Supplemental Remedial Investigation Work Plan
Weldcraft Steel and Marine (Gate 2 Boatyard) Site
Bellingham, Washington

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Prepared for

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1.0 INTRODUCTION

This document presents the work plan to conduct supplemental site characterization activities at the Weldcraft Steel and Marine (Gate 2 Boatyard) site in Bellingham, Washington. These activities are being conducted under Agreed Order DE 03TCPBE-5623 between the Port of Bellingham (Port) and the Washington State Department of Ecology (Ecology) for remedial action at the site.

The site is owned by the Port and is currently occupied by its tenant Seaview Boatyard. Figure 1 is a vicinity map showing the location of the site. Figure 2 is a site plan showing existing site features and the investigation area.

This supplemental site characterization work is being conducted based on Ecology comments on the Ecology Review Draft Remedial Investigation/Feasibility Study (RI/FS) report for the site (Landau Associates 2005) and in consideration of planned future site development activities. The supplemental site characterization work will be conducted as RI activities and will be used to refine and evaluate remedial alternatives for the FS and to support redevelopment of the site currently being planned by Seaview Boatyard.

RI site characterization activities described in this work plan include the following:

- Delineation of the extent of gasoline-range petroleum hydrocarbon soil contamination beneath Building 1 in the vicinity of the former gasoline underground storage tank (UST)
- Delineation of shallow soil for metals contamination in the vicinity of Boring SB-20
- Installation and water quality monitoring of three groundwater monitoring wells at the proposed conditional point of compliance for groundwater at the shoreline.

The Ecology Review Draft RI/FS report presents a more thorough description of site environmental conditions. In this document, the scope of work and procedures for RI field activities are presented in Section 2.0. Health and safety for field activities is discussed in Section 3.0. Quality assurance/quality control for analytical sampling and testing is presented in Section 4.0.

2.0 SCOPE OF WORK

This section describes the sampling strategy and procedures that will be used during the RI field activities, including soil and groundwater investigation activities, sample transportation and handling, sample custody and documentation, equipment decontamination, residual waste management, utility locate, and surveying procedures.

2.1 SOIL INVESTIGATION

This portion of the investigation will focus on heavy metals contamination in shallow soil in the vicinity of Boring SB-20 and gasoline-range petroleum hydrocarbon contamination in the vicinity of the former gasoline UST. As shown on Figure 2, 11 soil boring locations are proposed for the area to the south of the former UST within Building 1. Eight explorations are proposed for the vicinity of Boring SB-20, also shown on Figure 2.

Soil sample collection methods are presented in Section 2.1.1. The former UST area and the area in the vicinity of Boring SB-20 will be investigated as described in Sections 2.1.2 and 2.1.3, respectively. Analytical test methods are presented in Section 2.1.4.

2.1.1 SOIL SAMPLE COLLECTION METHODS

Soil samples will be collected using a truck-mounted Geoprobe direct-push drilling rig, except as discussed in Section 2.1.3. Soil samples will be obtained from the soil borings using a closed-piston sampling device with a 48-inch long, 1.5-inch inside-diameter (ID) core sampler. The sampler will be advanced to the top of the sample interval with the piston in a locked position. The piston tip will then be loosened and the sampler will be advanced over the desired depth interval, thereby coring the soil inside the sampler's disposable, single-use liner. The sampler will be withdrawn to retrieve the liner and soil sample. The liner will be cut to remove the soil sample. A new liner will be placed in the core sampler and this process will be repeated until all desired soil samples have been obtained. Between samples, the core sampler, including the piston tip and rods, will be decontaminated, as specified in Section 2.6.2.

After the liner has been cut, the soil type will be field-classified and recorded on the Log of Exploration form in accordance with the Uniform Soil Classification System [American Society for Testing and Materials (ASTM) 1998]. The soil column retained in the sample liner will be field-screened by physical inspection. A visual examination will then be made for discoloration of soil, the presence of sheen or non-aqueous phase liquid (NAPL), and precipitates. The presence of any odor will also be documented.

The core will be divided into the identified sample intervals, and the sample intervals will be individually homogenized using decontaminated stainless-steel bowls and spoons. The homogenized sample volumes will then be placed into the appropriate laboratory-supplied sample containers. However, volatile organic compound (VOC) soil samples, including samples for hydrocarbon testing, will be collected from the undisturbed soil sample prior to homogenization, as described below.

The cores will be field-screened using a photo-ionization detector (PID) prior to sampling or homogenization and will be recorded for each 2-ft interval. If obvious signs of contamination are observed, a discrete sample will be collected from the area with the greatest level of observed contamination. If the soil consists primarily of coarse sand or finer grained material, U.S. Environmental Protection Agency (EPA) Method 5035A, described below, will be used. If soil containing significant gravel content is encountered, the EPA method is not effective and the previously accepted method of placing larger sample volume in a larger sample container will be used.

The EPA Method 5035A soil sampling procedures will be used to collect soil samples planned for gasoline-range petroleum hydrocarbons (TPH-G), and benzene, toluene, ethylbenzene, and xylene (BTEX) analyses consistent with recent Ecology guidance (Ecology 1998). The EPA 5035A soil sampling method is intended to reduce volatilization and biodegradation of samples. The EPA 5035A procedure for soil sample collection is as follows:

- Collect soil "cores" using coring devices (i.e., EnCore sampler, EasyDraw Syringe, or a Terra Core sampling device). Each core will consist of approximately 5 grams of soil. Collect three discrete cores from each sampling location. One EasyDraw Syringe or Terra Core device will be used to collect the three discrete cores; however, if the EnCore samplers are used, three sampling devices are required.

- Remove excess soil from the coring device. If EasyDraw Syringe or Terra Core sampling devices are used for sample collection, place the cored soil directly into unpreserved 40 ml vials with a stirbar. If the EnCore sampler is used, close the sampler for transport to the laboratory.

- Collect one 2-oz jar of representative soil for moisture content and laboratory screening purposes. Fill the jar to minimize headspace.

- Samples will be placed in shipping cooler at 4ºC. Samples will be transported to the laboratory within 24 hours of sample collection and will be stored at the laboratory at -7ºC.

Soil samples will be collected and preserved consistent with the method-specific requirements presented in Table 1. Analyses will be conducted within the specified holding times, which are also presented in Table 1.

2.1.2 FORMER UNDERGROUND STORAGE TANK AREA

Soil Boring SB-8 (completed during the Phase II ESA in 1998), located west of the former UST area, had a TPH-G concentration of 3,200 mg/kg at a depth interval of 4.7 to 5.6 ft below ground surface (BGS), which exceeds the preliminary cleanup level. Evidence of hydrocarbon sheen and gasoline odor was observed in a number of other borings advanced along the north side of Building 1 during the Phase II ESA. The extent of contamination associated with releases from the former gasoline UST was adequately delineated to the north, west, and east during previous investigations, as shown on Figure 2. However, during previous upland site investigations, explorations were not advanced to the south of the UST to delineate the extent of gasoline-range petroleum hydrocarbon contamination that extends beneath Building 1; this is the purpose of the RI in the former UST area.

To further delineate TPH-G concentrations in soil to the south of the UST area, up to 11 soil borings will be advanced within the interior of Building 1. As shown on Figure 2, the borings will be spaced approximately 20 to 40 ft apart in the area south of the former UST. The concrete floor slab of Building 1 will be cored at each location to facilitate boring advancement and one soil sample will be collected from each boring that is advanced. It should be noted that the proposed boring locations are approximate and may be adjusted based on the presence of utilities, observed site conditions, and obstructions (such as boats under repair) associated with current site activities.

Because soil contamination associated with the UST release is the result of gasoline, a light NAPL that migrates along the water table, it is anticipated that the highest levels of contamination will be encountered in the vicinity of the groundwater table (about 8 ft BGS). At each soil boring location, the boring will be extended to about 12 ft BGS. Samples will be collected continuously from the ground surface for field-screening and lithologic classification purposes, as described in Section 2.1.1.

