Interim Action Work Plan

RG Haley Site
Bellingham, Washington

for
City of Bellingham

June 12, 2013

GeoEngineers

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym	Description
AO	Agreed Order NO. DE 2186
BMP	best management practice
BMC	Bellingham Municipal Code
City	City of Bellingham
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
GMD	Glaciomarine Drift
HPA	Hydraulic Project Approval
IA	Interim action
JARPA	Joint Aquatic Resources Permit Application
LNAPL	light nonaqueous phase liquid
mg/kg	milligram per kilogram
MHHW	mean higher high water
MLLW	mean lower low water
MTCA	Model Toxics Control Act (Chapter 173-340 WAC)
PAHs	polycyclic aromatic hydrocarbons
PCP	pentachlorophenol
PCBs	Polychlorinated biphenyls
RCW	Revised Code of Washington
RI/FS	remedial investigation/feasibility study
SEPA	State Environmental Policy Act
Site	RG Haley Site
SMP	Sediment Management Plan

SMS	Sediment Management Standards
SPCC	spill prevention, control and countermeasure plan
SVOC	semi-volatile organic compounds
SWPP	stormwater pollution prevention plan
TPH-Dx	total petroleum hydrocarbons-diesel extended
USACE	U.S. Army Corps of Engineers
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
Work Plan	Interim Action Work Plan

1.0 INTRODUCTION

The RG Haley Site (Site) is generally located at 500 Cornwall Avenue in Bellingham, Washington (Figure 1) and includes portions of approximately 6 acres of upland property and adjacent aquatic lands in Bellingham Bay. The City of Bellingham (City) is planning to perform an interim action (IA) at the Site to contain light nonaqueous phase liquid (LNAPL) petroleum releases on the southern[1] portion of the Site shoreline. Containment will be achieved by placing a cap over the area where LNAPL has been observed emanating from contaminated sediment. The proposed IA is intended to contain NAPL while the City completes a Remedial Investigation and Feasibility Study (RI/FS) in accordance with Model Toxics Control Act (MTCA) [Chapter 173-340 Washington Administrative Code (WAC)] to select a final cleanup action for the Site including the IA area. The IA will be implemented in advance of the final cleanup action but will not preclude the evaluation or selection of alternatives for the final cleanup action.

The IA will be conducted under Agreed Order No. DE 2186 (AO) (Ecology, 2005) as amended (Ecology, 2010a and 2013) between the City and the Washington State Department of Ecology (Ecology). This IA Work Plan has been prepared in accordance with the Scope of Work (Exhibit 6) of the second amendment to the AO and, once approved by Ecology, will become an integral and enforceable part of the AO. The remaining sections of this Work Plan include the following:

- Section 2 – Background
- Section 3 – Interim Action Overview
- Section 4 – Interim Action Components
- Section 5 – Permitting and Substantive Requirements
- Section 6 – Reporting
- Section 7 – Schedule
- Section 8 – References

Additionally, Appendix A includes a health and safety plan for GeoEngineers' personnel performing construction observation on behalf of the City during IA construction activities.

2.0 BACKGROUND

2.1 Site History and Current Conditions

The RG Haley property and surrounding waterfront industrial properties were originally developed starting in the 1880s as part of lumber mill operations. Historical activities conducted between the 1880s and mid-1900s were primarily related to sawmill and wharf operations. Wood treatment operations were conducted on the former Haley property between approximately 1948 and 1985.

[1] Directions in this report are referenced relative to the "project north" shown in the figures.

Wood treatment activities performed at the Site included treating lumber with pentachlorophenol (PCP) contained in a carrier oil.

Fill was historically placed along the Bellingham Bay shoreline to produce the upland portion of the RG Haley property. The nature of the fill beneath the Haley property is variable and generally includes substantial horizons of wood debris from historic waterfront mill operations, silts and sands possibly originating from dredging activities, and construction/demolition debris generally comprised of brick, concrete, and gravel. Municipal wastes associated with the adjacent Cornwall Avenue Landfill also extend onto the Haley property.

Fill beneath the Haley property is generally thickest at the shoreline. The fill extends into the intertidal and subtidal zones offshore of the Haley shoreline. The fill is underlain by bedrock comprised of the Chuckanut Formation. Glaciomarine Drift (GMD), comprised of hard silt and clay, is locally present between the Chuckanut and overlying fill.

Multiple investigations and cleanup actions have been performed at the Site between 1985 and 2012. Hazardous substances identified at the Site include chemicals used in the wood treatment process, including petroleum hydrocarbons, PCP, polycyclic aromatic hydrocarbons (PAHs), and dioxins and furans. These hazardous substances have impacted soil, groundwater, and sediment at the Site. Isolated cleanup actions have previously been completed at the Haley Site, including the excavation of soil from a seepage pit, installation of a containment barrier (sheet pile wall), removal of petroleum-contaminated sediment, and installation and operation of an oil recovery system.

The City has conducted quarterly monitoring to observe petroleum occurrences in nearshore monitoring wells at the Site. During these monitoring events, the near-shore environment has also been observed for the potential presence of petroleum-related sheens. On December 12, 2012, sheen was observed on surface water near the shoreline. Agency notifications were made in response to the observed sheen that included Ecology, the Washington State Emergency Management Division and National Response Center. A containment boom and oil-sorbent materials were deployed to contain the sheen and collect LNAPL emerging from the shoreline. Regular monitoring and maintenance are ongoing to contain sheen and capture LNAPL. The sheen is sporadic in occurrence and has diminished in size since it was first observed in December 2012. The proposed IA will focus on the point at which the LNAPL has been observed emerging from sediment.

2.2 Source of Contamination in the Interim Action Area

LNAPL has been observed emerging from sediment in the intertidal zone in the approximate areas shown in Figure 2. Sheen has been intermittently observed in this area between December 2012 and March 2013. Figure 3 presents photographs showing an example of where LNAPL is emerging from sediment and the resulting sheen that occurs on surface water during a period of tidal inundation. Based on past investigations, intertidal zone sediment in this general area exhibits petroleum-related sheens to depths of two feet or greater. Petroleum hydrocarbons have been detected in this sediment at concentrations up to 50,000 milligrams per kilogram (mg/kg).

Sediment impacts in the intertidal zone appear to be the result of historical petroleum releases in upland portions of the Site. Petroleum in the upland has accumulated on the groundwater table as a floating plume of LNAPL. This plume has migrated downgradient toward the shoreline, producing a "smear zone" in soil as a result of seasonal and tidally-induced fluctuations of the groundwater table. The estimated extent of the upland LNAPL plume and smear zone based on past investigations is presented in Figure 2. The LNAPL emergence area is located offshore of the upland LNAPL plume and smear zone, south of an existing sheet pile cutoff wall designed to contain LNAPL in the upland. The sheet pile wall was installed during a previous interim action (GeoEngineers, 2002).

The interpreted extent of the smear zone beneath the upland and intertidal zone is presented in Cross Section A-A' (Figure 4). The smear zone is generally present near the groundwater table beneath the upland and appears to extend into the intertidal zone at an elevation approximately mid-way between mean higher high water (MHHW) and mean lower low water (MLLW). Near the shoreline, the smear zone appears to occur primarily in a wood debris (fill) unit.

The LNAPL appears to be emerging from the intertidal zone near sediment sample PS-20 (Figures 4 and 5). Sediment in this area contains elevated petroleum hydrocarbon concentrations based on field screening (sheen) and chemical analytical results from previous studies. The petroleum-impacted sediment at this location and possible LNAPL migration from the adjacent upland is believed to be the source of the intermittent sheens observed on surface water.

2.3 Physical Conditions in the Interim Action Area

The IA area is located in the intertidal zone and is bounded to the east by a steep shoreline bank that extends from the upland to the aquatic portion of the Site. The shoreline bank is armored with rock rip rap in localized areas. A vertical sheet pile wall installed in 2000 as part of a previous cleanup action to contain LNAPL is located north of the IA area. The IA area extends from the steep shoreline bank to approximately 0 feet MLLW.

Below the shoreline bank, the sediment surface in the IA area slopes approximately 7 feet horizontally to 1 foot vertically (7H:1V) towards Bellingham Bay. The sediment in this area consists of sand and gravel mixed with debris (i.e., brick, concrete, metal, wood debris, glass fragments, etc.). Multiple remnant, untreated, degraded, vertical wood piling are present in the IA area. The height of the piling range from at or near the sediment surface to approximately 7 feet above the sediment surface.

The intertidal zone within and adjacent to the IA area is comprised of fill overlying native sediment deposits. Fill has generally been observed to be between approximately 10 to 20 feet thick in the upper intertidal zone during previous investigations. The stratigraphy observed in sediment core COB-SC-01, located within the IA area is shown in Figure 4. The fill was observed to consist of layers of wood comprised of sawdust, chips, and dimensional lumber-sized debris and layers of silty sand to sandy silt.

2.4 Coordination with Final Cleanup Action

The City is currently preparing an RI/FS for the RG Haley Site in accordance with AO No. DE 2186 as amended (Ecology 2005, 2010), MTCA (Chapter 173-340 WAC), and the Washington State

Sediment Management Standards (SMS) (Chapter 173-204 WAC) to identify the appropriate cleanup action for the Site. The RI/FS is currently scheduled to be completed in 2014.

The second amendment to the AO (Ecology, 2013) requires the City to complete an IA to contain LNAPL emerging from the southern portion of the Haley shoreline to reduce the potential threat to human health and the environment. The IA will be implemented in advance of selecting the final cleanup action for the Site and will not preclude reasonable alternatives for the final cleanup action (WAC 173-340-430(3)(b)). The action is interim or temporary and will be in place until the final cleanup action is implemented.

The RI/FS for the Site will identify the completion of the IA performed on the southern portion of the shoreline and describe the IA as part of the exiting Site conditions. The RI/FS will identify appropriate alternatives for the final cleanup of the Site. The final cleanup action will include implementation of the appropriate cleanup remedy for the IA area including the appropriate final surface that supports aquatic habitat development.

3.0 INTERIM ACTION OVERVIEW

The proposed IA consists of placing a cap over the area where LNAPL has been observed to be emanating from sediment on the southern portion of the Haley shoreline. The cap will contain amendments that are capable of adsorbing petroleum hydrocarbons in the form of NAPL and dissolved-phase constituents. A containment berm will be constructed at the lateral limits of the cap, and an armoring layer will be placed on top of the cap to contain the amended capping material and provide erosion protection.

The following section summarizes the goals, remediation levels and basis of design for the IA.

3.1 Interim Action Goals

The goals of the IA include the following:

- Reduce the potential threat to human health and the environment by containing LNAPL that has been intermittently discharging from sediment in the southern portion of the Haley shoreline.
- Provide a temporary, interim remedy that does not preclude the evaluation or selection of alternatives for the final cleanup action.

3.2 Remediation Level for the Interim Action

Remediation levels may be used to identify areas where certain cleanup action components will be used. Remediation levels may be used in conjunction with interim actions, and at sites where cleanup actions involve the containment of contaminated media (WAC 173-340-355). For the proposed IA, the remediation level is not based on a petroleum concentration, but rather, is based on the location where LNAPL has been observed to be discharging from the shoreline. This includes the location on the southern shoreline where LNAPL has caused an intermittent sheen between December 2012 and March 2013. It also includes surficial sediment that exhibited petroleum sheen upon agitation using field screening techniques during previous investigations.

Sediment that exceeds the remediation level defines the limits of the IA area. Capping will be performed in this area to contain the NAPL.

3.3 Basis of the Interim Action Design

The IA is being designed to provide a temporary, interim remedy to mitigate LNAPL observed in the intertidal zone while plans for the final cleanup are being developed as part of the RI/FS process. The Haley RI/FS is anticipated to be completed in 2014 and planning, design, and implementation of the final cleanup action are anticipated to be completed in 2015 and 2016.

The IA design utilizes a sand cap that will be amended with a media that adsorbs organic contaminants. The cap amendment will be organoclay, which is capable of adsorbing between approximately 100 to 200 percent of its weight in petroleum hydrocarbons. Organoclay has historically been used as a filtration media for treating groundwater and leachate, for adsorbing hydrocarbons from water generated during oil drilling processes, and has more recently been used for remediation of contaminated sites including a former Manufactured Gas Plant site in Bremerton, Washington (Anchor, 2010). Organoclay effectively adsorbs NAPL as well as dissolved-phase organic contaminants in groundwater. The proposed cap design is a mixture of 50 percent granulated organoclay and 50 percent well graded sand. This cap material will be placed on the existing surface of the sediment to contain the NAPL at the locations where it has intermittently emerged along the Haley shoreline.

The proposed limits of the cap encompass the area where surface sediment exceeds the remediation level based on visual observations of LNAPL at the location of the intertidal seeps and where field screening results from previous investigations exhibited sheens in surface sediment. The approximate lateral length of the cap along the shoreline is 65 feet. The outer boundary of the cap will extend to an elevation no lower than MLLW or approximately 75 feet from the base of the steep shoreline bank. This will facilitate construction during low tides and is anticipated to encompass all surface sediment that exceeds the remediation level.

The materials, dimensions, and installation methods of the cap were selected based on chemical properties of the cap materials, general engineering principles, as well as experience completing sediment remediation projects.

4.0 INTERIM ACTION COMPONENTS

The components of the IA include the following:

- Site Preparation
- Containment Berm Construction
- Cap Placement
- Cap Armoring
- Debris Handling and Disposal
- Environmental Protection During Construction

The sections below provide greater detail on the materials and procedures to be used to complete the proposed IA.

4.1 Site Preparation

Limited site preparation will be required to complete IA construction activities.

