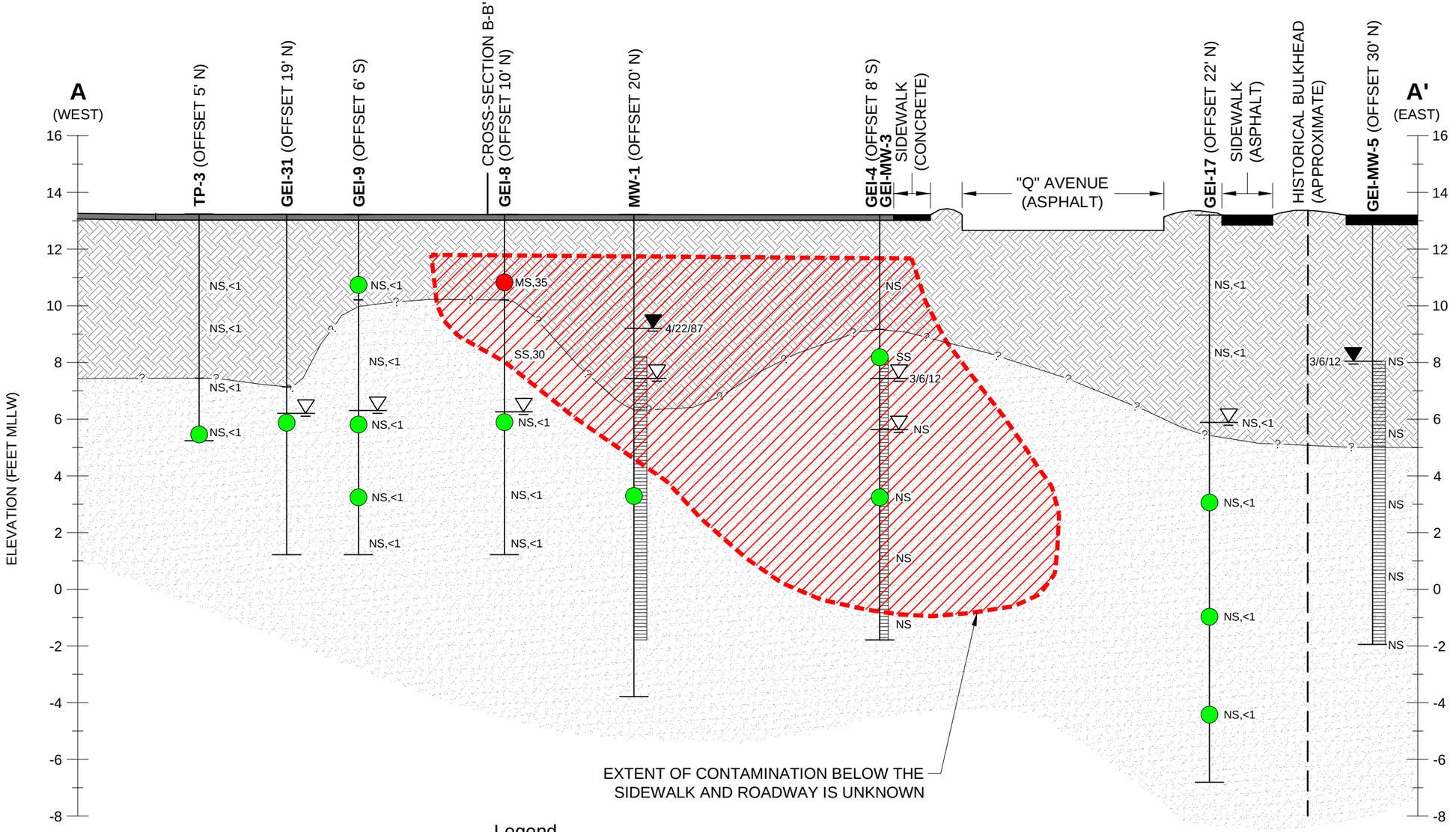
cPAH Carcinogenic Polycyclic Aromatic Hydrocarbons
TPH Petroleum Hydrocarbons (Gasoline, Diesel and/or Heavy Oil)

Current Site Conditions

Former Shell Oil Tank Farm Site
Anacortes, Washington

Figure 4

Path: \\sea\projects\51\51470\2\GIS\DCAP\51470\1202_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