One soil sample from each boring will be collected from the sampling interval corresponding to the location with the highest VOC concentration measured by field-screening with a PID, as described in Section 2.1.1. If VOCs are not detected during field screening, the sample will be collected from the capillary fringe, the first saturated interval encountered at the groundwater table. The sample will be submitted to an analytical laboratory for analysis, as described in Section 2.1.4.

The concrete surface at all potential boring locations will be cored. However, whether an exploration is completed or a soil sample is tested at a given location will depend on results from adjacent locations. Explorations will initially be advanced at the eight borings closest to the north wall of Building 1. If evidence of contamination, such as odor or PID readings, is encountered within the borings in either of the first two rows of borings, the last row of three borings will also be completed. If no evidence of contamination is encountered in the first two rows of borings, the third row of borings will not be advanced.

All samples exhibiting evidence of gasoline-range petroleum hydrocarbon contamination will be tested for TPH-G, as described in Section 2.1.4. The closest sample to the south of the sample exhibiting evidence of gasoline-range petroleum hydrocarbon contamination will also be tested for TPH-G. The remaining samples will be archived for potential testing, depending on the results of the initial testing. Archived samples will be tested if the results for the nearest sample to the north exhibit a TPH-G concentration greater than 100 mg/kg.

2.1.3 BORING SB-20 AREA

Soil Boring SB-20, located east of Building 1, had copper, lead, mercury, and zinc concentrations above the preliminary cleanup levels in shallow soil underlying the existing pavement section. The extent of shallow soil contamination in this area is not well delineated, so additional shallow soil characterization will be conducted to better define the vertical and lateral limits of metals contamination in this area.

To further delineate metals concentrations in soil in the vicinity of SB-20, eight soil borings will be advanced and soil samples will be collected from each boring as described below. As shown on Figure 2, borings will be spaced approximately 20 to 40 ft from one another in the vicinity of Boring SB-20. It should be noted that the spacing between some boring locations is irregular due to the presence of obstructions, including utilities and large boats undergoing long-term maintenance.

At each soil boring location, the boring will be extended to 3 ft BGS, and samples for laboratory analysis will be collected continuously from the ground surface. Three intervals will be sampled at each boring location: 0 to 1 ft, 1 to2 ft, and 2 to 3 ft BGS. The top interval (0 to 1 ft) will be analyzed by the laboratory for selected metals (arsenic, copper, lead, mercury, nickel, and zinc). The two remaining intervals (1 to 2 ft and 2 to 3 ft) will be initially archived at the laboratory pending a review of the results of the top interval. The second interval (1 to 2 ft) will be analyzed for those constituents that exceed the preliminary cleanup levels in the top interval. Similarly, the third interval (2 to 3 ft) will be analyzed for constituents that exceed the preliminary cleanup levels in the second interval.

2.1.4 SOIL LABORATORY ANALYSES

Soil samples will be submitted to the laboratory for the analyses described above. Analytical testing for gasoline-range petroleum hydrocarbons in the former UST area will consist of TPH-G analysis using Ecology Method NWTPH-G. Analytical testing for shallow soil in the SB-20 vicinity will consist of metals analysis for arsenic, copper, lead, mercury, nickel, and zinc using EPA Method 3050A/6010B. The target reporting limit for each analyte is presented in Table 2.

2.2 GROUNDWATER INVESTIGATION

The purpose of the groundwater investigation is to install and monitor groundwater monitoring wells as close as practicable to the shoreline to confirm that copper and nickel achieve the preliminary cleanup levels at the proposed conditional point of compliance. Dissolved copper or nickel concentrations slightly exceed the preliminary cleanup level in current downgradient groundwater monitoring wells MW-3, MW-4, and MW-7. However, these wells are located about 30 to 40 ft upgradient from the proposed conditional point of compliance at the shoreline. We anticipate that significant dynamic dispersion will occur in proximity to the shoreline due to tidal fluctuations in the adjacent surface water, and that groundwater concentrations of copper and nickel in the immediate vicinity of the shoreline will comply with the preliminary cleanup levels.

The groundwater investigation will consist of installing three monitoring wells adjacent to the shoreline to function as the downgradient groundwater compliance monitoring wells for the site. After well installation, the wells will be developed. Following a minimum stabilization period of 1 week, groundwater samples will be collected from each of the monitoring wells and analyzed for selected metals. Procedures for conducting these activities are described below.

2.2.1 WELL LOCATIONS

Three monitoring wells (MW-10 through MW-12) will be installed as close as possible to the locations shown on Figure 2. Worker safety considerations preclude installing the wells any closer than about 5 ft from the shoreline, so the wells will be installed upgradient of the former bulkhead . State plane coordinates will be collected at each monitoring well using a Trimble differential global positioning system (DGPS) unit.

2.2.2 MONITORING WELL INSTALLATION AND DEVELOPMENT

Each of the three monitoring wells will be installed to a depth of approximately 20 ft BGS with a 15 ft screen interval. This screened interval will extend across the water table and provide sufficient vertical range to allow groundwater monitoring within the full range of tidally influenced changes in groundwater elevation. Drilling will be performed using hollow-stem auger equipment, and soil samples will be collected for geologic characterization at 5-ft intervals during boring advancement. The depth of the wells may be modified, as necessary, based on groundwater conditions observed at the time of drilling.

The monitoring wells will be constructed of 2-inch-diameter, Schedule 40 polyvinyl chloride (PVC) casing. The anticipated screen interval is 5 to 20 ft BGS, and the wells will be constructed using 0.020-inch slotted screen. A filter pack using No. 10-20 silica sand will be installed from the base of the boring to at least 1.5 ft above the top of the screen, and a bentonite chip seal will be installed above the filter pack. All wells completed in paved areas will be installed with flush-mount monuments. Above-grade monuments may be used for wells located within the bioswale immediately adjacent to the bulkhead in the vicinity of wells MW-10 and MW-11 if the ground surface is low enough to potentially accumulate water during rainfall events. Monitoring well construction will be performed in accordance with the *Minimum Standards for Construction and Maintenance of Wells* (Chapter 173-160 WAC).

The wells will be developed after construction to remove formation material from the well bore and the filter pack prior to groundwater level measurement and sampling. Development will be achieved by repeatedly surging the well with a surge block and purging up to 10, but no less than 5, well casing volumes. The well will be developed until the turbidity of the purged groundwater is no greater than 5 nephelometric turbidity units (NTUs), if practicable. If the well dewaters during the initial surging and purging effort, one final well casing volume will be removed after the well has fully recharged, if practicable.

2.2.3 WATER LEVEL MEASUREMENTS

Water level measurements will be obtained at each monitoring well prior to purging and sampling, but after the wells have been developed and fully recharged to static groundwater level conditions. Water level measurements will be collected from all site monitoring wells prior to sample collection.

All water levels will be measured using a decontaminated electronic water level indicator and will be recorded to the nearest 0.01 ft. Measurements will be taken from the pre-surveyed reference mark at the top of the well casing.

2.2.4 GROUNDWATER SAMPLE COLLECTION

Groundwater samples will be collected from existing wells MW-3, MW-4, and MW-7 in additional to new wells MW-10, MW-11, and MW-12. All samples will be collected at or near low tide to ensure that the sample contains groundwater discharging from the upland portion of the site, not solely marine water recently recharged to the aquifer during high tide. Specific conductance will be monitored during well purging prior to sampling, and groundwater samples will not be collected until specific conductance exhibits a decreasing trend indicative of freshwater recharge.

Groundwater samples will be collected at each monitoring well using a low flow groundwater sampling technique as described by the following procedure:

- Immediately following removal of each well monument cover, the well head will be observed for damage, leaks, and stains. Additionally, immediately following removal of the well head cap, any odors will be recorded and the condition of the well opening will be observed. Any damage or leakage to the well head or well opening will be recorded.

- Depth to groundwater measurements will be collected using a decontaminated electronic water level indicator and recorded to the nearest 0.01 ft. The measurement will be recorded on the groundwater sampling form.