Existing access routes are expected to be adequate for contractors to transport materials and equipment to and from the IA area. Additionally, adequate open space exists at the Site in the vicinity of the IA area to temporarily store equipment and materials.

The location(s) for equipment and material stockpiling and storage will be identified for contractors performing the work. Equipment or material storage and stockpiling will occur only in the upland. Equipment and materials will not be stored in areas of exposed soil due to the presence of upland contamination. Equipment and materials will be stored on site in areas covered by asphalt or concrete pavement. Additionally, bulk capping materials stored in paved areas will be underlain and covered by visqueen.

Preparation of the IA area for capping as well as placement of capping materials is to be performed using land-based equipment located on the upland portion of the Site. Equipment such as long-reach excavators, cranes, and conveyors are anticipated to be used to perform the work. Site preparation may require some cutting of vegetation (i.e., brush) in the upland portion of the Site adjacent to the IA area to allow setup and operation of equipment. A protective barrier will be placed in unpaved areas adjacent to the shoreline to prevent equipment from contacting underlying contaminated soil in areas of operation.

The limits of the cap will be established prior to preparing (clearing) the IA area. Additional field screening also will be conducted in the IA area to assess potential changes in Site conditions and make minor adjustments to the capping area, if needed. The limits of the area to be capped will also be surveyed and staked prior to Site preparation activities to minimize disturbance of sediment outside of the IA area.

Preparation of the IA area for placement of capping materials will consist of removing remnant piling, debris and rocks that extend above the depth of the capping material within the surveyed area. Disturbance of surface sediment in the IA area will be minimized during this process to reduce the potential for release of NAPL. Figure 6 shows the current surface conditions in the IA area where the cap will be placed.

Remnant piling located in the area to be capped will be cut off at the mudline using hand-held tools (i.e., chainsaw). The remnant piling will not be pulled out of the sediment or broken off using an excavator bucket or other means to minimize the disturbance of sediment containing NAPL. Leaving the piling in place also will minimize the potential of creating a transport pathway for NAPL from the subsurface to surface sediment. Additionally, debris (i.e., rocks, brick, metal, wood, etc.) greater than approximately 3 inches high that is sitting on top of the sediment surface (i.e., not embedded) will be removed from the IA area. All piling and debris removed from the IA area will be placed in a stockpile in the upland portion of the Site while awaiting transport off-site for disposal.

Rocks removed from the sediment surface prior to capping will be reused on-site, where possible, as armoring.

In order to prevent trespassing within the IA area during construction, fencing will be installed around the work area. The fencing will include signage specifying the activities being performed and the potential dangers.

4.2 Containment Berm

A berm will be constructed at the lateral limits of the north, west and south sides of the cap. The containment berm will be constructed to an approximate height of 18-inches using 8-inch to 18-inch-diameter angular rock. The size of rock to be used for the containment berm will be finalized as part of completing the engineering design. The berm will secure the edges of a geotextile fabric as well as the armoring that will be placed on top of the amended cap material (Figure 8).

4.3 Amended Cap

IA construction activities will include placing approximately 100 cubic yards of amended cap material across approximately 5,000 square feet of the intertidal sediment. The approximate limits of the cap are shown on Figures 5 and 7. An approximately 6-inch-thick layer of capping material that is a mixture of 50 percent granulated organoclay and 50 percent well graded sand will be placed on the surface of the existing mudline in the IA area. Granulated organoclay designed for use in a sediment cap will be obtained from a vendor. The sand will be obtained from an approved source of clean materials and will be tested for contaminants prior to use at the Site. The capping materials will be mixed prior to being transported to the Site or will be mixed in a designated material stockpiling and storage area in the upland portion of the Site prior to being placed in the IA area.

As previously stated, capping material will be placed using land-based equipment located on the upland portion of the Site. Operation of large equipment such as excavation equipment will not be allowed below MHHW during IA construction activities. The specific means and methods used to place the capping material will be selected by the contractor, but acceptable methods would include the following:

- Placing capping material using a long-reach excavator with a standard or clamshell bucket.
- Placing capping material using a crane with a clamshell bucket or bottom-dump hopper.
- Placing capping material using conveyor equipment fed by an upland-based hopper. Support structures for conveyor equipment may be placed below MHHW within the cap area to extend the reach of the conveyor equipment as long as the support structures do not penetrate into and disturb the sediment surface.

Placement will be conducted “in the dry” during periods of low tide. The cap placement will be performed such that the cap material will be covered by at least a temporarily anchored geotextile to prevent disturbance of cap material during tidal inundation.

4.4 Cap Armoring

Due to the relatively small grain-size of the amended (i.e., organoclay and sand) cap material and the tidal and wave action in the IA area, armoring will be added as erosion protection. Figure 8 provides schematic details of the cap construction, including armoring.

Geotextile fabric will be placed on top of and along the lateral limits of the amended cap material. The geotextile will be held in place by the overlying armoring layer and the containment berm as described in Section 4.2 (Figure 8). The purpose of the geotextile fabric is to prevent the loss of capping material through the interstices of the large-diameter rock that comprises the armoring and containment berm. The geotextile fabric will extend approximately 2 feet beyond the edges of the amended capping material. The geotextile fabric will meet WSDOT requirements for separation as specified in Table 3 of Section 9-33.2(2) of the WSDOT handbook.

Following placement of geotextile over the amended capping material, containment berm will be placed along the lateral limits of the cap as described in Section 4.2.

A 1-foot layer of armor rock will be placed directly on top of the geotextile fabric layer. The armor rock will consist of 6- to 8-inch-diameter, angular rock. Concrete debris will not be used for armoring. Care will be taken to place the armor rock without puncturing the geotextile fabric or disturbing the underlying amended capping material layer.

The nature of the existing shoreline bank varies along the width of the IA area as shown schematically in Figure 8. At some locations where rip rap is absent, the bank is nearly vertical as a result of shoreline erosion. The bank is not over-steepened in areas where rip rap is present. In areas where the shoreline is over-steepened, the amended cap and rock armoring will extend to the bottom of the bank and rip rap will be placed on top of the armoring for additional erosion protection (Figure 8, Detail 1). The face of the rip rap will be constructed at an approximate inclination of 1H:1V (horizontal to vertical). This material will consist of light loose riprap in accordance with WSDOT Section 9-13.1(2) – Light Loose Riprap.

Additional rip rap will not be placed in portions of the IA area where the existing shoreline is currently stabilized (Figure 8, Detail 2). In these areas, the amended capping material and armoring layer will be overlapped onto the bottom of the existing rip rap.

4.5 Debris Handling and Disposal

Remnant piling and debris generated during site preparation will be placed in a lined and covered stockpile while awaiting transport off site for disposal. The location for debris stockpiling will be identified for contractors performing the work. Debris stockpiling will occur only in the upland in areas covered by asphalt or concrete pavement. Debris stockpiles will not be stored in areas of exposed soil due to the presence of upland contamination. Stockpiles will be established so that water will not run into or off of the stockpiled material.

4.6 Environmental Protection During Construction

The IA will address known regulatory requirements governing the construction activities by prescribing best management practices (BMPs) to be implemented during construction of the IA.

The following BMPs are planned to be implemented during construction. Additional BMPs may be prescribed by regulatory agencies and stakeholders during the permitting process.

- Contractors will be required to prepare and implement a Spill Prevention Control and Countermeasures Plan (SPCC) consistent with Ecology regulations.
- Contractor personnel will be trained in hazardous material handling and will be equipped with appropriate spill response materials including oil-absorbent pads and booms.
- Extreme care shall be taken to ensure that no petroleum products, hydraulic fluid, sediment, sediment-laden water, chemicals, or any other toxic or deleterious materials are allowed to enter or leach into surface water.
- The entire IA construction area below MHHW will be surrounded by a debris boom and oil-absorbent boom. The debris and oil-absorbent boom will be inspected daily and repaired immediately if damage is observed.
- Material removed from the IA capping area will be immediately moved to a designated upland stockpile area.
- Material used for IA construction will only be stockpiled in the upland, in a designated stockpile area. Material will only be placed the IA area if it is to be immediately place as part of the cap.
- Equipment will be inspected daily for drips or leaks in order to prevent spills or releases to surface water.
- In order to reduce the potential impacts on listed species, as much work as possible will be conducted during low tides.

In the event of an unexpected release of a hazardous substance during performance of the IA, notification will be provided to the USCG National response Center at 1-800-424-8802 and the Washington State Emergency Management Division at 1-800-OILS-911 within one hour of discovery. This reporting obligation will not apply to the disturbance, handling, and removal of hazardous substances anticipated as part of IA construction activities.

4.7 Interim Action Compliance Monitoring

In accordance with WAC 173-340-410, compliance monitoring for a cleanup action includes the following elements:

- Protection monitoring confirms that human health and the environment are adequately protected during the cleanup action.
- Performance monitoring confirms that the cleanup action has been completed in areas exceeding remediation levels and met other performance standards, such as permit requirements.
- Confirmation monitoring confirms the long-term effectiveness of the cleanup action once cleanup levels and other performance standards have been reached.

For this IA, protection and performance monitoring will be conducted during construction. Confirmation monitoring will be conducted until the final remedial action has been implemented at the Site. The monitoring programs for the IA are outlined below.

4.7.1 Protection Monitoring

Protection monitoring will be implemented during the IA by requiring that on-site workers be appropriately trained in hazardous waste operations as well as follow a site-specific health and safety plan prepared specifically for the IA project. GeoEngineers personnel performing observation of IA construction activities for the City will adhere to the requirements of the site-specific health and safety plan presented in Appendix A. The Contractor that is selected to perform the IA construction will be required to develop a site-specific health and safety plan for their employees.

4.7.2 Performance Monitoring

Performance monitoring during the IA will include sampling and analysis of sand to be used as capping material, inspection of the amended capping material to ensure that it meets the mixture requirements, and confirmation of the placement of capping materials in the area where surface sediment exceeds remediation levels.

Upon initiation of the IA, the contractor will identify the upland quarry that is to be the source of sand to be used as capping material. The source of the sand will be undisturbed, native deposits from an upland quarry and will not include any reused or recycled materials. A representative of the City will perform an inspection of the cap material source and collect a sample of the sand to be used as capping material. The sample will be submitted for chemical analysis to demonstrate that the sand is free from contamination. The material will be collected using clean (i.e., decontaminated) stainless steel sampling equipment and placed in pre-cleaned, previously unused sample jars supplied by the laboratory. The capping material sample will be labeled and placed in a cooler on ice for transport to the laboratory. Sample handling will follow appropriate chain of custody procedures from sample collection through analysis. The capping material sample will be analyzed for the following:

- Petroleum hydrocarbons by NWTPH-Dx;
- Dioxins and furans by EPA Method 1613 Modified;
- Semi-volatile organic compounds (SVOCs) by EPA Method 8270D;
- Metals by EPA Method 6010/7470/7471; and
- Polychlorinated biphenyls (PCBs) by EPA Method 8082B.

The results of the capping material sample will be reviewed by representatives from the City and Ecology to identify whether the sand from the proposed source is free from contamination and is acceptable for use as capping material. For metals and dioxins/furans, the proposed capping material will be within the range of concentrations typical of natural background for upland soil in Washington State (Ecology, 1994 and 2010b). Sand that is proposed to be used as capping will not be transported to the Site until the City and Ecology provide approval of the material.

The sand and organoclay will be combined using equipment designed for mixing materials (i.e., pug mill or other mixing equipment). Prior to placement, a representative of the City will collect samples of the amended capping material to visually inspect the mixture and confirm a roughly 50/50 mix of granulated organoclay and sand. Approximately one sample will be collected and inspected for every 5 cubic yards of amended capping material. Samples indicating a mixture

other than 50 percent organoclay and 50 percent sand will trigger additional mixing to achieve the appropriate blend of organoclay and sand. Additional samples will be collected and visually inspected upon completion of additional mixing to confirm that the amended capping material meets the mixture specifications.

During placement of the amended capping material, a representative of the City will monitor the cap thickness to confirm that an approximate 6-inch layer of amended capping material has been placed on top of the existing sediment surface. The cap thickness will be measured from the existing sediment surface in a given area. In instances where observed cap thickness is less than 6 inches on top of the existing sediment, the representative of the City will instruct the contractor to place additional material to achieve the desired cap thickness.

During cap placement, a representative of the City will inspect the cap area to confirm that the cap material has been placed to the full surveyed limits of the IA area. The details of the procedures for cap placement confirmation will be developed as part of completing the engineering design.

4.7.3 Compliance Monitoring

Following completion of IA construction, compliance monitoring will be performed weekly for the first month and then quarterly to confirm the effectiveness of the IA. Compliance monitoring will include inspection of the IA area to assess the integrity of the cap. The cap integrity monitoring will document that the containment berm, cap armoring, and capping material are intact. Additionally, compliance monitoring will include inspection and observation for the presence of sheen in the IA capping area. Inspections for the presence of sheen will be conducted during similar tidal conditions that resulted in the recent sheens.

5.0 PERMITTING AND SUBSTANTIVE REQUIREMENTS

The IA will be conducted under Agreed Order No. DE 2186, as amended, with Ecology (Ecology, 2013). The second amendment to the AO requires that the IA be done in accordance with all applicable federal, state, and local requirements, including requirements to obtain necessary permits, except as provided in Chapter 70.105D.090 of the Revised Code of Washington (RCW). As specified in Chapter 70.105D.090 of the RCW and the second amendment to the AO, the City is exempt from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 of the RCW and of any laws requiring or authorizing local government permits or approvals when performing the IA. However, the City must still comply with the substantive requirements of such permits or approvals. The second amendment to the AO specifies that the exempt permits or approvals and the applicable substantive requirements of those permits or approvals will be identified in the work plan. Ecology's subsequent approval of the Work Plan reflects Ecology's determination as to the specific permits and substantive requirements that apply.