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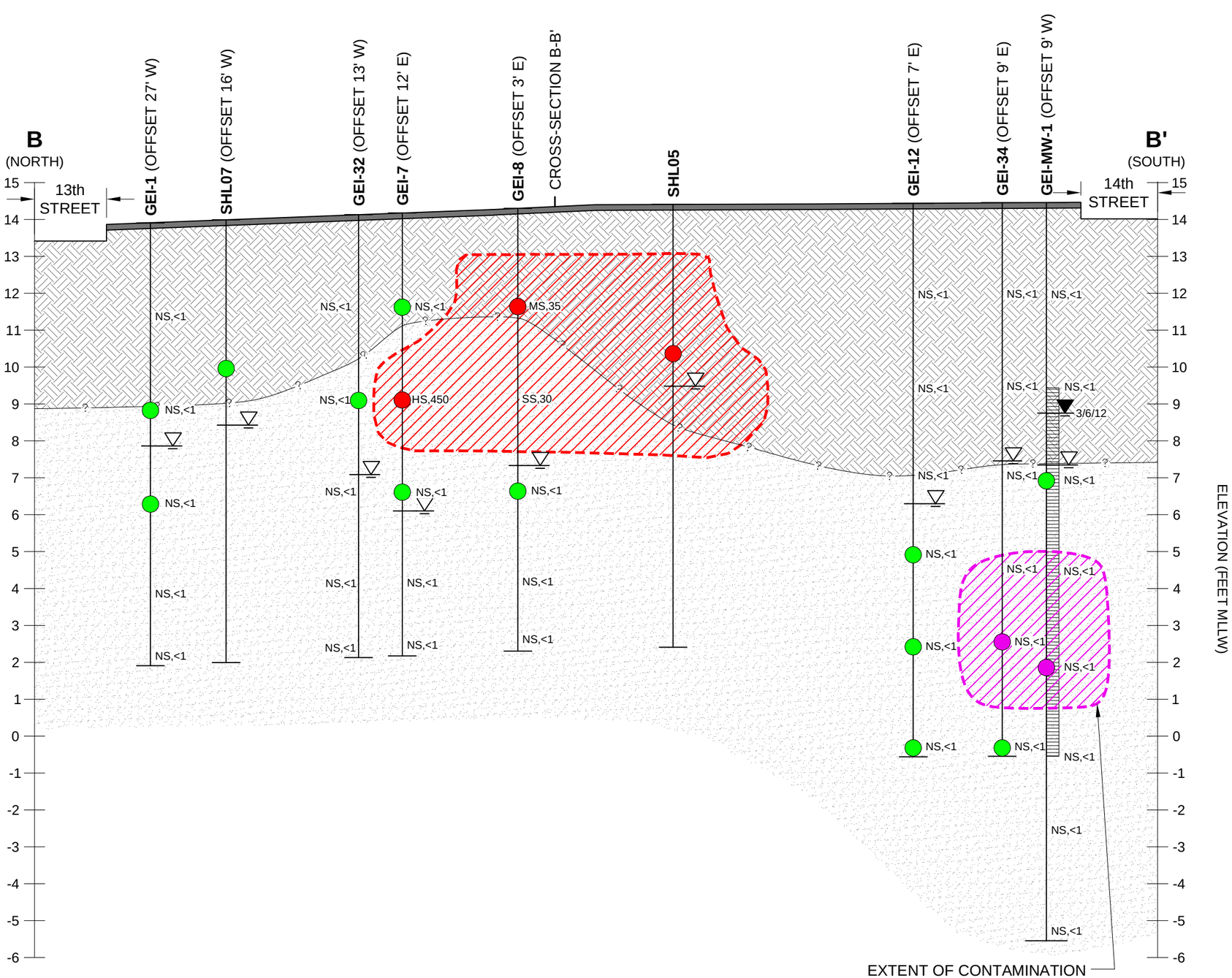


Legend

- 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
- cPAHs Exceed Soil Cleanup Level
- Approximate Area of TPH Exceedance in Soil
- Approximate Area of cPAHs 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"= 30'
VERTICAL SCALE: 1"= 3'
VERTICAL EXAGGERATION: 10X