- Prior to sampling, each well will be purged using a peristaltic pump that is attached to dedicated purge and sample collection tubing. Purging will be maintained at a low purge rate (no more than 0.1 liter per minute). The rate will be adjusted to minimize drawdown (with a target drawdown of less than 0.33 ft) during purging.

- Field parameters, including pH, temperature, conductivity, dissolved oxygen (DO), and turbidity, will be continuously monitored during purging using a flow cell and recorded every 2 to 3 minutes. Purging of the well will be considered complete when all field parameters become stable for three successive readings. The successive readings should be within +/- 0.1 units for pH, +/- 3 percent for conductivity, and +/- 10 percent for DO and turbidity.

- Purge data will be recorded on a Groundwater Sample Collection form, including purge volume; time of commencement and termination of purging; any observations regarding color, turbidity, or other factors that may be important in evaluation of sample quality; and field measurements of pH, specific conductance, temperature, DO, and turbidity.

- Following the stabilization of field parameters, the flow cell will be disconnected and groundwater samples will be collected. Sample data will be recorded on a Groundwater Sample Collection form, including sample number and time collected; the observed physical characteristics of the sample (e.g., color, turbidity); and field parameters (pH, specific conductance, temperature, DO, and turbidity).

- Four replicate field measurements of temperature, pH, specific conductance, DO, and turbidity will be obtained using the following procedure:

  - A 250-mL plastic beaker will be rinsed with deionized water followed by sample water.

  - The electrodes and temperature compensation probe will be rinsed with deionized water followed by sample water.

  - The beaker will be filled with sample water; the probes will be placed in the beaker until the readings are stabilized. Temperature, pH, specific conductance, DO, and turbidity measurements will be recorded on the Groundwater Sample Collection form.

  - The above steps will be repeated to collect remaining replicates.

- Any problems or significant observations will be noted in the "comments" section of the Groundwater Sample Collection form.

- Groundwater samples will be collected into the appropriate sample containers using a peristaltic pump. Samples will be chilled to 4°C immediately after collecting the sample. Clean gloves will be worn when collecting each sample.

- Groundwater for dissolved metals analyses will be collected last and filtered in the field through a 0.45-micron, in-line disposable filter. Dissolved metal samples will be preserved as specified in Table 1. A note will be made on the sample label, sample collection form, and chain of custody (COC) to indicate the sample has been field-filtered and preserved, including the type of preservative used.

2.2.5 LABORATORY ANALYSES

Groundwater samples will be analyzed for select dissolved metals (copper, lead, mercury, nickel, and zinc). Metals other than nickel will be analyzed by EPA Method 6010/7471. Nickel will be analyzed using EPA Method 8020 (ICP/MS) to attain a reporting limit below the preliminary cleanup level. The target reporting limit for each analyte is presented in Table 2.

2.3 SAMPLE TRANSPORTATION AND HANDLING

The transportation and handling of soil and groundwater samples will be accomplished in a manner that not only protects the integrity of the sample, but also prevents any detrimental effects due to release of samples. Samples will be kept in coolers on ice until delivery to the analytical laboratory. At the end of each day, samples will be logged on a COC form. The COC will accompany each shipment of samples to the laboratory.

2.4 SAMPLE CUSTODY AND DOCUMENTATION

The primary objective of sample custody is to create an accurate, written record that can be used to trace the possession and handling of samples so that their quality and integrity can be maintained from collection until completion of all required analyses. Adequate sample custody will be achieved by means of approved field and analytical documentation. Such documentation includes the COC record that is initially completed by the sampler and is, thereafter, signed by those individuals who accept custody of the sample. A sample is in custody if at least one of the following is true:

- It is in someone’s physical possession.
- It is in someone’s view.
- It is secured in a locked container or otherwise sealed so that tampering will be evident.
- It is kept in a secured area, restricted to authorized personnel only.

Sample control and COC in the field and during transportation to the laboratory will be conducted in general conformance with the procedures described below:

- As few people as possible will handle samples.
- Sample bottles will be obtained new or pre-cleaned from the laboratory performing the analyses.
- The sample collector will be personally responsible for the completion of the COC record and the care and custody of samples collected until they are transferred to another person or dispatched properly under COC rules.
- The coolers in which the samples are shipped will be accompanied by the COC record identifying their contents. The original record and laboratory copy will accompany the shipment (sealed inside the shipping container). The other copy will be forwarded to Landau Associates along with sample collection forms.
- Coolers will be sealed with strapping tape and custody seals for shipment to the laboratory. The method of shipment, name of courier, and other pertinent information will be entered in the "remarks" section of the COC record.

When samples are transferred, the individuals relinquishing and receiving the samples will sign the COC form and record the date and time of transfer. The sample collector will sign the form in the first signature space. Each person taking custody will observe whether the shipping container is correctly sealed and in the same condition as noted by the previous custodian; deviations will be noted on the appropriate section of the COC record.

A designated sample custodian at the laboratory will accept custody of the shipped samples, verify the integrity of the custody seals, and certify that the sample identification numbers match those on the COC record. The custodian will then enter sample identification number data into a bound logbook, which is arranged by a project code and station number. If containers arrive with broken custody seals, the laboratory will note this on the COC record and will immediately notify the sampler and Landau Associates.

All documentation and other project records will be safeguarded to prevent loss, damage, or alteration. If an error is made on a document, corrections will be made by drawing a single line through the error and entering the correct information. The erroneous information will not be obliterated. Corrections will be initialed and dated and, if necessary, a footnote explaining the correction will be included. Errors will be corrected by the person who made the entry, whenever possible.

2.5 EQUIPMENT DECONTAMINATION

The decontamination procedures described below are to be used by field personnel to clean drilling, sampling, and related field equipment. Deviation from these procedures must be documented in the field records.

2.5.1 SAMPLING EQUIPMENT

All used sampling equipment (e.g., stainless-steel bowls, stainless-steel spoons, hand augers, and Geoprobe core samplers) will be cleaned using a three-step process, as follows:

1. Scrub surfaces of equipment that would be in contact with the sample with brushes using an Alconox solution.
2. Rinse and scrub equipment with clean tap water.
3. Rinse equipment a final time with deionized water to remove tap water impurities.

Decontamination of the reusable sampling devices will occur between collection of each sample. Decontamination of sampling equipment that contains a visible sheen will include a hexane rinse (or other appropriate solvent) prior to the tap water rinse.

2.5.2 HEAVY EQUIPMENT

Heavy equipment (e.g., drilling rigs and drilling equipment used downhole, or equipment that contacts material) will be cleaned with a hot water, high pressure wash before each use and at completion of the project. Potable tap water will be used as the cleansing agent.

2.6 RESIDUAL WASTE MANAGEMENT

This section describes the management of the soil cuttings, well development water, purge water, and decontamination water generated during soil boring and well installation, well development, and groundwater sampling.

2.6.1 SOIL CUTTINGS

Soil cuttings from boreholes will be temporarily stored in 55-gal drums. Soil cuttings from the monitoring well installation will be segregated from the soil cuttings associated with the gasoline UST and SB-20 area investigations because the soil cuttings from the monitoring wells are not expected to be contaminated. Because Geoprobe investigations do not generate a significant volume of soil cuttings, a single drum will likely be sufficient for the UST and SB-20 investigation areas. Three to four drums will likely be required for the monitoring well cuttings.

Disposal of the soil cuttings will be completed in accordance with appropriate regulations. Separate soil composite samples will be collected from the materials in the drum containing the cuttings from the UST and SB-20 investigations, and the drums containing the monitoring well cuttings. Each composite sample will be analyzed for parameters required for disposal.

2.6.2 DECONTAMINATION WATER, PURGE WATER, AND MONITORING WELL DEVELOPMENT WATER

Decontamination water, purge water, and monitoring well development water generated during soil and groundwater sampling and monitoring well installation will be temporarily stored in 55-gal drums. Disposal methods will be determined based on the analytical results for the groundwater samples.