The following sections identify the permitting and substantive requirements for the IA at the Haley Site.

5.1 Applicable Permits and Requirements

The following sections identify the permitting requirements for the IA at the Site.

5.1.1 U.S. Army Corps of Engineers (USACE) Nationwide Permit 38

Section 404 of the Clean Water Act, 33 U.S.C. § 1344, requires a permit prior to discharging dredged or fill material into the waters of the United States. Section 404 Nationwide Permit 38 is specific to activities required to effect the containment, stabilization, or removal of hazardous or toxic waste materials that are performed, ordered, or sponsored by a government agency with established legal or regulatory authority. The City will obtain and comply with the conditions of a Nationwide Permit 38 that covers the activities to be performed as part of the IA which includes containment of hazardous materials by the City under the AO amendment.

A Joint Aquatic Resources Permit Application (JARPA) will be prepared and submitted to the United States Army Corps of Engineers (USACE) to support acquisition of a Nationwide Permit 38.

5.1.2 State Environmental Policy Act Integrated Compliance

Compliance with the State Environmental Policy Act (SEPA), Chapter 43.21C RCW, was achieved by conducting SEPA review in accordance with applicable regulatory requirements, including WAC 197-11-268, and Ecology guidance as presented in Ecology Policy 130A. The City, acting as the SEPA lead agency, issued a Determination of Nonsignificance (DNS) dated June 12, 2013.

5.1.3 Department of Natural Resources Right of Entry Authorization

The IA area is located on State-owned land managed by the Washington State Department of Natural Resources (DNR) and therefore, will require an aquatic use authorization. A Right of Entry Authorization is specific to activities performed on state-owned aquatic lands for recreational, scientific, or environmental purposes. The JARPA prepared for the project will include an Attachment E requesting an aquatic use authorization on DNR-managed aquatic lands and the JARPA will be submitted to DNR to support acquisition of a Right of Entry Authorization. The City will obtain and comply with the conditions of the Right of Entry Authorization that covers the IA to be performed at the Site.

5.2 Permit Exemptions and Substantive Requirements

The following state and local requirements have been identified as applicable but are procedurally exempt for performing the IA:

- Hydraulic Project Approval (HPA);
- City Shoreline Management Program including Critical Areas; and
- City Stormwater Management.

The applicable substantive requirements of these permits or programs, as they are known at the time of the preparation of this Work Plan, are identified below. The manner in which the IA will meet the substantive requirements for these permits and programs is presented in the following sections. Substantive requirements may be further identified in subsequent deliverables and their approval shall reflect Ecology's determination on what substantive requirements apply.

5.2.1 Washington Department of Fish and Wildlife Hydraulic Project Approval

Chapter 220-110 WAC (Hydraulic Code Rules) and Chapter 77.55 RCW (Construction Projects in State Waters) regulate work that uses, diverts, obstructs, or changes the natural flow or bed of any salt or fresh waters of the state and includes bed reconfiguration, all construction, or other work within the mean higher high water line in marine waters. The Washington Department of Fish and Wildlife (WDFW) oversees the implementation of these laws and issues Hydraulic Project Approvals (HPAs) for protection of fish life. For projects being performed under Chapter 70.105D.090 of the RCW, WDFW reviews project submittals to identify whether a project meets the substantive requirements of the laws and an HPA.

A JARPA will be prepared for the IA as part of the Nationwide Permit process. The JARPA will be submitted to the WDFW for review to ensure that the project meets the substantive requirements of the laws and an HPA.

5.2.2 City of Bellingham Shoreline Substantial Development Permit

Pursuant to the City of Bellingham Shoreline Master Program [Bellingham Municipal Code (BMC Title 22], the IA must meet the substantive requirements of a City Shoreline Substantial Development Permit for projects that involve more than 50 cubic yards of grading within the shoreline zone. The interim action will occur within the regulated shoreline area designated by BMC Title 22 as Waterfront District – Recreational Use Sub-area. The substantive requirements include meeting the general conditions for SMP, requirements and conditions of the Waterfront District – Recreational Use Sub-area shoreline designation, and applicable use activity policies, procedures, and regulations.

Critical areas within shoreline jurisdiction are now regulated by the City's SMP. The interim action occurs within two distinct geologically hazardous areas; 'erosion' and 'seismic.' The substantive requirements include an assessment or characterization of the hazard areas, a hazard analysis, and a geotechnical engineering report by a licensed professional.

A JARPA will be prepared for the IA as part of the Nationwide Permit process. The JARPA will be reviewed by the City to ensure that the project meets the substantive requirements of the Shoreline Substantial Development Permit. Additionally, a hazardous analysis and geotechnical engineering report will be prepared and submitted to the City for review to ensure that the IA meets the substantive requirements for critical areas administered as part of the City's SMP.

5.2.3 City of Bellingham Construction Stormwater Permit

Pursuant to the City of Bellingham Stormwater Management Ordinance (BMC 15.42), the IA must meet the requirements of a City Stormwater Permit. The requirements of the City Stormwater permit include preparation of a stormwater site plan, preparation of a construction stormwater pollution prevention plan (SWPP), source control of pollution, preservation of natural drainage systems and outfalls, on-site stormwater management, run-off treatment, flow control, and system operations and maintenance. Applicable stormwater plans will be prepared to meet the substantive requirements of the City Stormwater Permit.

6.0 REPORTING

Upon completion of the IA work, an Interim Action Completion Report that describes the construction of the IA will be prepared and submitted to Ecology for review and approval in accordance with the requirements of the AO, as amended. Additionally, the results of the IA, as described in the final Interim Action Completion Report, will be incorporated into the RI/FS for the Site.

7.0 SCHEDULE

The IA is anticipated to be performed during the fall/winter of 2013. The anticipated schedule for the IA at the Haley Site is the following:

1. Within 30 days of the effective date of the second amendment to the AO, the City will prepare an IA Work Plan for Ecology review and approval.
2. Within 15 days of receipt of Ecology's comments, the City will incorporate Ecology's comments and submit a revised IA Work Plan for review. The revised IA Work Plan will be considered final after Ecology's approval.
3. Within 45 days of receiving Ecology approval of the IA Work Plan, the City will prepare construction plans and specifications for the purpose of soliciting bids from contractors to perform the IA.
4. Within six months of the effective date of second amendment to the AO, the City shall complete construction of the IA at the Site.
5. Within 90 days of the completion of IA construction activities, the City shall prepare an Interim Action Completion Report for Ecology for review and approval. The City will subsequently integrate the information concerning the completion of the IA into the RI/FS for the Haley Site.

8.0 REFERENCES

Anchor Environmental, 2010. Final Work Plan: Former Bremerton MGP Site, Incident Action and Time Critical Removal Action. Manufactured Gas Plant site in Bremerton, Washington Prepared for U.S. Coast Guard Sector Puget Sound by Anchor QEA, LLC and Aspect Consulting. November 2010.

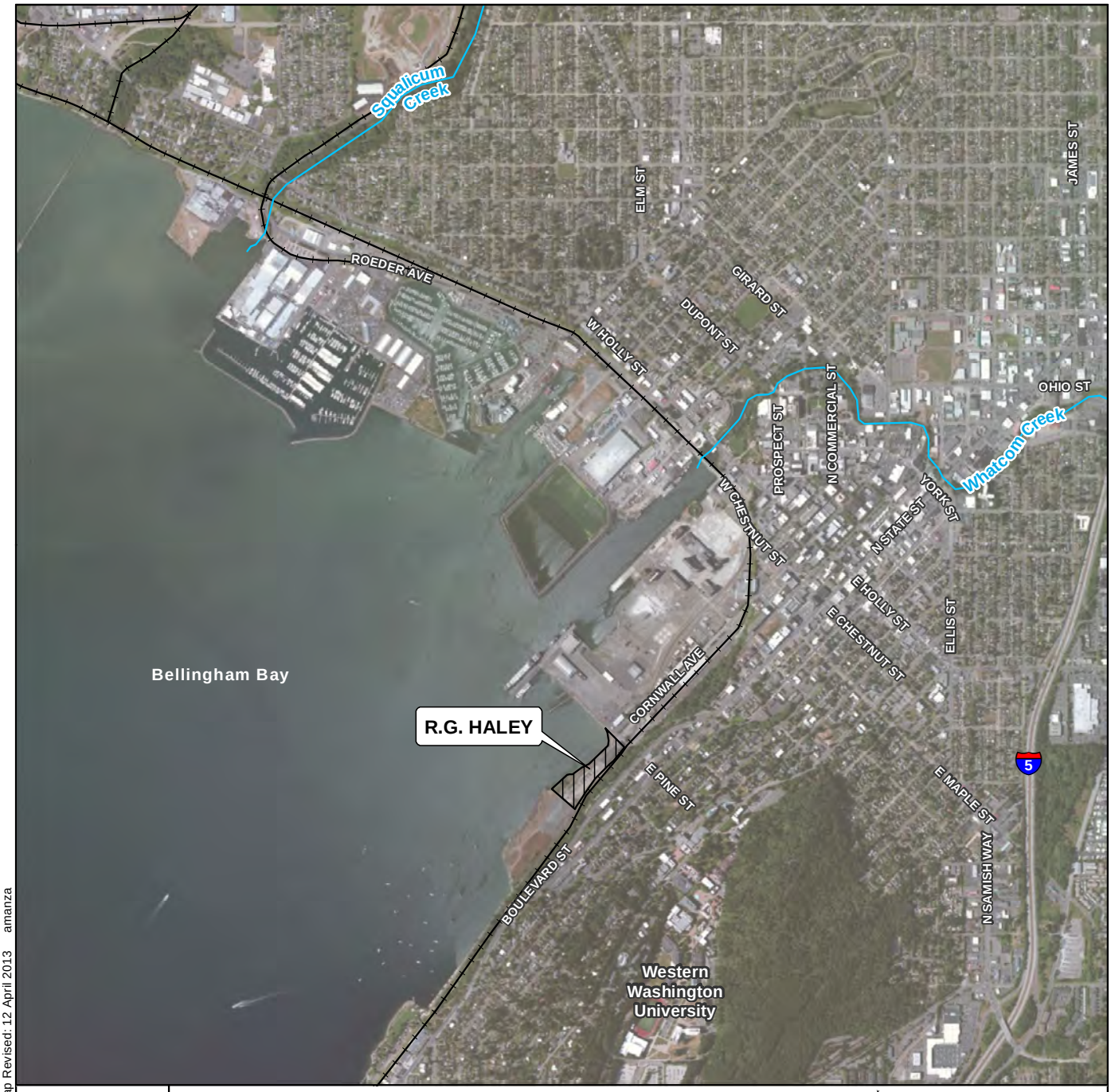
Ecology, 2005. In the Matter of Remedial Action by the Port of Bellingham and the City of Bellingham. Agreed Order No. DE 3441 issued by Washington State Department of Ecology. September 2005.

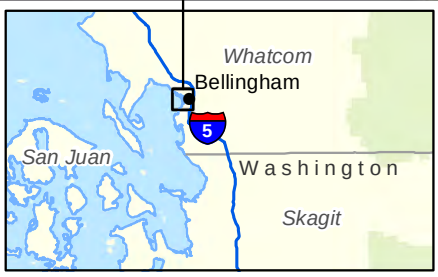
Ecology, 2010a. In the Matter of Remedial Action by the Port of Bellingham and the City of Bellingham. First Amendment to Agreed Order No. DE 3441 issued by Washington State Department of Ecology. 2010.

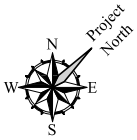
Ecology, 2013. In the Matter of Remedial Action by the Port of Bellingham and the City of Bellingham. Draft Second Amendment to Agreed Order No. DE 3441 issued by Washington State Department of Ecology. 2013.

Ecology, 2010b. Natural Background for Dioxins/Furans in WA Soils, Technical Memorandum #8. Dated August 9, 2010.

GeoEngineers, 2002. Interim Cleanup Action Report. Former R.G. Haley International Wood Treating/DNR Property Site. Prepared for Perkins Coie LLP by GeoEngineers, Inc. May 20, 2002.







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.

Reference: Whatcom County GIS, City of Bellingham GIS, Esri World Imagery.