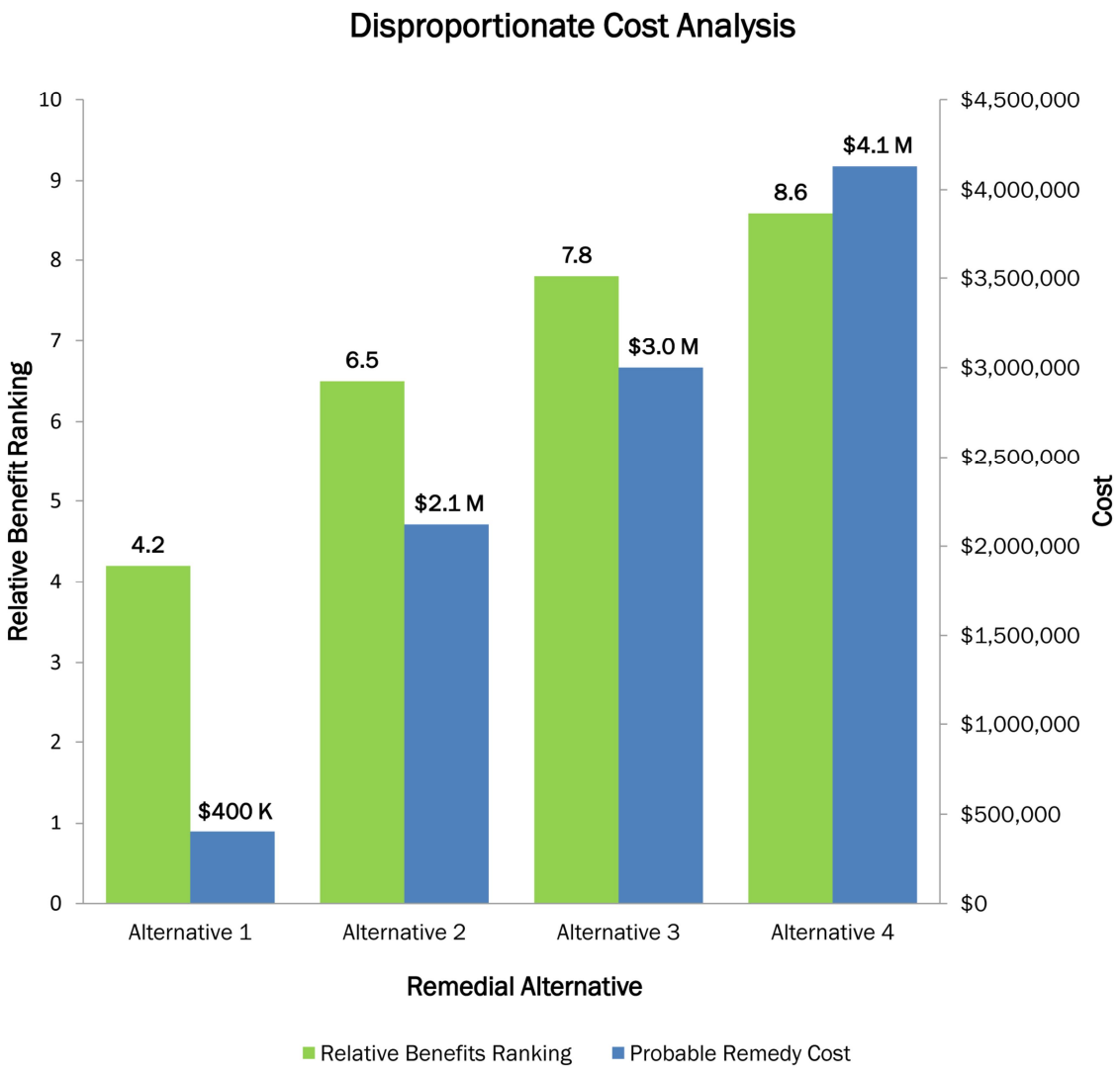
30 0 30
FEET

Cross-Section B-B'

Former Shell Oil Tank Farm Site
Anacortes, Washington

Figure 6

P:\51\5147012\CAD\SHELL DCAP\5147012-02 CROSS-SECTIONS.DWG\TAB:CROSS-SECTION BB MODIFIED BY THICHAUD ON MAR 21, 2013 - 9:38



Disproportionate Cost Analysis
Former Shell Oil Tank Farm Site Anacortes, Washington
Figure 7