2.7 UTILITY LOCATE

Prior to conducting subsurface explorations, the public utility locate service will be contacted to locate underground utilities at the perimeter of the property. A private utility locate service will also be contracted to clear all exploration locations not located in the public right-of-way.

2.8 SURVEYING

Landau Associates personnel will survey the location of each exploration using DGPS equipment to facilitate accurate placement of these features on project figures and drawings. Landau Associates will also survey the vertical elevation of the new monitoring wells using land surveying equipment with the existing well reference elevations as the datum. Surveying will be accomplished after site investigation activities are completed. To assist in relocating the sampling locations, a piece of masking tape with the sample designation noted on it will be secured to the exploration location at the time of sampling.

3.0 HEALTH AND SAFETY

A project health and safety plan for implementation of field activities described in this work plan is provided in Appendix A. All Landau Associates employees will follow the procedures described in this plan. Landau Associates subcontractors will either adopt this plan or prepare their own plan that is at least as protective as this plan.

4.0 QUALITY ASSURANCE/QUALITY CONTROL

This section establishes quality assurance (QA) objectives for the data gaps investigation and quality control (QC) procedures developed to meet the QA objectives.

The overall data quality objective (DQO) for the data gaps investigation is to establish confidence that investigation data are of known, appropriate, and sufficient quality to support their intended use, which is to evaluate the need for remedial action at the site. To accomplish this goal, project data should be technically sound, statistically valid, and properly documented, having been evaluated against established criteria for the principal data quality indicators [DQIs; i.e., precision, accuracy, representativeness, completeness, and comparability (also referred to as PARCC)], as defined in EPA (1998) guidance documents. The QA procedures presented in this work plan were developed in accordance with EPA (1994a) guidance documents to accomplish the investigation DQO.

Laboratory analyses to be conducted during this investigation will be in accordance with standard EPA-approved methods (EPA 1986, as currently updated). The targeted level of data quality is comparable to that obtained from the use of Contract Laboratory Program methods (EPA 1994b,c), with the exception of the level of documentation required with submittal of the analytical results from the laboratories. The analytical, documentation, and validation procedures established in this QA plan are sufficient to achieve this level of data quality and therefore are sufficient to support the appropriate conclusions from the data.

Current control limits established by the laboratory for the cited analytical methods will be used for evaluating the principal DQIs. Precision will be evaluated through the collection and analysis of field and laboratory matrix spike duplicate samples, and laboratory accuracy will be monitored through the use of matrix spike and surrogate spike samples. In field duplicates, both field and laboratory variability are potential sources of error; therefore, both will be considered in any investigation of relative percent difference (RPD) values outside the target control limits. Data acceptability will be determined on the basis of the results of a qualitative review of error sources and, therefore, will be case-specific.

The QA objectives for representativeness, completeness, and comparability will be achieved by:

- Collecting representative samples.
- Implementing standardized and uniform field and laboratory procedures.
- Collecting field equipment blanks for nondedicated equipment and analyzing trip blanks and laboratory method blanks to verify that the analytical results are representative of the sampled item and not influenced by cross-contamination.
- Reporting data in conventional and standard units.

PARCC parameters are further defined and discussed later in this plan.

Quantitation limits will generally equal those listed in the standard EPA methods (EPA 1986, as currently updated) or those currently achievable by the laboratory depending on effects by matrix interferences. The project quantitation limit goals for soil and groundwater are presented in Table 2.

4.1 FIELD AND LABORATORY INSTRUMENT QA/QC PROCEDURES

Field and laboratory instruments will be properly operated, calibrated, and maintained by qualified personnel according to the manufacturer's guidelines and recommendations, as well as criteria in the analytical method. Documentation of routine and special preventive maintenance and calibration information will be maintained in a field or laboratory logbook or reference file. Each maintenance and calibration logbook entry will include the date and initials of the individual performing the activity. Field instruments requiring calibration will include those measuring pH and conductivity, and a PID (e.g., Microtip).

The analytical laboratory is responsible for maintaining laboratory instruments in proper working order, including routine maintenance and calibration and training of personnel in maintenance and calibration procedures. Laboratory instruments will be properly calibrated with appropriate check standards and calibration blanks for each parameter before beginning each analysis. Instrument performance check standards, where required, and calibration blank results will be recorded in a laboratory logbook dedicated to each instrument. At a minimum, the preventive maintenance schedules contained in the EPA methods and in the equipment manufacturer's instructions will be followed. Laboratory calibration procedures and schedules will be as described in the laboratory QA/QC plan, which will be available for review upon request.

Multipoint initial calibration will be performed on each instrument at the start of the project, after each major interruption to the analytical instrument, and when any ongoing calibration does not meet control criteria. Ongoing calibration will be performed daily for metals and organic analyses and with every sample batch for conventional parameters (when applicable) to track instrument performance.

Laboratory instrument blanks or continuing calibration blanks provide information on the stability of the established baseline. Continuing calibration blanks will be analyzed immediately prior to continuing calibration verification at a frequency of one continuing calibration blank for every 10 samples analyzed at the instrument for inorganic analyses and every 21 hours for organic analyses. If the ongoing calibration is out of control, the analysis must come to a halt until the source of the control failure is eliminated or reduced to meet control specifications. All project samples analyzed while instrument calibration was out of control will be reanalyzed.

4.2 QA PROCEDURES FOR SAMPLE ANALYSES

As noted previously, the analytical methods and quantitation limit goals for this investigation are listed in Tables 1 and 2. Changes in analytical methods will not be allowed without prior written documentation from the laboratory regarding the desired substitution and its rationale, and prior written acceptance by Landau Associates.

The project quantitation limits are recognized to be goals because instances may arise where high sample concentrations, nonhomogeneity of samples, or matrix interferences preclude achieving the desired quantitation limits and associated QC criteria. If this occurs, the laboratory will report the reason(s) for deviations from these quantitation limits or noncompliance with QC criteria, and the missed goals will be noted during data validation. Routine, poorly substantiated noncompliance with the quantitation limit goals will not be tolerated.

4.3 FIELD QC SAMPLES

Internal QC will be assessed through specific QC samples collected and/or measurements taken in the field and laboratory. The QC samples will be used to evaluate precision, accuracy, representativeness, completeness, and comparability of the analytical results for this project (see detailed discussion of these parameters in Section 4.5). The planned analytical methods specify routine procedures required to verify that data are within proper QC limits. Additional internal QC includes collection and analysis of a number of field and laboratory QC samples, which are described in this section.

Field and laboratory QC samples will be used to evaluate data validity and representativeness. Field and laboratory QC samples will include blind field duplicates, field trip blanks, laboratory matrix or method spikes, laboratory matrix spike duplicates, laboratory duplicates, and laboratory method blanks. Field duplicates will be collected only for groundwater samples because the inherent heterogeneity of soil samples results in variations in sample concentration that are unrelated to data validity or representativeness.

Groundwater blind field duplicates will consist of split samples collected at a single sample location. Blind field duplicates will be collected by alternately filling sample containers for both the original and the corresponding duplicate sample at the same location to decrease variability between the duplicates, and submitted “blind” to the laboratory as discrete samples (i.e., given unique sample identifiers to keep the duplicate identity unknown to the laboratory). Blind field duplicates will be collected at a frequency of one per 20 samples, not including QC samples, but not less than one duplicate per sampling event (a sampling event, as defined for the purpose of QC sample frequency, consists of a set of samples collected within a regularly scheduled event or within a 14-calendar-day period). Blind field duplicates will be analyzed for all analyses requested during that sampling event for that matrix. One trip blank will be analyzed per groundwater sampling event. Trip blanks will be provided by the laboratory with the sample containers and cooler, and will remain in the cooler throughout the sampling event and during sample transport to the laboratory. Trip blanks will be analyzed for BTEX and TPH-G to check for sample cross-contamination during storage and transport.