Projection: NAD 1983 UTM Zone 10N

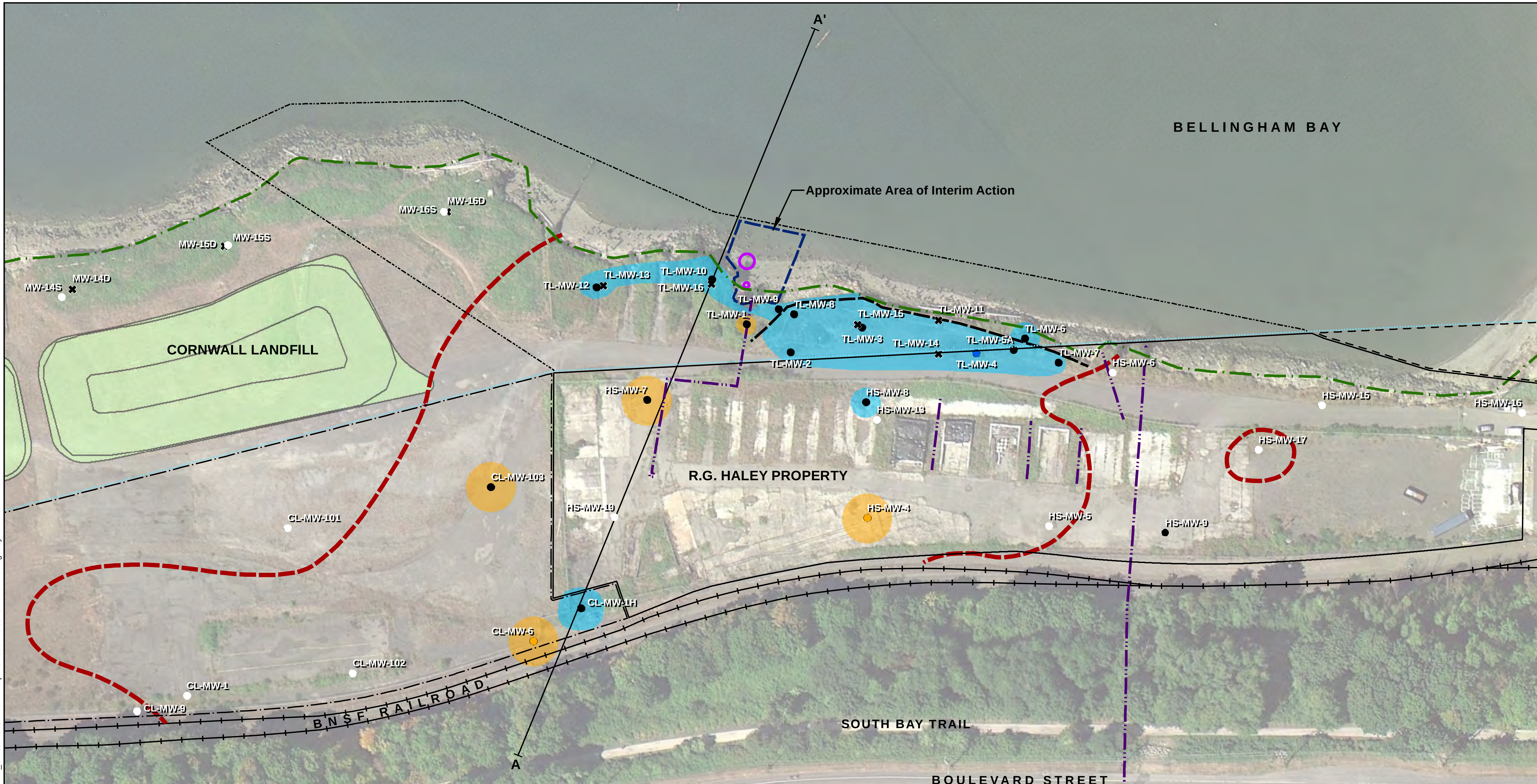
Vicinity Map

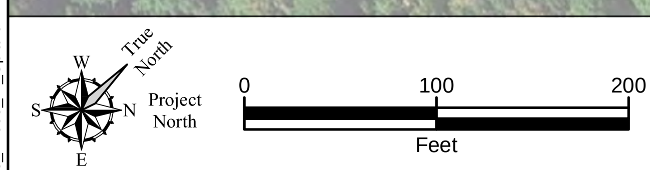
R.G. Haley Site
Bellingham, Washington

GeoEngineers

Figure 1

Path: \\seaProjects\0035611\4\GIS\0035611406_T2600_VicinityMap.mxd Map Revised: 12 April 2013 amanza





Legend

- Approximate Boundary of Interim Action Area
- Smear Zone Boundary in Soil
- Sheet Pile Wall
- Outfall
- Mean Higher High Water (MHHW) (8.04 ft NAVD88)
- Tideland Lease Area
- Inner Harbor Line
- Cross Section A-A'
- Deep Monitoring Well
- Shallow Monitoring Well
- Light Nonaqueous Phase Liquid (LNAPL) Emerging from Sediment (2012/2013)
- Measurable LNAPL (Current or Historical)
- Trace LNAPL (Current or Historical)
- Cornwall Interim Placement Area

Note: The lateral extent of the smear zone on the Cornwall Site is based on Figure 6-3 in the January 2013 Agency Review Draft of the RI report for Cornwall. For the purposes of this figure it is assumed that the smear zones on the Cornwall and Haley Sites are connected. The continuity of these smear zones will be further evaluated during completion of the R.G. Haley RI.

Reference: Aerial from Google Earth, August 2011.

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.

Path: P:\0\0356114\GIS\0356114_06_T2600_IA_UplandLNAPL_SmearZone.mxd Map Revised: 10 June 2013 bmagdasy

LNAPL Locations and Interim Action Area

R.G. Haley Site
Bellingham, Washington

GEOENGINEERS

Figure 2

Note:
LNAPL = light nonaqueous phase liquid

Photographs of LNAPL Emergence Location

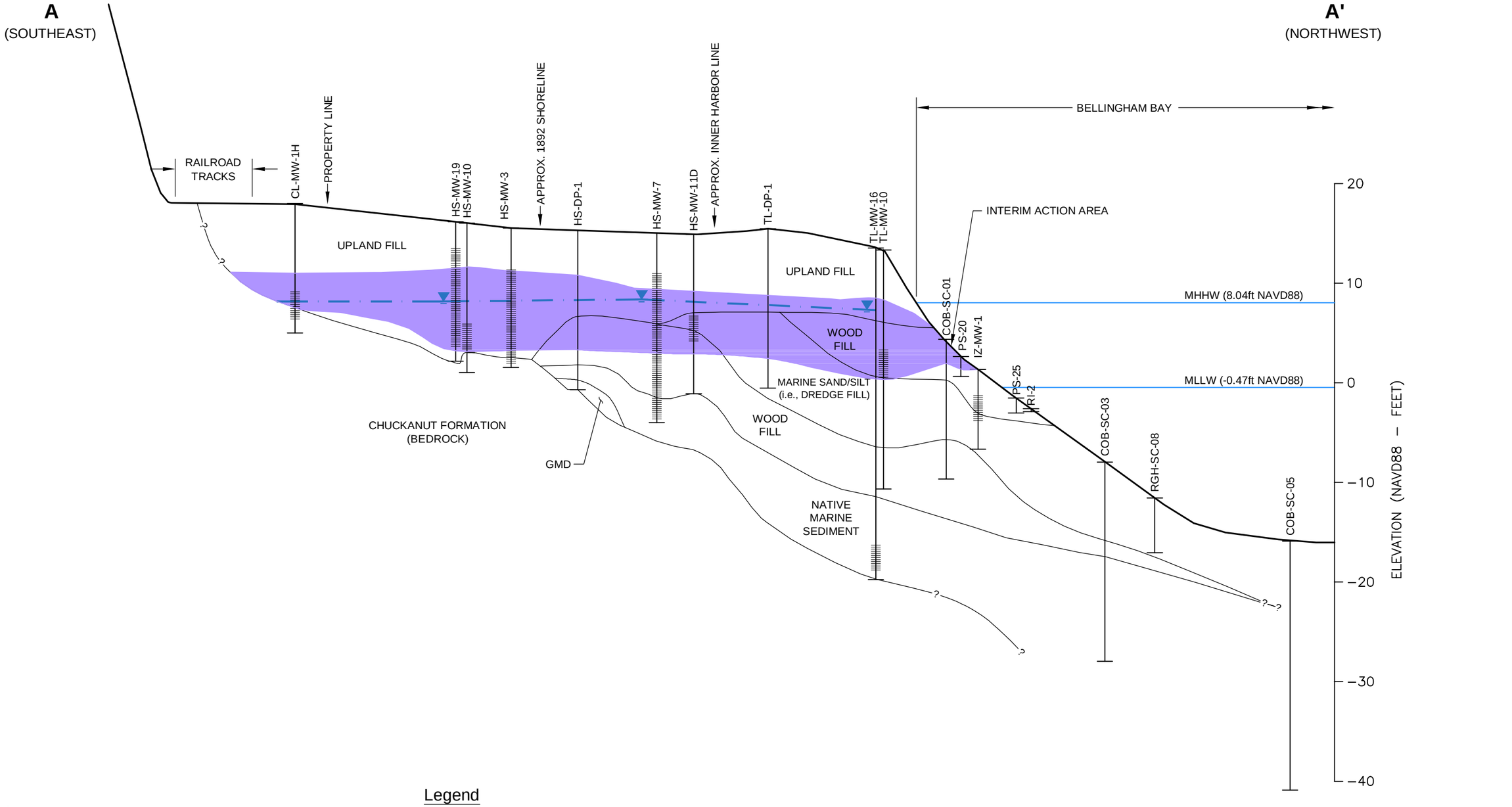
R.G. Haley Site
Bellingham, Washington

GeoEngineers

Figure 3

05/14/13

0356-114-06



Notes

1. Directions given on cross section line refer to Project North.
2. Smear Zone interpretation for upland area is based on moderate or heavy sheen in soil, and/or sum of diesel and heavy oil hydrocarbon concentrations greater than 500 mg/kg.
3. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
4. Please refer to Figure 2 for cross section location.
5. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document.

Legend

HS-DP-1 — Monitoring Well and Boring Identification

Groundwater Level Measured on 8/9/2012

Screened Interval

Interpolated Extent of Petroleum Hydrocarbon Smear Zone

HORIZONTAL SCALE: 1"= 60'
VERTICAL SCALE: 1"= 10'
VERTICAL EXAGGERATION: 6X

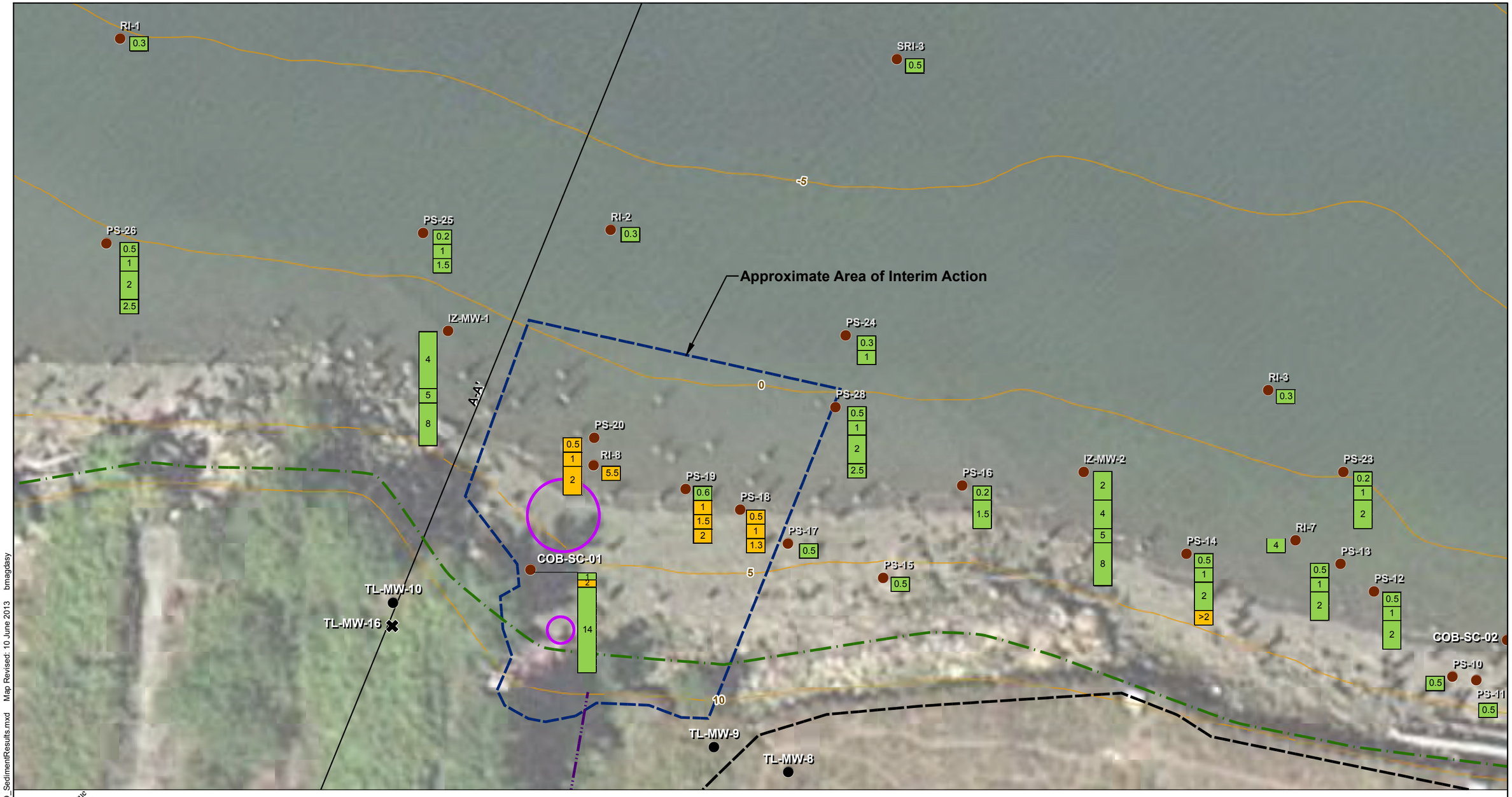
60 0 60
FEET

Interpolated Extent of Petroleum Smear Zone

R.G. Haley Site
Bellingham, Washington

GeoEngineers

Figure 4



W True North S N E Project North

0 20 40
Feet

Reference: Aerial from Google Earth Pro, 2011.

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.