4.4 LABORATORY QC SAMPLES

4.4.1 LABORATORY DUPLICATES

Laboratory duplicates will be performed on water samples. A minimum of one laboratory duplicate per 20 samples, not including QC samples, or one laboratory duplicate sample per batch of samples if fewer than 20 samples are obtained, will be analyzed for dissolved metals. Laboratory duplicates will be performed using project samples. These analyses will be performed to provide information on the precision of chemical analyses. The laboratory duplicate will follow EPA guidance in the method.

4.4.2 LABORATORY CONTROL SAMPLES

A minimum of one laboratory control sample per 20 samples, not including QC samples, or one laboratory control sample per sample batch if fewer than 20 samples are obtained, will be analyzed for all parameters except total solids.

4.4.3 LABORATORY METHOD BLANKS

A minimum of one laboratory method blank per 20 samples, or one every 12 hours, or one per batch of samples analyzed (if fewer than 20 samples are analyzed) will be analyzed for all parameters conducted using standard analytical methods to assess possible cross-contamination introduced during the analysis. In these analyses, the laboratory source of sample dilution water will be used when possible and appropriate. Laboratory method blanks will contain the same reagents used for the associated sample analyses. The generation and analysis of additional method, reagent, and glassware blanks may be necessary to verify that analysis procedures do not contaminate samples.

4.5 QA/QC PROCEDURES USED TO ASSESS DATA

4.5.1 PARCC PARAMETERS

Analytical laboratory data will be reviewed to confirm that the QA objectives for the PARCC parameters are met. The PARCC parameters and the associated statistical tests used in their evaluation are included in the following sections.

Target control limits (the range within which project data of acceptable quality should fall) will be used to evaluate data acceptability as noted in this section. For data acceptance, control limits are considered to be goals only.

4.5.2 PRECISION

Precision is a measure of "the reproducibility of analyses under a given set of conditions" (EPA 1988). Precision is best expressed in terms of the standard deviation or RPD. QA/QC sample types that test precision include field and laboratory duplicates and matrix spike duplicates. The estimate of precision of duplicate measurements will be expressed as an RPD, which is calculated as follows:

$$RPD = \left| \frac{D_1 - D_2}{(D_1 + D_2) \div 2} \right| x100$$

where: D_1 = first sample value

D_2 = second sample value (duplicate)

The RPDs will be routinely calculated and compared with DQO control limits. For groundwater field duplicates, RPD control limits will be 20 percent (or if duplicate sample values are within five times the quantitation limit, the control limit interval will be plus or minus the quantitation limit). For matrix spike/matrix spike duplicates and laboratory duplicates, laboratory RPD control limits will be used.

4.5.3 ACCURACY

Accuracy is a measure of "the bias in a measurement system" (EPA 1988). Numerically, accuracy can be expressed as an average of measurements of the same property X, with an accepted reference or true value T, usually expressed as the difference between the two values (X–T), the difference as a percentage of the reference or true value [100 (X–T)/T], or as a ratio (X/T). Accuracy of laboratory analyses is evaluated through the percent recovery of spiked (matrix or surrogate spike) samples calculated as:

$$Percent\ Recovery = \frac{(Spiked\ Sample\ Result - Unspiked\ Sample\ Result)}{Amount\ of\ Spike\ Added}\ x\,100$$

The percent recovery will be routinely calculated and checked against DQO control limits as established by the most recent laboratory control data.

4.5.4 REPRESENTATIVENESS

Representativeness expresses "the degree to which data accurately and precisely represent selected characteristics" (EPA 1988). Representativeness can be evaluated using additional sampling locations and blanks.

4.5.5 COMPLETENESS

Completeness is a measure of "the amount of valid data obtained from a measurement system compared to the amount that could be expected to be obtained under 'normal' conditions" (EPA 1988). Completeness is calculated as the number of valid (i.e., nonrejected) data points divided by the total number of data points requested. The QA criterion for completeness for this investigation is 95 percent. Completeness will be routinely determined and compared to the QA objective as part of data validation.

4.5.6 COMPARABILITY

Comparability is an expression of the confidence with which one data set can be compared to another. QA procedures in this plan will provide for measurements that are consistent and representative of the media and conditions measured. All sampling procedures and analytical methods used for investigation activities will be consistent to provide comparability of results for samples and split samples. Data collected under this work plan also will be calculated, qualified, and reported in units specified by the quantitation limits as listed in Table 2. The units have been selected to provide for comparability of the data with previously generated relevant site data and pertinent criteria.

4.6 LABORATORY DATA REPORTS

Analytical laboratories supporting site environmental investigations will provide data reports that include the following elements:

- Case narrative, including discussions of adherence to prescribed protocols, nonconformity events, corrective measures, and/or data deficiencies

- Sample analytical results
- Surrogate recoveries
- Laboratory control sample results
- Laboratory duplicate results
- Laboratory method blank results
- Sample custody documentation (including signed, original COC records, and documentation of condition of custody seals)
- Analytical responsibility.

Analytical data from the laboratory will be reported in the units noted in Table 2. These units have been selected to provide for comparability of the data with previously generated, relevant data and, to the extent possible, applicable criteria. The analytical laboratory will be required to routinely archive raw laboratory data, to the extent possible, including initial and continuing calibration data, chromatograms, quantitation reports, blank sheets, and sampling logs. Laboratory records will identify the field-designated sample identification number, the sample matrix, the analytical (and preparatory) methods used, dates of extraction, dates and time of analysis, weight or volume of sample used for analysis, dilution factors, instruments used for analysis, percent moisture (or solids) in the sample, method reporting and quantitation limits, analytical results, and appropriate data qualifiers (and their definitions). The laboratory will provide, as requested, raw data required for data validation purposes.

4.7 DATA QUALITY EVALUATION

Upon receipt of the sample analytical data from the laboratory, data validation will be conducted, as described below, and a brief report of the results of the validation will be prepared. If significant nonconformities are found, Landau Associates will evaluate additional laboratory data.

Validation of the analytical laboratory report packages will consist of a summary validation for 100 percent of the data, which will be conducted according to relevant portions of the EPA guidelines on data validation (EPA 1994b,c).

A summary data validation will include evaluations of the following QA components:

- Chain-of-custody records
- Holding times
- Detection limits

- Field and laboratory method blanks
- Surrogate recoveries
- Laboratory control samples
- Field and laboratory duplicates
- Initial and continuing calibration summary forms
- Audit/corrective action records
- Completeness
- Overall assessment of data quality.

Section 4.5.1 presents statistical tests used to determine data precision, accuracy, and completeness during data evaluation and validation. If a portion of the data is outside the limits specified in this QA plan or if sample collection and/or documentation practices are deficient, corrective action will be initiated. Corrective action will be determined by the investigation task leader in consultation with the project manager and may include rejection of the data and resampling, qualification of the data, or modification of field and/or laboratory procedures. Data qualification arising from data validation findings will be described in the data validation report rather than in individual corrective action reports.

5.0 SCHEDULE

Field activities associated with the soil and groundwater investigations are anticipated to commence within 2 weeks of Ecology approval of this plan. Analytical results are expected to be available from the laboratory within 3 weeks of submittal of the samples to the laboratory. The results of the supplemental site characterization will be incorporated into the RI/FS report within about 6 to 8 weeks of receipt of final laboratory reports.

6.0 REPORTING

The results of the supplemental investigation will be presented in the revised RI/FS report, which will be prepared after site investigation activities are completed and laboratory data are received. The revised RI/FS report will also address Ecology comments from the previous draft.

7.0 USE OF THIS REPORT

This work plan has been prepared for the exclusive use of the Port of Bellingham for specific application to the Weldcraft Steel and Marine (Gate 2 Boatyard) site. No other party is entitled to rely on the information, conclusions, and recommendations included in this document without the express written consent of the Port and Landau Associates. Further, the reuse of information, conclusions, and recommendations provided herein for extensions of the project or for any other project, without review and authorization by the Port and Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions as this project. We make no other warranty, either express or implied.

This document has been prepared under the supervision and direction of the following key staff.

LANDAU ASSOCIATES, INC.