Sample Type
- Sediment Sample Location
- Deep Monitoring Well
- Shallow Monitoring Well

Legend
- Sediment Sample Sheen Observation
- Depth of the Bottom of the Sample Interval in Feet
- Orange Color Indicates Moderate or Heavy Sheen Observed in Sample Interval
- Green Color Indicates Slight or No Sheen Observed in Sample Interval

Site Features
- Approximate Boundary of Interim Action Area
- Light Nonaqueous Phase Liquid (LNAPL) Emergence Area
- Sheet Pile Wall
- Outfall
- Mean Higher High Water (MHHW) (8.04 ft NAVD88)
- Cross Section A-A'
- Bathymetry (feet, NAVD88)

Interim Action Area

R.G. Haley Site
Bellingham, Washington

GeoEngineers

Figure 5

Path: P:\00356114\GIS\0356114l06_T2600_AO_SedimentResults.mxd Map Revised: 10 June 2013 bmagdasy

Photograph Showing Conditions in Interim Action Area

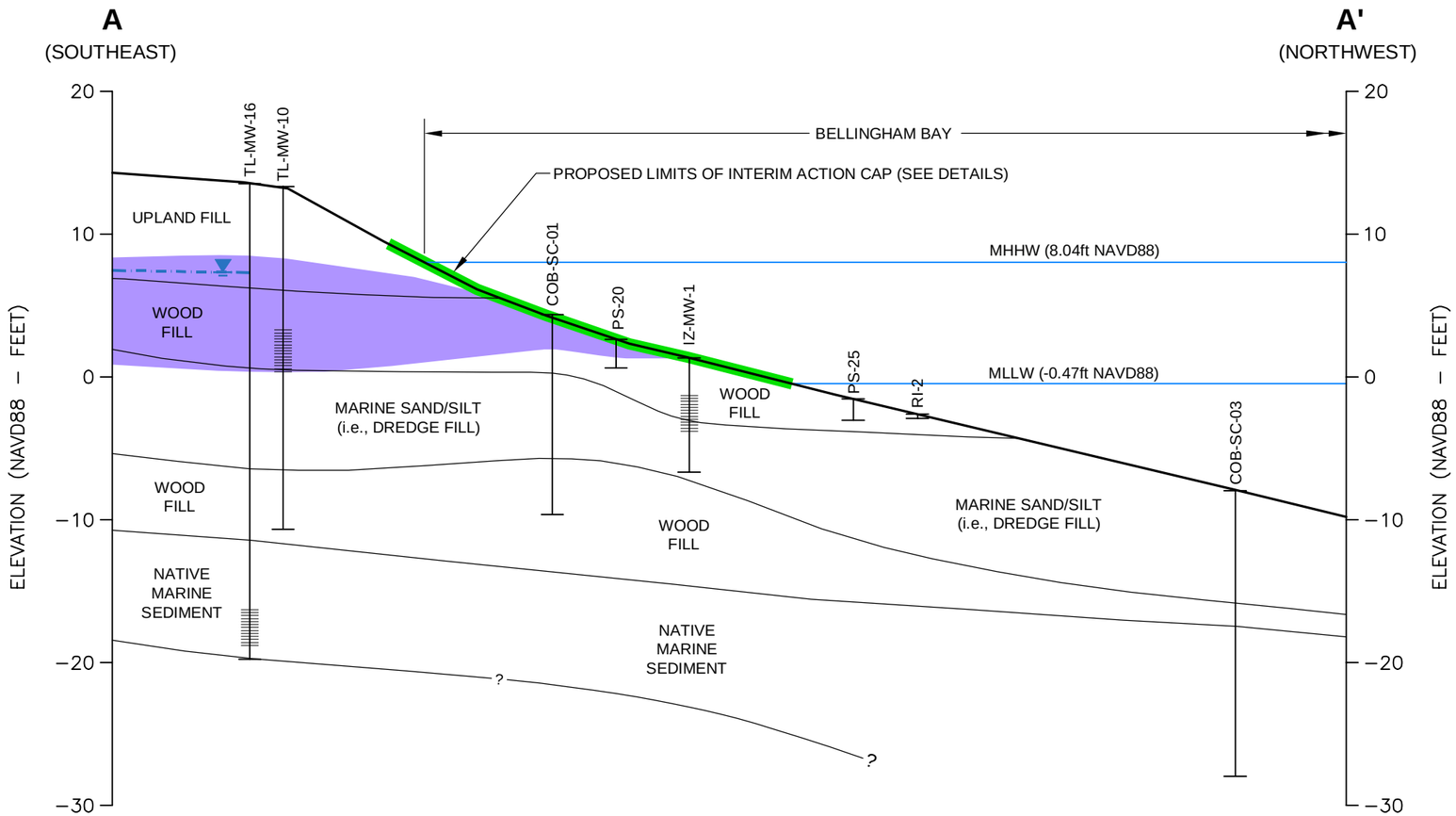
R.G. Haley Site
Bellingham, Washington

GeoEngineers

Figure 6

03/28/13

0356-114-06



Upland Fill: Predominantly poorly graded silty sand, sand, and gravel with some silt and variable amounts of coal fragments, brick fragments, and sawdust.

Marine Fill: Predominantly silt, silty sand, and poorly graded fine to medium grained sand with shell fragments and occasional wood fragments.

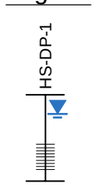
Wood Fill: At least 50 percent wood based on visual estimate with some silt and occasional sand. Wood present as sawdust, chips, or fragments.

Native Marine Sediment: Predominantly silt, silty sand, and poorly graded fine to coarse grained sand with occasional gravel, shell fragments, and wood fragments.

GMD (Glacimarine Drift): Stiff silt and clay with occasional gravel and shells.

Chuckanut Formation: The Eocene-age Padden Member of the Chuckanut Formation is predominantly siltstone where encountered in borings.

Legend



Monitoring Well and Boring Identification

Groundwater Level Measured on 8/9/2012

Screened Interval

Petroleum Hydrocarbon Smear Zone

Proposed Limits of Interim Action Cap

Notes

1. Directions given on cross section line refer to Project North.
2. Smear Zone interpretation for upland area is based on moderate or heavy sheen in soil, and/or sum of diesel and heavy oil hydrocarbon concentrations greater than 500 mg/kg.
3. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.
4. Please refer to Figure 4-1 for cross section location.
5. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document.

HORIZONTAL SCALE: 1"= 20'
VERTICAL SCALE: 1"= 10'
VERTICAL EXAGGERATION: 2X

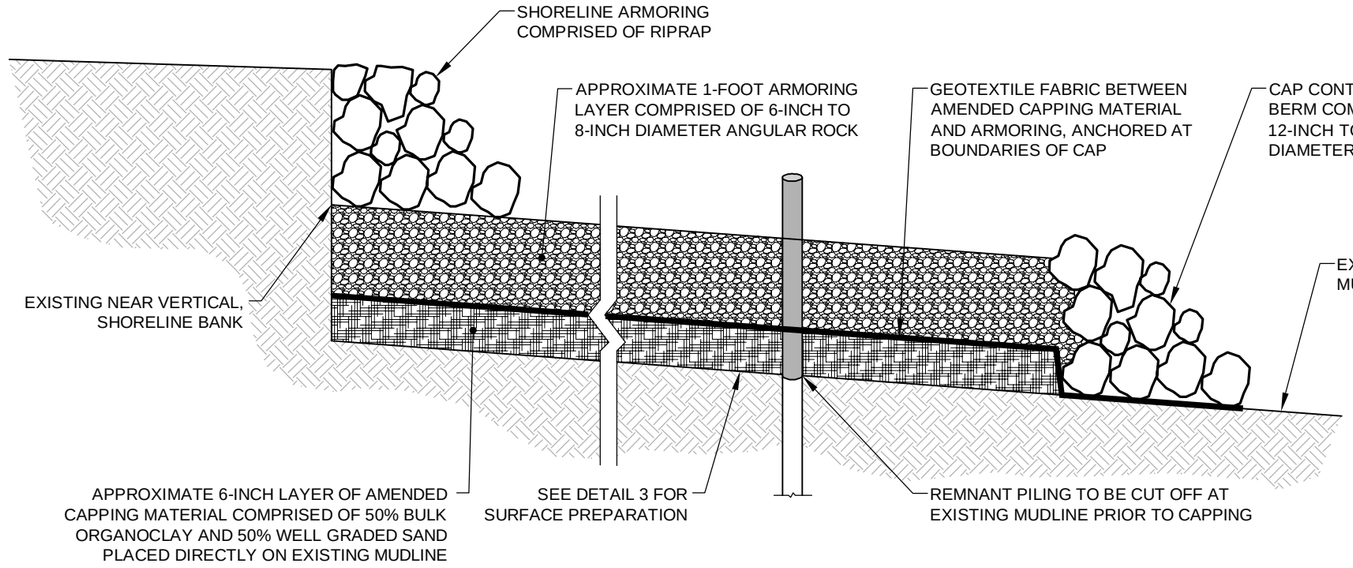
20 0 20
FEET

Schematic Interim Action Cap Plan

R.G. Haley Site
Bellingham, Washington

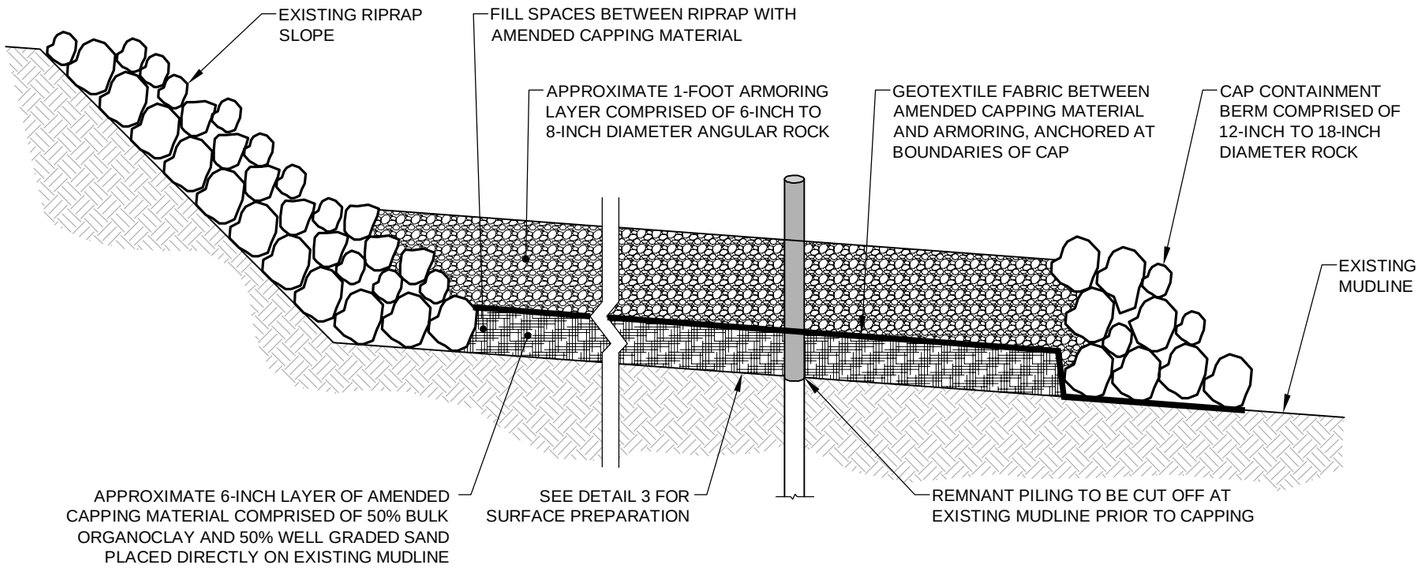
GeoEngineers

Figure 7



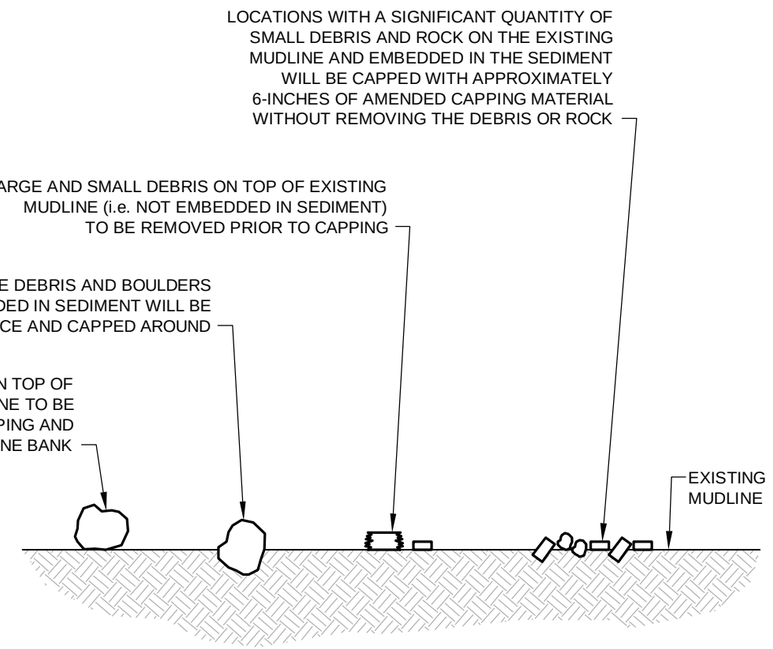
INTERIM ACTION CAP DETAIL 1

CAP TO STEEP SHORELINE BANK



INTERIM ACTION CAP DETAIL 2

CAP TO RIPRAP SLOPE



INTERIM ACTION CAP DETAIL 3

SURFACE PREPARATION

NOT TO SCALE

Schematic Cap Details	
R.G. Haley Site Bellingham, Washington	
GeoEngineers	Figure 8

APPENDIX A
Health and Safety Plan

Site Health and Safety Plan

R.G. Haley Site
Bellingham, Washington

for
City of Bellingham

May 14, 2013

GeoEngineers

Plaza 600 Building
600 Stewart Street, Suite 1700
Seattle, Washington 98101
206.728.2674

Table of Contents

GEOENGINEERS, INC.
SITE HEALTH AND SAFETY PLAN
SUPPLEMENTAL DATA COLLECTION FIELD INVESTIGATION
R.G. HALEY INTERNATIONAL CORPORATION
FILE NO. 0356-114-06

This HASP is to be used in conjunction with the GeoEngineers Safety Program Manual. Together, the written safety programs and this HASP constitute the site safety plan for this site. This plan is to be used by GeoEngineers personnel on this site and must be available on-site. If the work entails potential exposures to other substances or unusual situations, additional safety and health information will be included, and the plan will need to be approved by the GeoEngineers Health and Safety Manager. All plans are to be used in conjunction with current standards and policies outlined in the GeoEngineers Health and Safety Program Manual.

Liability Clause: If requested by subcontractors, this site safety plan may be provided for informational purposes only. In this case, Form 3 shall be signed by the subcontractor. Please be advised that this Site Safety Plan is intended for use by GeoEngineers Employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this Site Safety Plan. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by them.

1.0 GENERAL PROJECT INFORMATION

Project Name:	R. G. Haley Site Interim Action
Project Number:	00356-114-06
Type of Project:	Construction Monitoring and sediment sampling
Site Address	500 Cornwall Avenue, Bellingham, Washington
Start/Completion:	2013
Subcontractors:	Sediment remediation construction contractor

2.0 WORK PLAN

GeoEngineers will oversee construction of an Interim Action for contaminated sediment at the R.G. Haley International Site (Site). The purpose of this Interim Action is to address sediment contamination causing a sheen in surface water adjacent to the Site. As part of the Interim Action, our scope includes:

- Observe the remediation construction contractor during Site preparation, cap placement, and Site restoration activities required to complete the Interim Action.
- Measure cap thickness and general performance of capping activities during construction.
- Post construction Site surveying.

2.1. Site Description

The approximately 7-acre site, located at the end of Cornwall Avenue in Bellingham, Washington, is relatively flat. The Site is vacant and most of it is surrounded by a chain link fence. Inside the fence is an ecology block wall area that designates where recovered fluids are stored. Vehicle access to the site is limited to authorized vehicles by a gate across the access road. The shoreline is accessible to the public.

The area of the Interim Action is limited to a roughly 5,000 square foot portion of the intertidal zone immediately below ordinary high water (OHW) in the southwest portion of the Site. Additional area upland of the area of sediment to be capped will be used for contractor staging and material stockpiling.

2.2. Site History

Wood treatment activities were conducted at the site from about 1951 to 1985. The wood was treated using pentachlorophenol (PCP) in a P-9 carrier oil (diesel-range petroleum) and this liquid was released to soil and groundwater at the Site.

Chemicals released at the Site include pentachlorophenol (PCP) in a diesel oil carrier (P9 oil), dioxins/furans (associated with the PCP), and polycyclic aromatic hydrocarbons. The proposed Interim Action was designed to address a location of contaminated sediment that is causing a petroleum hydrocarbon sheen on surface water adjacent to the Site.

2.3. List of Field Activities

Check the activities to be completed during the project:

X	Site reconnaissance		Field Screening of Soil Samples
	Exploratory Borings		Vapor Measurements
X	Construction Monitoring		Groundwater Sampling
X	Surveying		Groundwater Depth and Free Product Measurement
	Test Pit Exploration		Product Sample Collection
	Monitoring Well Installation		Soil Stockpile Testing
	Monitoring Well Development		Remedial Excavation
	Soil Sample Collection		Underground Storage Tank (UST) Removal Monitoring
	Remediation System Monitoring		Sediment Sampling

Check the activities to be completed during the project:

3.0 LIST OF FIELD PERSONNEL AND TRAINING

Name of Employee on Site	Level of HAZWOPER Training (24-/40-hr)	Date of 8-Hr Refresher Training	Date of HAZWOPER Supervisor Training	First Aid/ CPR	Date of Other Trainings	Date of Respirator Fit Test
TBD						
TBD						
TBD						
TBD						

Chain of Command	Title	Name	Telephone Numbers
1	Project Manager	Dana Carlisle	425-861-6040
2	HAZWOPER Supervisor	Iain Wingard	253-722-2417
3	Field Engineer/Geologist	TBD	
4	Site Safety and Health Supervisor*	TBD	
5	Client Assigned Site Supervisor	TBD	
6	Health and Safety Program Manager	Wayne Adams	253-383-4940
7	Current Owner	City of Bellingham	
8	Subcontractors	TBD	

*** Site Safety and Health Supervisor –** The individual present at a hazardous waste site responsible to the employer and who has the authority and knowledge necessary to establish the site-specific health and safety plan and verify compliance with applicable safety and health requirements.

4.0 EMERGENCY INFORMATION

Hospital Name and Address:

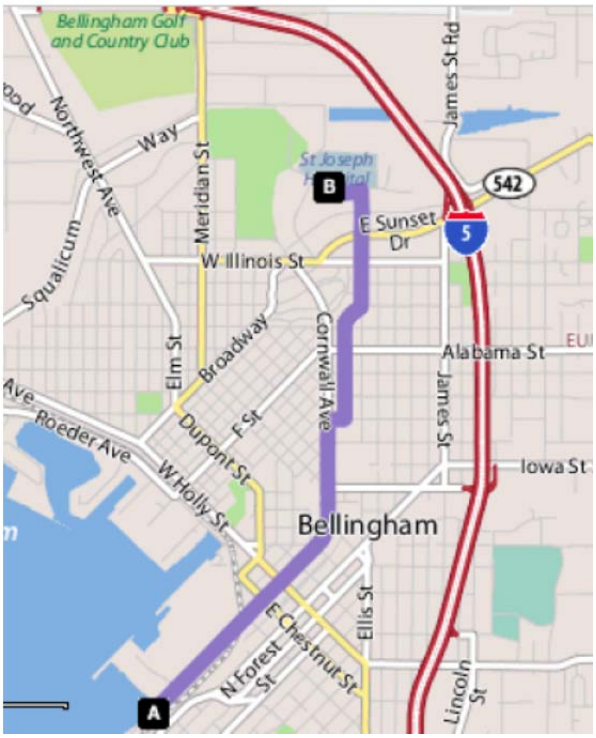
St. Joseph Hospital
2901 Squalicum Parkway
Bellingham, WA 98225-1898
Phone: (360) 734-5400

Phone Numbers (Hospital ER):

ER: 206.731.3000

Route to Hospital:
Distance: 2.58 miles
Time: 12 minutes

1. Start at 500 CORNWALL AVE, BELLINGHAM going toward E PINE ST - go 1.4 mi/
2. Turn Right on VIRGINIA ST
3. Turn Left on DEAN AVE - go 0.4 mi/
4. Continue on HAMPTON PL - go 0.1 mi/
5. Bear Left on ELLIS ST - go 0.5 mi/
6. Turn Left on SQUALICUM PKY - go 0.1 mi/
7. Arrive at 2901 SQUALICUM PKY, BELLINGHAM, on the Right



Ambulance: 9-1-1

Poison Control: (800) 732-6985

Police: 9-1-1

Fire: 9-1-1

Location of Nearest Telephone: Cell phones are carried by field personnel.

Nearest Fire Extinguisher: Located in the GeoEngineers vehicle on-site.

Nearest First-Aid Kit: Located in the GeoEngineers vehicle on-site.

4.1. Standard Emergency Procedures

Get help

- Send another worker to phone 9-1-1 (if necessary)
- As soon as feasible, notify GeoEngineers' Project Manager

Reduce risk to injured person

- Turn off equipment
- Move person from injury location (if in life-threatening situation only)

- Keep person warm
- Perform CPR (if necessary)

Transport injured person to medical treatment facility (if necessary)

- By ambulance (if necessary) or GeoEngineers vehicle
- Stay with person at medical facility
- Keep GeoEngineers manager apprised of situation and notify Human Resources Manager of situation

5.0 HAZARD ANALYSIS

- Note: A hazard assessment will be completed at every site prior to beginning field activities. Updates will be included in the daily log. This list is a summary of hazards listed on the form.

5.1. Physical Hazards

_____	Drill rigs and Concrete Coring, including working inside a warehouse
X	Backhoe
X	Trackhoe
X	Crane
X	Front End Loader
_____	Excavations/trenching (1:1 slopes for Type B soil)
_____	Shored/braced excavation if greater than 4 feet of depth
_____	Overhead hazards/power lines
X	Tripping/puncture hazards: working close to eroded 4 to 6 foot tall bluff along shoreline. In places the edge of the bluff is obscured by vegetation so care should be taken to ensure sure footing.
X	Unusual traffic hazard – Street traffic: Transients frequent the site and GeoEngineers personnel should leave the Site and call police at any indication of a threat.
X	Heat/Cold, Humidity
X	Utilities/utility locate
X	Tide fluctuations in portion of Site affected by tides

- High-visibility vests will be worn by on-site personnel to ensure they can be seen by vehicle and equipment operators.
- Field personnel will be aware at all times of the location and motion of heavy equipment in the area of work to ensure a safe distance between personnel and the equipment. Personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment apparatus. Personnel will approach operating heavy equipment only when they are certain the operator has indicated that it is safe to do so through hand signal or other acceptable means.
- Heavy equipment and/or vehicles used on this Site will not work within 20 feet of overhead utility lines without first ensuring that the lines are not energized. This distance may be reduced to 10 feet based on acceptable electrical engineering controls or the use of a safety watch.

- Safety glasses will be worn during sampling to protect against splashing or other potential eye injuries.
- Caution will be taken near the drill rig to avoid moving parts of the drill rig, as well as falling or flying objects.
- Field personnel will minimize time spent near drill rig; will not wear loose clothing; will use safety glasses, hard hat, and steel-toed boots.
- Personnel will avoid tripping hazards, steep slopes, pits and other hazardous encumbrances. If it becomes necessary to work within 6 feet of the edge of a pit, slope or other potentially hazardous area, appropriate fall protection measures will be implemented by the Site Safety and Health Supervisor in accordance with OSHA/DOSH regulations and the GeoEngineers Health and Safety Program.
- Personnel shall understand the times and magnitude of tides when working in the intertidal areas.
- Cold stress control measures will be implemented according to the GeoEngineers Health and Safety Program to prevent frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature). Heated break areas and warm beverages shall be available during periods of cold weather.
- Heat stress control measures required for this site will be implemented according to GeoEngineers Health and Safety Program with water provided on-site.
- Excessive levels of noise (exceeding 85 dBA) are anticipated during construction. Personnel potentially exposed will wear ear plugs or muffs with a noise reduction rating (NRR) of at least 25 dB whenever it becomes difficult to carry on a conversation 3 feet away from a co-worker or whenever noise levels become bothersome. (Increasing the distance from the source will decrease the noise level noticeably.)

5.2. Engineering Controls

_____	Trench shoring (1:1 slope for Type B Soils)
X	Location work spaces upwind/wind direction monitoring
X	Other soil covers (as needed)
X	Dust Control (as needed)

5.3. Chemical Hazards

CHEMICAL HAZARDS (POTENTIALLY PRESENT AT SITE)

Substance	Pathways
Pentachlorophenol (PCP)	Free product/Water/Soil
Dioxins and Furans (PCDD's, TCDD's, related congeners and other organics)	Free product /Water/Soil
Diesel fuel	Free product/ Water/Soil
Polycyclic aromatic hydrocarbons (PAHs)	Free product /Water/Soil

SPECIFIC CHEMICAL HAZARDS AND EXPOSURES (POTENTIALLY PRESENT AT SITE)

Compound/ Description	Exposure Limits/IDLH	Exposure Routes	symptoms/health effects
Diesel Fuel — liquid with a characteristic odor	None established by OSHA, but ACGIH has adopted 100 mg/m³ for a TWA (as total hydrocarbons)	Ingestion, inhalation, skin absorption, skin and eye contact	Irritated eyes, skin, and mucous membrane; fatigue; blurred vision; dizziness; slurred speech; confusion; convulsions; headache; dermatitis
Polycyclic aromatic hydrocarbons (PAHs) as coal tar pitch volatiles	PEL 0.2 mg/m³ TLV 0.2 mg/m³ REL 0.1 mg/m³ IDLH 80 mg/m³	Inhalation, ingestion, skin and/or eye contact	Dermatitis, bronchitis, potential carcinogen
Pentachlorophenol (PCP)	PEL 0.5 mg/m³ TLV 0.5 mg/m³ REL 0.5 mg/m³ IDLH 2.5 mg/m³	Inhalation, ingestion, skin and/or eye contact	Irritating to the eyes, nose, throat; sneezing, cough; lassitude (weakness, exhaustion), anorexia, weight loss; sweating; headache, dizziness; nausea, vomiting; dyspnea (breathing difficulty), chest pain; high fever; dermatitis.
Dioxins and Furans (PCDD's, TCDD's, related congeners and other organics)	Data not available	Ingestion, skin and/or eye contact	Increased risk of severe skin lesions such as chloracne and hyperpigmentation, altered liver function and lipid metabolism, general weakness associated with drastic weight loss, changes in activities of various liver enzymes, depression of the immune system, and endocrine- and nervous-system abnormalities
Copper	PEL 1 mg/m3 IDLH 100 mg/m3	Inhalation, ingestion, skin and eye contact	Irritated eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis

Notes:

IDLH = immediately dangerous to life or health
OSHA = Occupational Safety and Health Administration
ACGIH = American Conference of Governmental Industrial Hygienists
mg/m³ = milligrams per cubic meter
TWA = time-weighted average (Over 8 hrs.)
PEL = permissible exposure limit
TLV = threshold limit value (over 10 hrs.)
STEL = short-term exposure limit (15 min)
ppm = parts per million

5.3.1. Diesel Oil

Diesel fuels are similar to fuel oils used for heating (fuel oils no. 1, no. 2 and no. 4). All fuel oils consist of complex mixtures of aliphatic and aromatic hydrocarbons. Diesel fuels predominantly contain a mixture of C10 through C19 hydrocarbons, which include approximately 64 percent aliphatic hydrocarbons, 1 to 2 percent olefinic hydrocarbons and 35 percent aromatic hydrocarbons. Workers may be exposed to fuel oils through their skin without adequate protection, such as gloves, boots, coveralls or other protective clothing. Breathing diesel fuel vapors for a long time may damage your kidneys, increase your blood pressure, or lower your blood's ability to clot. Constant skin contact (for example, washing) with diesel fuel may also damage your kidneys. The International Agency for Research on Cancer (IARC) has determined that residual (heavy) fuel oils and marine diesel fuel are possibly carcinogenic to humans (Group 2B classification).