Evalyn I. Albright
Senior Staff Environmental Scientist

Lawrence D. Beard, P.E.
Principal

EIA/LDB/rgm

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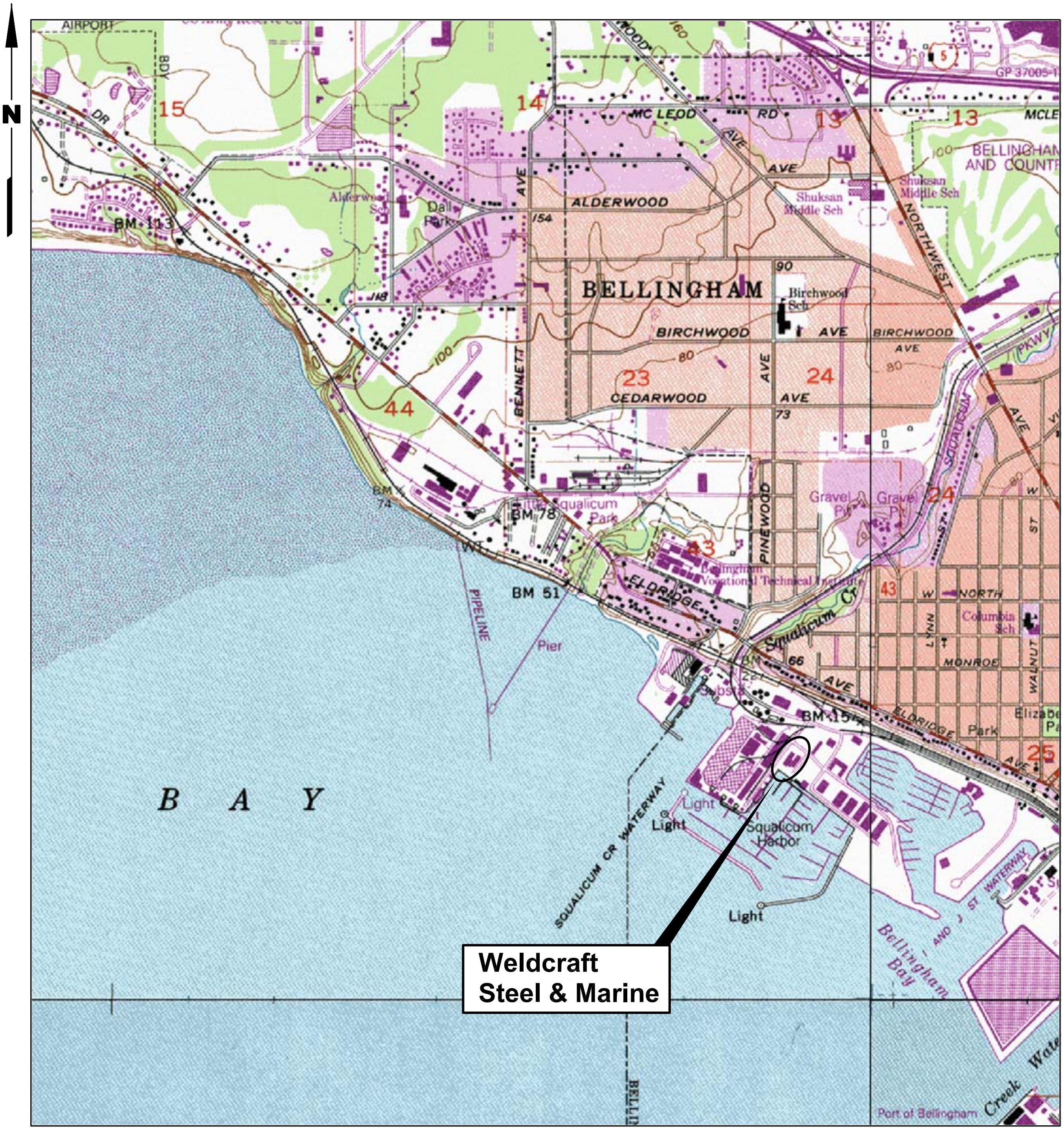
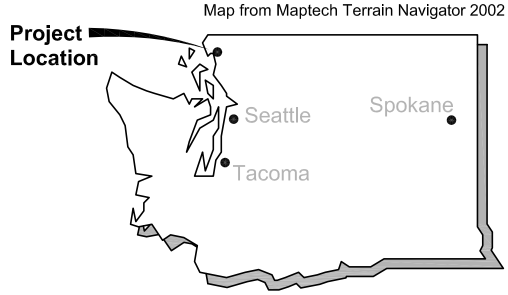


Map from Maptech Terrain Navigator 2002



0 2000 4000

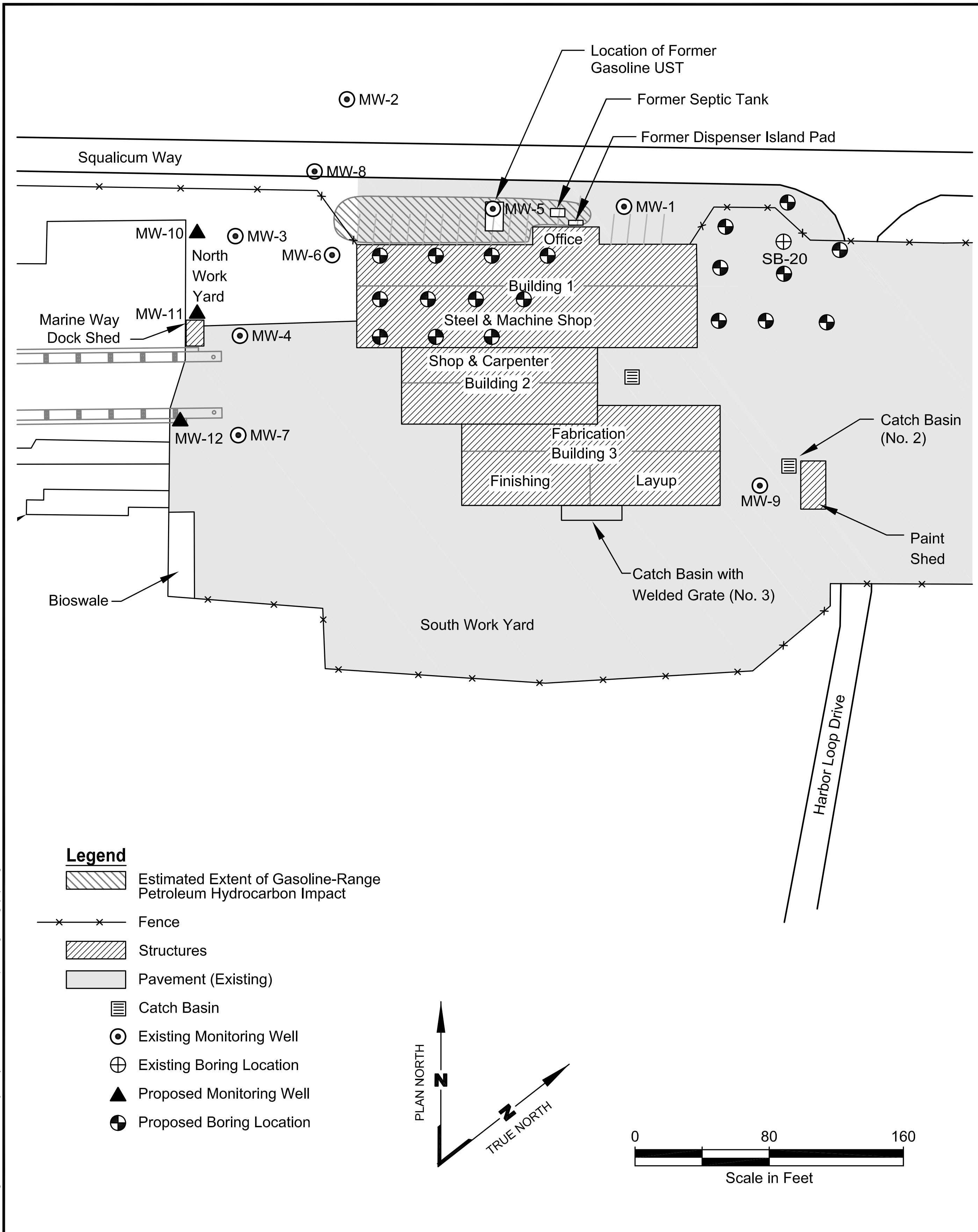
Scale in Feet

LANDAU ASSOCIATES

Port of Bellingham
Gate 2 Boatyard
Bellingham, Washington

Vicinity Map

Figure
1



Port of Bellingham/Gate 2 Boatyard | T:\001\024\240\ReportFig2.dwg (A) "Figure 2" 4/21/2006

LANDAU ASSOCIATES

Port of Bellingham
Gate 2 Boatyard
Bellingham, Washington

Proposed Supplemental RI Sampling Locations

Figure 2

TABLE 1
SAMPLE CONTAINERS AND PRESERVATIVES
SUPPLEMENTAL REMEDIAL INVESTIGATION WORK PLAN
WELDCRAFT STEEL AND MARINE (GATE 2 BOATYARD) SITE

Matrix / Analysis	Analytical Method	Container	Preservation	Maximum Holding Time (Days)
Soil:				
NWTPH-G	NWTPH-Gx	3 x 40-ml vial - glass 1 2-oz jar - glass	Store at -7°C	14
Metals (including mercury)	EPA 6010B (7471B for mercury)	8-oz. jar - glass	Store cool at 4°C	180 (mercury 28 days)
Water:				
Dissolved Metals (including mercury)	EPA 3010A / 6020 (7470 for mercury)	1-L polyethylene	Add HN03; Store cool at 4°C	180

BTEX = Benzene, Toluene, Ethylbenzene, Xylenes
TPH = Total Petroleum Hydrocarbons

TABLE 2
QUANTITATION LIMIT GOALS FOR SOIL AND GROUNDWATER
SUPPLEMENTAL REMEDIAL INVESTIGATION WORK PLAN
WELDCRAFT STEEL AND MARINE (GATE 2 BOATYARD) SITE

		SOIL		WATER	
Analyte	Analytical Method (a)	Reporting Limits (b)	Units	Reporting Limits (a)	Units
METALS					
Copper	EPA-6010/6010	ND(<0.2)	mg/Kg	ND(<2)	µg/L
Lead	EPA-6010/6010	ND(<2.0)	mg/Kg	ND(<1.0)	µg/L
Mercury	EPA-7471/7470	ND(<.05)	mg/Kg	ND(<0.1)	µg/L
Nickel	EPA-6010/200.8	ND(<1.0)	mg/Kg	ND(<0.5)	µg/L
Zinc	EPA-6010/6010	ND(<0.6)	mg/Kg	ND(<10)	µg/L
TOTAL PETROLEUM HYDROCARBONS (TPH)					
Gasoline Range	NWTPH-Gx	ND(<5)	mg/Kg	ND(<250)	µg/L

ND = Not Detected.

(a) Analytical method listed first is for soil, and the one listed second is for water.
(b) Reporting limit goals are based on current laboratory data and may be modified during the investigation process as methodology is refined. Laboratory reporting will be based on the lowest standard on the calibration curve. Instances may arise where high sample concentrations, nonhomogeneity of samples, or matrix interferences preclude achieving the desired reporting limits.

APPENDIX A

Health and Safety Plan

LANDAU ASSOCIATES
ENVIRONMENTAL | GEOTECHNICAL | NATURAL RESOURCES

WORK LOCATION PERSONNEL PROTECTION AND SAFETY EVALUATION FORM

Attach Pertinent Documents/Data
Fill in Blanks As Appropriate

Job No.:	001024.200.250		
Prepared by:	April Wallace	Reviewed by:	Evalyn Albright
Date:	February 11, 2006	Date:	February 12, 2006

A. WORK LOCATION DESCRIPTION

1. **Project Name:** Port of Bellingham /Weldcraft Steel and Marine (Gate 2 Boatyard) Site
2. **Location:** Squalicum Way and Harbor Loop Way, Bellingham, Washington
3. **Anticipated Activities:** Monitoring well installation using hollow stem auger drilling and soil sampling using GeoProbe technology; groundwater sampling
4. **Size:** < 1 Acre
5. **Surrounding Population:** Commercial
6. **Buildings/Homes/Industry:** Several buildings, open storage areas, parking lots, and a marine railway. The site is used for general shipbuilding and repair activities.
7. **Topography:** Generally flat
8. **Anticipated Weather:** Cool with possible rain
9. **Unusual Features:** Operational Shipbuilding facility
10. **Site History:** Weldcraft Steel and Marine was established on the site in 1946 and was involved in general shipyard activities, including boat construction, repair, and maintenance; wood and metal fabrication; marine pipefitting; electrical; sheet metal work; painting; machinery construction, installation, and repair; vessel haul-out and launching; concrete work; and retail and wholesale sales. The site is located on Port of Bellingham property adjacent to Squalicum Harbor.

B. HAZARD DESCRIPTION

1. **Background Review:** ☒ Complete ☐ Partial

   If partial, why?

2. **Hazardous Level:** ☐ B ☐ C ☒ D ☐ Unknown

3. Types of Hazards: (Attach additional sheets as necessary)

A. ☒ Chemical ☒ Inhalation ☐ Explosive

☐ Biological ☒ Ingestion ☐ O2 Def. ☒ Skin Contact

Describe: Exposure to chemical hazards from gasoline and metals contaminated soil and water. Nitrile gloves will be worn. Respirator will be worn when vapor levels warrant.

B. ☒ Physical ☐ Cold Stress ☒ Noise ☐ Heat Stress ☐ Other

Describe: Physical hazards from equipment and overhead obstacles (e.g., overhead power lines) and location adjacent to the bulkhead may be encountered during exploration activities. Hard hats will be worn and care will be taken to avoid nearing the edge of the bulkhead. Noise hazards associated with exploration equipment. Ear protection will be used. Steel-toe boots will be worn at all times due to heavy object hazards.

C. ☐ Radiation

Describe: NA

4. Nature of Hazards:

☒ Air — Describe: Potential inhalation exposure to volatiles and contaminated particulates.

☒ Soil — Describe: Potential inhalation, ingestion, or skin exposure to volatiles and contaminated particulates.

☐ Surface Water — Describe:

☒ Groundwater — Describe: Potential inhalation, ingestion, or skin exposure to petroleum and metal constituents.

☐ Other — Describe:

5. Chemical Contaminants of Concern ☐ N/A

Contaminant	PEL (ppm)	I.D.L.H. (ppm)	Source/Quantity Characteristics	Route of Exposure	Symptoms of Acute Exposure	Instruments Used to Monitor Contaminant
Total Petroleum Hydrocarbons	100 (as petroleum distillates; naptha) *source: WA State*	400 mg/m^3 (as petroleum distillates; naptha) *source: NIOSH*	Soil and groundwater	Inhalation Ingestion Dermal contact Eye contact	Irritation of eyes, nose, and throat nausea, dizziness, headache, dry cracked skin.	Olfactory; Gas/kerosene-like odor, visual, Photoionization detector (PID)
Lead	0.050 mg/m^3 *source: OSHA*	100 mg/m^3 (as Pb) *source: NIOSH*	Soil and groundwater	Inhalation Ingestion Dermal contact Eye contact	Weakness, exhaustion, insomnia, facial pallor, constipation, abdominal pain, tremor, wrist drop, anemia, gingival lead line, eye irritation, kidney disease	Visual observation for excessive dust

Notes:

6. Physical Hazards of Concern ☒ Slip / trip, drill rig overhead, heavy lifting and pinch points, proximity to the bulkhead

7. Work Location Instrument Readings ☐ N/A

Location: ____________________

Percent O_2: ____________________ Percent LEL: ____________________

Radioactivity: ____________________ PID: ____________________

FID: ____________________ Other: ____________________

Other: ____________________ Other: ____________________

Other: ____________________ Other: ____________________

Location: ____________________

Percent O_2: ____________________ Percent LEL: ____________________

Radioactivity: ____________________ PID: ____________________

FID: ____________________ Other: ____________________

Other: ____________________ Other: ____________________

Other: ____________________ Other: ____________________

Location: ____________________

Percent O_2: ____________________ Percent LEL: ____________________

Radioactivity: ____________________ PID: ____________________

FID: ____________________ Other: ____________________

Other: ____________________ Other: ____________________

Other: ____________________ Other: ____________________

Location: ____________________

Percent O_2: ____________________ Percent LEL: ____________________

Radioactivity: ____________________ PID: ____________________

FID: ____________________ Other: ____________________

Other: ____________________ Other: ____________________

Other: ____________________ Other: ____________________

8. Hazards Expected In Preparation For Work Assignment ☐ N/A

Describe:

C. PERSONAL PROTECTIVE EQUIPMENT

1. Level of Protection

☐ A ☐ B ☐ C ☒ D

Location/Activity: Monitoring well drilling and geoprobe soil sampling without action level conditions. Groundwater sampling.