5.3.2. Polycyclic Aromatic Hydrocarbons (PAHs), Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)

Exposure to cPAHs can occur via inhalation of vapors, ingestion, and skin and eye contact. Skin contact can result in reddening or corrosion. Ingestion can cause nausea, vomiting, blood pressure fall, abdominal pain, convulsions and coma. Damage to the central nervous system can also occur. The U.S. Department of Health and Human Services (1989) has classified 15 PAHs compounds as having sufficient evidence for carcinogenicity, while the U.S. EPA (1990) has classified at least 5 of the identified PAHs as human carcinogens. There is no currently assigned PEL-TWA for cPAHs, but the closely related material coal tar is listed as coal tar pitch volatiles with a PEL-TWA of 0.2 mg/m3. PAHs and cPAHs as soil contaminants can be irritating to eyes and mucous membranes. PAHs are also formed during combustion and are linked to lung cancers with exposure to combustion byproducts. Lymphatic cancers are reported in the literature with PAHs in the presence of carbon black.

5.3.3. Pentachlorophenol

Pentachlorophenol (penta or PCP), like other chlorinated phenolics, n-nitrosodiphenylamine, and dibenzofuran are absorbed through the skin. They are irritating to eyes, nose, and mucous membranes. They are potential carcinogens or listed as animal carcinogens. When inhaled they may cause cough, dizziness, headache, drowsiness, difficulty breathing, and sore throat. They are also hazardous by ingestion (soil particles, etc.) causing abdominal cramps, diarrhea, nausea, vomiting, and weakness. Penta has low volatility (VP @ 77 degrees F is 0.0001 mmHg) like the others, but often the combination of chemical odors in oils or heavily contaminated soils can cause transient nausea and headache. Penta (liquid) has an IDLH limit of 2.5 mg/m3 based on acute toxicity data in humans. This may be a conservative value due to the lack of relevant acute toxicity data for workers exposed to concentrations above 2.4 mg/m3.

5.3.4. Dioxins/Furans

Very little human toxicity data from exposure to TCDD's and/or PCDDs are available. Health-effect data obtained from occupational settings in humans are based on exposure to chemicals contaminated with dioxins. It produces a variety of toxic effects in animals and is considered one of the most toxic chemicals known. Most of the toxicity data available are from high-dose oral exposures to animals (including tumor production, immunological dysfunction, and teratogenesis). Very little dermal and inhalation exposure data are available in the literature. It is important for field personnel to remember that while dioxins are toxic and carcinogenic (see next paragraph), most of the information is based on high doses to liquid product. These products are not very volatile, so the major concern is on skin

protection and inhalation/ingestion of soil particles. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a 20 ppm TLV for 1,4 dioxane (an example of numerous dioxin compounds), lists it as being absorbed through the skin, as potentially carcinogenic as well as toxic to liver and kidneys. This is typical of health effects for dioxin/furan compounds. Care should be taken especially in sampling product from drums and wells known to contain detectable levels of dioxins. Emphasis will be on working outside in well-ventilated areas using proper PPE (as discussed later in this plan). There is a wide range of difference in sensitivity to regarding lethality in animals. The signs and symptoms of poisoning with chemicals contaminated with dioxins in humans, however are analogous to those observed in animals.

Generally, dioxin exposures to humans are associated with increased risk of severe skin lesions such as chloracne and hyperpigmentation, altered liver function and lipid metabolism, general weakness associated with drastic weight loss, changes in activities of various liver enzymes, depression of the immune system, and endocrine- and nervous-system abnormalities. It is a potent teratogenic and fetotoxic chemical in animals. A very potent promoter in rat liver cancers, TCDD also causes cancers of the liver and other organs in animals. Populations occupationally or accidentally exposed to chemicals contaminated with dioxin have increased incidences of soft-tissue sarcoma and non-Hodgkin's lymphoma.

Dioxin-contaminated soil may result in dioxins occurring in a food chain. This is especially important for the general population. It has been estimated that about 98% of exposure to dioxins is through the oral route. Exposure as a vapor is normally negligible because of the low vapor pressure typical of these compounds. In the 1980s, a concentration level of 1 ppb 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) in soil was specified as "a level of concern," based on cancer effects. However, recent studies indicate that end points other than cancer (such as those listed above) are also of concern based on a projected intake from 1 ppb TCDD in soil. TL-MW-3-P01, HS-SSP-S01, and other samples taken on this site indicate levels in the well and soils exceeding 1 ppb.

5.4. Biological Hazards and Procedures

Y/N	Hazard	Procedures
N	Poison Ivy or other vegetation	
Y	Insects or snakes	Work gloves and long sleeve shirt
Y	Used hypodermic needs or other infectious hazards	Do not pick up or contact
Y	Others: Blackberry bushes	Hard hat, gloves and long sleeve shirt

5.5. Additional Hazards

Update in Daily Report. Include evaluation of:

- *Physical Hazards* (equipment hazards, tripping hazards and others)
- *Chemical Hazards* (odors, spills, free product, airborne particulates and others present)
- *Biological Hazards* (stray dogs, discarded needles, pollen, bees/wasps and others present)

6.0 AIR MONITORING PLAN

Work upwind if at all possible.

Check instrumentation to be used:

X Photoionization Detector (PID)

_____ Other (i.e., detector tubes): _____

Check monitoring frequency/locations and type (specify: work space, borehole, breathing zone):

_____ 15 minutes - Continuous during soil disturbance activities or handling samples

_____ 15 minutes

_____ 30 minutes

X Initially to detect hot spots and hourly thereafter (in breathing zone during construction)

Additional personal air monitoring for specific chemical exposure:

6.1. Dust

If construction activities generate visible dust, the Site Safety and Health Supervisor will be notified immediately to assess the need for air monitoring and lab analysis for inhalable and respirable particulates.

6.2. Action Levels

- The workspace will be monitored using a photoionization detector (PID) and lower-explosive-limit meter (LEL). These instruments must be properly maintained, calibrated and charged (refer to the instrument manuals for details). Zero this meter in the same relative humidity as the area in which it will be used and allow at least a 10-minute warm-up prior to zeroing. Do not zero in a contaminated area. The PID can be tuned to read chemicals specifically if there are not multiple contaminants on-site. It can be tuned to detect one chemical with the response factor entered into the equipment, but the PID picks up all volatile organic compounds (VOCs) present. The ionization potential (IP) of the chemical has to be less than the PID lamp (11.7 / 10.6eV), and the PID does not detect methane. The LEL meter will detect if explosive gasses such as methane are present at concentrations approaching the lower explosive limit (LEL).
- An initial vapor measurement survey of the site should be conducted to detect “hot spots” every 15 minutes during initial excavation and boring of the soil. If ppm is below 5 ppm during this time the vapor measurement survey of the workspace can be conducted at least hourly or more often if persistent petroleum-related odors are detected. If vapor concentrations exceed 5 ppm above background continuously for a 15-minute period as measured in the breathing zone, upgrade to Level C personal protective equipment (PPE) or move to a non-contaminated area.
- Note: Standard industrial hygiene/safety procedure is to require that action be taken to reduce worker exposure to organic vapors when vapor concentrations exceed one-half the TLV. Because of the variety of chemicals, the PID will not indicate exposure to a specific PEL and is therefore not a

preferred tool for determining worker exposure to chemicals. If odors are detected, then employees shall upgrade to respirators with Organic Vapor cartridges and will contact the Health and Safety Program Manager for other sampling options.

ACTION LEVEL TABLE FOR CHEMICAL MONITORING

Contaminant	Activity	Monitoring Device	Frequency of Monitoring Breathing Zone	Action Level	Action
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; every 60 minutes and in event of odors	Background to 5 ppm in breathing zone	Use Level D or Modified Level D PPE
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; every 60 minutes and in event of odors	5 to 25 ppm in breathing zone	Upgrade to Level C PPE
Organic Vapors	Environmental Remedial Actions	PID	Start of shift; every 60 minutes and in event of odors	> 25 ppm in breathing zone	Stop work and evacuate the area. Contact Health and Safety Manager for guidance.
Combustible Atmosphere	Environmental Remedial Actions	PID	Start of shift; every 60 minutes and in event of odors	>10% LEL or >1,000 ppm	Depends on contaminant. The PEL is usually exceeded before the lower explosive limit (LEL).
Combustible Atmosphere	Environmental Remedial Actions	PID or 4-gas meter	Start of shift; every 60 minutes and in event of odors	>10% LEL or >1,000 ppm	Stop work and evacuate the Site. Contact Health and Safety Manager for guidance.
Oxygen Deficient/ Enriched Atmosphere	Environmental Remedial Actions Confined Spaces	Oxygen meter or 4-gas meter	Start of shift; prior to excavation entry; every 30 to 60 minutes	<19.5>23.5%	Continue work if inside range. If outside range, evacuate area and contact Health and Safety Manager.

7.0 SITE CONTROL PLAN

Work zones will be considered within 10 feet of the well being monitored and the area within the ecology block enclosure. Employee should work upwind to the extent practical. The decontamination area and contaminant reduction zone are located in the ecology block enclosure. Employees must not leave the site without following decontamination procedures, such as washing hands, if they were handling fluids from the wells.

7.1. Traffic or Vehicle Access Control Plans

Traffic is restricted to authorized vehicles on the one road that goes through the Site. No unauthorized entry to the Site or unauthorized vehicles will be allowed in the work area. Contractor vehicle access to the Site will be controlled by the contractor with the help of road work signs and cones.

7.2. Site Work Zones

Site work zones (construction Staging Areas, material stockpiling areas) will be demarcated by the contractor during construction and will be located immediately upland of the intertidal sediment cap area. Only persons with the appropriate training will enter this perimeter while work is being conducted there.

Contact with contaminated material on Site is expected to be limited during construction. In the event that construction equipment comes into contact with contaminated sediment, a contamination reduction zone will be established just outside the exclusion zone for the decontamination of equipment. Care will be taken to prevent the spread of contamination. Equipment and personnel decontamination are discussed in the following sections, and the following types of equipment will be available to perform these activities:

- Scrub brushes;
- Spray rinse applicator;
- Plastic garbage bags; and
- Container of Alconox/water solution and Alconox powder.

Method of delineation / excluding non-site personnel

X	Fence
X	Survey Tape
X	Traffic Cones-when traffic is present
X	Other. Oil storage area has exclusion signs posted.

7.3. Buddy System

Personnel on-site should use the buddy system (pairs), particularly whenever communication is restricted. If only one GeoEngineers employee is on-site, a buddy system can be arranged with subcontractor/ contractor personnel.

7.4. Site Communication Plan

Positive communications (within sight and hearing distance or via radio) should be maintained between pairs on-site, with the pair remaining in proximity to assist each other in case of emergencies. The team should prearrange hand signals or other emergency signals for communication when voice communication becomes impaired (including cases of lack of radios or radio breakdown). In these instances, you should consider suspending work until communication can be restored; if not, the following are some examples for communication:

1. Hand gripping throat: Out of air, can't breathe.

2. Gripping partner's wrist or placing both hands around waist: Leave area immediately, no debate.
3. Hands on top of head: Need assistance.
4. Thumbs up: Okay, I'm all right: or I understand.
5. Thumbs down: No, negative.

7.5. Decontamination Procedures

Decontamination consists of removing and discarding disposable gloves and outer protective Tyvek clothing and washing hands in the decontamination area. Soiled boots (if boot covers not worn) should be cleaned using bucket and brush provided on-site in the decontamination area. Employees will perform decontamination procedures and wash prior to eating, drinking or leaving the site.

All decontamination equipment and PPE must be left on Site and managed in accordance with the Fluid Recovery Management Plan.

7.6. Waste Disposal or Storage

PPE disposal: Used disposable PPE (gloves, Tyvek®) will be placed in plastic trash bags and disposed as solid waste.

Drill cutting/excavated sediment disposal or storage:

_____ On-site, pending analysis and further action
X Secured (list method) On-site in 55-gallon drum
X Other (describe destination, responsible parties): Stockpiled on site near existing stockpile

8.0 PERSONAL PROTECTIVE EQUIPMENT

PPE will consist of standard Level D equipment.

Air monitoring will be conducted to determine the level of respiratory protection.

- Half-face combination organic vapor/high efficiency particulate air (HEPA) or P100 cartridge respirators will be available on-site to be used as necessary. P100 cartridges are to be used only if PID measurements are below the site action limit. P100 cartridges are used for protection against dust, metals and asbestos, while the combination organic vapor/HEPA cartridges are protective against both dust and vapor. Ensure that the PID or TLV will detect the chemicals of concern on-site.
- Level D PPE unless a higher level of protection is required will be worn at all times on the site. Potentially exposed personnel will wash gloves, hands, face and other pertinent items to prevent hand-to-mouth contact. This will be done prior to hand-to-mouth activities including eating, smoking, etc.
- Adequate personnel and equipment decontamination will be used to decrease potential ingestion and inhalation.