☐ A ☐ B ☒ C ☐ D

Location/Activity: Monitoring well drilling and geoprobe soil sampling with action level conditions.

2. Protective Equipment (specify probable quantity required)

Respirator ☐ N/A

☐ SCBA, Airline

☐ Full-Face Respirator

☒ Half-Face Respirator (Combo. cart. HEPA and organic vapor) if action levels are met.

☐ Escape mask

☐ None

☐ Other:

☐ Other:

Clothing ☐ N/A

☐ Fully Encapsulating Suit

☐ Chemically Resistant Splash Suit

☐ Apron, Specify:

☐ Tyvek Coverall

☐ Saranex Coverall

☐ Coverall, Specify

☐ Other:

Head & Eye ☐ N/A

☒ Hard Hat

☐ Goggles

☐ Face Shield

☒ Safety Eyeglasses

☐ Other:

Hand Protection ☐ N/A

☐ Under-gloves; Type:

☒ Gloves; Type: Nitrile (breakthrough <8 hrs)
Viton (breakthrough >8 hrs)

☐ Over-gloves; Type:

☐ None

☐ Other:

Foot Protection ☐ N/A

☐ Neoprene Safety Boots with Steel Toe/Shank

☐ Disposable Over-boots

☒ Other: Boots with steel toes

3. Monitoring Equipment ☐ N/A

☐ CGI ☒ PID

☐ O^2 Meter ☐ FID

☐ Rad Survey ☐ Other LEL monitor (4 gas)

☐ Detector Tubes (optional)

Type:

D. PERSONNEL DECONTAMINATION (ATTACH DIAGRAM)

☒ Required washing your face and hands before breaks and lunch. ☐ Not Required

EQUIPMENT DECONTAMINATION (ATTACH DIAGRAM)

☒ Required ☐ Not Required

If required, describe and list equipment:
List equipment here, or attach. (To ensure it is brought to the site).

E. PERSONNEL

Name	Work Location Title/Task	Medical Current	Fit Test Current

	Name	Work Location Title/Task	N/A	FA/CPR Current	40 HR Current	Medical Current	Fit Test Current
1.	**Larry Beard**	**Project Manager**	☐	☐	☒	☒	☒
2.	**Erik Gerking**	**Field Manager/Health and Safety Coordinator**	☐	☐	☒	☒	☒
3.			☐	☐	☐	☐	☐
4.			☐	☐	☐	☐	☐
5.			☐	☐	☐	☐	☐
6.			☐	☐	☐	☐	☐
7.			☐	☐	☐	☐	☐
8.			☐	☐	☐	☐	☐

Site Safety Coordinator: Erik Gerking

F. ACTIVITIES COVERED UNDER THIS PLAN

Task No.	Description	Preliminary Schedule
	Monitoring Well Installation	
	GeoProbe Soil Sampling	
	Groundwater Sampling	

G. SUBCONTRACTOR'S HEALTH AND SAFETY PROGRAM EVALUATION

☐ N/A

Name and Address of Subcontractor: Cascade Drilling

EVALUATION CRITERIA

Item	Adequate	Inadequate	Comments
Medical Surveillance Program	☒	☐	
Personal Protective Equipment Availability	☒	☐	
Onsite Monitoring Equipment Availability	☒	☐	
Safe Working Procedures Specification	☒	☐	
Training Protocols	☒	☐	
Ancillary Support Procedures (if any)	☒	☐	
Emergency Procedures	☒	☐	
Evacuation Procedures Contingency Plan	☒	☐	
Decontamination Procedures Equipment	☒	☐	
Decontamination Procedures Personnel	☒	☐	

GENERAL HEALTH AND SAFETY PROGRAM EVALUATION: ☒ Adequate ☐ Inadequate

Additional Comments: Landau Associates Basic Agreement in place with Cascade Drilling – copy on file

Evaluation Conducted By: Landau Associates

Date: February 10, 2006

EMERGENCY FACILITIES AND NUMBERS

Hospital:

St. Joseph Hospital
2901 Squalicum Parkway
Bellingham, Washington 98225

Directions:

1: Start out going Northeast on Squalicum Way towards W. Harbor Loop Drive (<0.1 miles)
2: Turn RIGHT onto Roeder Avenue (0.8 miles)
3: Turn LEFT onto F Street (0.8 miles)
4: Turn SLIGHT RIGHT onto Alabama Street (<0.1 miles)
5: Turn LEFT onto Cornwall Avenue (0.4 miles)
6: Turn RIGHT onto Plymouth Drive (<0.1 miles)
7: Turn LEFT onto Coolidge Drive (0.2 miles)
8: Turn LEFT onto Squalicum Parkway (<0.1 miles)

Total Estimated Time: 8 minutes
Total Distance: 2.6 miles

Telephone: (360) 734-5400

Emergency Transportation Systems (Fire, Police, Ambulance): 911

Emergency Routes: See Map (Attachment B)

Emergency Contacts:

Onsite	Offsite	Telephone
911	Larry Beard	(425) 778-0907

In the event of an emergency, do the following:

1. Call for help as soon as possible. Call 911. Give the following information:
   - WHERE the emergency is – use cross streets or landmarks
   - PHONE NUMBER you are calling from
   - WHAT HAPPENED – type of injury
   - WHAT is being done for the victim(s)
   - YOU HANG UP LAST – let the person you called hang up first.

2. If the victim can be moved, paramedics will transport to the hospital. If the injury or exposure is not life threatening, decontaminate the individual first. If decontamination is not feasible, wrap the individual in a blanket or sheet of plastic prior to transport.

HEALTH AND SAFETY PLAN
APPROVAL/SIGN OFF FORMAT

I have read, understood, and agreed with the information set forth in this Health and Safety Plan (and attachments) and discussed in the Personnel Health and Safety briefing.

Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Name	Signature	Date
Erik Gerking Site Safety Coordinator	Signature	Date
Chris Kimmel Landau Health and Safety Manager	Signature	Date
Larry Beard Project Manager	Signature	Date

Personnel Health and Safety Briefing Conducted By:

Name	Signature	Date

ATTACHMENT A

ACTION LEVELS FOR RESPIRATORY PROTECTION

Monitoring Parameter	PID Reading	Level of Protection
Organic Vapors	PID reading > 5 ppm in breathing zone for more than 15 minutes or > 25 ppm for momentary peak	Evacuate area and upgrade to Level C – half face respirator with organic vapor / HEPA combination cartridges
	PID reading > 25 ppm in breathing zone for more than 15 minutes or > 50 ppm for momentary peak	Evacuate area and contact H&S
Petroleum and Metals Contaminated Particulate	Visible Dust (**with** dust suppression utilized)	Evacuate area and upgrade to Level C – half face respirator with organic vapor / HEPA combination cartridges

ATTACHMENT B
MAP TO HOSPITAL