Check applicable personal protection gear to be used:

X	Hardhat (if overhead hazards, or client requests)
X	Steel-toed boots (if crushing hazards are a potential or if client requests)
X	Safety glasses (if dust, particles, or other hazards are present or client requests)
X	Hearing protection (if it is difficult to carry on a conversation 3 feet away)
X	Chemical resistant boots or boot covers
X	Life Jackets (for work near/over water)

Gloves (specify):

X	Nitrile
X	Latex
	Liners
X	Leather

Protective clothing:

X	Tyvek (if dry conditions are encountered, Tyvek is sufficient)
	Saranex (personnel shall use Saranex if liquids are handled or splash may be an issue)
	Cotton
X	Rain gear (as needed)
X	Layered warm clothing (as needed)

Inhalation hazard protection:

X	Level D
X	Level C (respirators with organic vapor/HEPA or P100 filters) – only if needed as indicated by air monitoring)

8.1. Personal Protective Equipment Inspections

PPE clothing ensembles designated for use during site activities shall be selected to provide protection against known or anticipated hazards. However, no protective garment, glove or boot is entirely chemical-resistant, nor does any PPE provide protection against all types of hazards. To obtain optimum performance from PPE, site personnel shall be trained in the proper use and inspection of PPE. This training shall include the following:

- Inspect PPE before and during use for imperfect seams, non-uniform coatings, tears, poorly functioning closures or other defects. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Inspect PPE during use for visible signs of chemical permeation such as swelling, discoloration, stiffness, brittleness, cracks, tears or other signs of punctures. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Disposable PPE should not be reused after breaks unless it has been properly decontaminated.

8.2. Respirator Selection, Use and Maintenance

If respirators are required, site personnel shall be trained before use on the proper use, maintenance and limitations of respirators. Additionally, they must be medically qualified to wear a respiratory

protection in accordance with 29 CFR 1910.134. Site personnel who will use a tight-fitting respirator must have passed a qualitative or quantitative fit test conducted in accordance with an OSHA-accepted fit test protocol. Fit testing must be repeated annually or whenever a new type of respirator is used. Respirators will be stored in a protective container.

8.2.1. Respirator Cartridges

If site personnel are required to wear air-purifying respirators, the appropriate cartridges shall be selected to protect personnel from known or anticipated site contaminants. The respirator/cartridge combination shall be certified and approved by the National Institute for Occupational Safety and Health (NIOSH). A cartridge change-out schedule shall be developed based on known site contaminants, anticipated contaminant concentrations and data supplied by the cartridge manufacturer related to the absorption capacity of the cartridge for specific contaminants. Site personnel shall be made aware of the cartridge change-out schedule prior to the initiation of site activities. Site personnel shall also be instructed to change respirator cartridges if they detect increased resistance during inhalation or detect vapor breakthrough by smell, taste or feel, although breakthrough is not an acceptable method of determining the change-out schedule.

8.2.2. Respirator Inspection and Cleaning

The Site Safety and Health Supervisor shall periodically (weekly) inspect respirators at the project site. Site personnel shall inspect respirators prior to each use in accordance with the manufacturer's instructions. In addition, site personnel wearing a tight-fitting respirator shall perform a positive and negative pressure user seal check each time the respirator is donned, to ensure proper fit and function. User seal checks shall be performed in accordance with the GeoEngineers respiratory protection program or the respirator manufacturer's instructions.

8.2.3. Facial Hair and Corrective Lenses

Site personnel with facial hair that interferes with the sealing surface of a respirator shall not be permitted to wear respiratory protection or work in areas where respiratory protection is required. Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the sealing surface of the respirator. Site personnel requiring corrective lenses will be provided with spectacle inserts designed for use with full-face respirators. Contact lenses should not be worn with respiratory protection.

9.0 ADDITIONAL ELEMENTS

9.1. Cold Stress Prevention

Working in cold environments presents many hazards to site personnel and can result in frost nip (superficial freezing of the skin), frost bite (deep tissue freezing), or hypothermia (lowering of the core body temperature).

The combination of wind and cold temperatures increases the degree of cold stress experienced by site personnel. Site personnel shall be trained on the signs and symptoms of cold-related illnesses, how the human body adapts to cold environments, and how to prevent the onset of cold-related illnesses. Heated break areas and warm beverages shall be provided during periods of cold weather.

9.2. Heat Stress Prevention

State and federal OSHA regulations provide specific requirements for handling employee exposure to heat stress. GeoEngineers' program complies with these requirements and will be implemented in all areas where heat stress is identified as a potential health issue.

General requirements for preventing heat stress apply to outdoor work environments from May 1 through September 30, annually, only when employees are exposed to outdoor heat at or above an applicable temperature listed in the table below. To determine which temperature applies to each worksite, select the temperature associated with the general type of clothing or personal protective equipment (PPE) each employee is required to wear.

HEAT STRESS

Type of Clothing	Outdoor Temperature Action Levels (Degrees Fahrenheit)
Nonbreathing clothes including vapor barrier clothing or PPE such as chemical resistant suits	52°
Double-layer woven clothes including coveralls, jackets and sweatshirts	77°
All other clothing	89°

9.2.1. Minimize Exposure to Extreme Temperatures

Where acceptable temperature cannot be maintained, all outdoor work should be scheduled so as to minimize exposure to extreme temperatures.

9.2.2. Monitoring

Temperature and conditions in the work area should be monitored by supervisory personnel.

9.2.3. Appropriate Dress

Employees are required to dress appropriately for the relevant working conditions, including normal weather extremes. Limiting the time of exposure and wearing protective clothing will reduce the dangers of exposure to heat. Clothing should:

- Be constructed of an absorbent, close-weave material that doesn't allow penetration of sunlight; and
- Be worn in light layers that can be adjusted for comfort.

9.2.4. Preventive Measures for Working Outdoors

The following measures are to be implemented to protect employees working outdoors:

- Use of a range of sunscreens (with high protection factor) that are persistent on the skin irrespective of humidity and perspiration.
- Encouragement of the application of a sunscreen 15 minutes prior to exposure.

- Encouragement of regular re-application of sunscreen throughout the day.
- Use of safety sunglasses (where lighting is not an issue).

9.2.5. Appropriate Dress

Employees shall retire to shaded or cooled areas for rest breaks when possible.

9.2.6. Rest Breaks

When cool down is required, employees shall take rest breaks in a shaded or cooled area.

9.2.7. Drinking Water

Ensure an adequate supply of cool drinking water for the employees to replace water lost through perspiration. It is essential that water intake be approximately equal to the amount of sweat produced to avoid dehydration. Most workers exposed to hot conditions drink fewer fluids than needed because of an insufficient thirst drive. A worker, therefore, should not depend on thirst to signal when and how much to drink.

- Fluids shall be replaced approximately every 20 minutes in amounts of at least one gallon per day.
- Water shall be kept cool throughout the operation.
- Electrolyte replacement shall be in the form of a commercial electrolyte replacement drink (that is, Gatorade or equivalent).
- Avoid alcohol and caffeine (including coffee and tea), which contribute to dehydration.

9.2.8. Air Conditioning

Minimize humidity in the work environment to improve sweat evaporation from the surface of the skin. This can be accomplished by air conditioning or dehumidification. Cooling by the evaporation of sweat lets the body reduce its temperature; evaporation proceeds more quickly and the cooling effect is more pronounced within increasing air speed and low relative humidity. When possible, vehicle and work areas should be equipped with air conditioning.

9.2.9. Reduce Physical Demands

Increase work during high temperatures can add stress to the body. Reduce physical demands of work task when possible through mechanical means such as hoists, hand trucks, lift-tables etc.

9.2.10. Steps to Prevent Heat Stress

Steps to help prevent heat stress include:

- Consider a worker's physical condition when determining fitness to work in hot environments. Obesity, lack of conditioning, pregnancy and inadequate rest can increase susceptibility to heat stress.
- Certain medical conditions (such as heart conditions) or treatments (such as low-sodium diets and some medications) increase the risk from heat exposure.
- Seek medical advice when symptoms of heat stress appear.

- Schedule strenuous physical activity at the beginning and end of the day, when external temperatures may be cooler.
- Provide portable water sprayers so that employees can cool down skin surfaces.
- Provide whole-body cooling devices such as ice vests with frozen packs or recirculation systems.

10.0 MISCELLANEOUS

10.1. Emergency Response

Indicate what site-specific procedures you will implement.

- Personnel on-site should use the "buddy system" (pairs).
- Visual contact should be maintained between "pairs" on-site, with the team remaining in proximity to assist each other in case of emergencies.
- If any member of the field crew experiences any adverse exposure symptoms while on-site, the entire field crew should immediately halt work and act according to the instructions provided by the Site Safety and Health Supervisor.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team, contact of the PM, and reevaluation of the hazard and the level of protection required.
- If an accident occurs, the Site Safety and Health Supervisor and the injured person are to complete, within 24 hours, an Accident Report for submittal to the PM, the Health and Safety Program Manager and Human Resources. The PM should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

10.2. Personnel Medical Surveillance

GeoEngineers employees are not in a medical surveillance program because they do not fall into the category of “Employees Covered” in OSHA 1910.120(f)(2), which states a medical surveillance program is required for the following employees:

1. All employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year;
2. All employees who wear a respirator for 30 days or more a year or as required by state and federal regulations;
3. All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation; and
4. Members of HAZMAT teams.

10.3. Spill Containment Plans (Drum and Container Handling)

If fluid from the wells is spelled onto the ground the area should be identified and noted in the field report, If significant volume of fluid is spilled absorbent (such as cat litter) should be applied to the spill area and the project manager contacted. Spent absorbent material will need to be stored within the ecology block wall enclosure.

10.4. Sampling, Managing and Handling Drums and Containers

Drums and containers used during the cleanup shall meet the appropriate Department of Transportation (DOT), OSHA and U.S. Environmental Protection Agency (EPA) regulations for the waste that they contain. Site operations shall be organized to minimize the amount of drum or container movement. When practicable, drums and containers shall be inspected and their integrity shall be ensured before they are moved. Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled. Before drums or containers are moved, all employees involved in the transfer operation shall be warned of the potential hazards associated with the contents.

Drums or containers and suitable quantities of proper absorbent shall be kept available and used where spills, leaks or rupture may occur. Where major spills may occur, a spill containment program shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred. Fire extinguishing equipment shall be on hand and ready for use to control incipient fires.

10.5. Sanitation

Portable toilets will be provided during work activities. Water should be available in the decontamination area for washing.

10.6. Lighting

Construction activities are expected to be conducted during daylight hours. However, in the event that construction must occur early or late in the day to time the construction at low tide, the contractor will be required to provide adequate artificial lighting to safely perform construction activities.

11.0 DOCUMENTATION TO BE COMPLETED FOR HAZWOPER PROJECTS

The following forms are required for Hazardous Waste Operations and Emergency Response (HAZWOPER) projects:

- Field Log
- Health and Safety Plan acknowledgment by GeoEngineers employees (Form 2)
- Contractors Health and Safety Plan Disclaimer (Form 3)
- Conditional forms available at GeoEngineers office: Accident Report

NOTE: The Field Report is to contain the following information:

- Updates on hazard assessments, field decisions, conversations with subcontractors, client or other parties, etc.;
- Air monitoring/calibration results, including: personnel, locations monitored, activity at the time of monitoring, etc.;
- Actions taken;
- Action level for upgrading PPE and rationale; and
- Meteorological conditions (temperature, wind direction, wind speed, humidity, rain, snow, etc.).

12.0 APPROVALS

1.	Plan Prepared	Jodie L. Sheldon Preparer	May 14, 2013 Date
2.	Plan Approval	Iain H. Wingard Project Manager	May 14, 2013 Date
3.	Health & Safety Officer	Wayne D. Adams Health & Safety Program Manager	May 14, 2013 Date

HASP FORM 1
HEALTH AND SAFETY BRIEFING
INTERIM ACTION CONSTRUCTION
FORMER R.G. HALEY WOOD TREATMENT SITE
FILE NO. 0356-114-06

Inform employees, contractors and subcontractors or their representatives about:

- The nature, level, and degree of exposure to hazardous substances they're likely to encounter;
- Emergency response procedures; and
- Any identified potential fire, explosion, or other health or safety hazards, and associated safe work practices.

Date	Topics	Attendee	Company Name	Employee Initials

HASP FORM 2
SITE SAFETY PLAN – GEOENGINEERS' EMPLOYEE ACKNOWLEDGMENT
FORMER R.G. HALEY WOOD TREATMENT SITE
FILE NO. 0356-114-06

(All GeoEngineers' Site workers shall complete this form, which should remain attached to the Safety Plan and filed with other project documentation).

I hereby verify that a copy of the current Safety Plan has been provided by GeoEngineers, Inc., for my review and personal use. I have read the document completely and acknowledge an understanding of the safety procedures and protocol for my responsibilities on Site. I agree to comply with all required, specified safety regulations and procedures.

Print Name	**Signature**	**Date**

HASP FORM 3
SUBCONTRACTOR AND SITE VISITOR SITE SAFETY FORM
FORMER R.G. HALEY WOOD TREATMENT SITE
FILE NO. 0356-114-06

I verify that a copy of the current Site Safety Plan has been provided by GeoEngineers, Inc. to inform me of the hazardous substances on Site and to provide safety procedures and protocols that will be used by GeoEngineers' staff at the Site. By signing below, I agree that the safety of my employees is the responsibility of the undersigned company.

Print Name	Signature	Firm	Date