INTERIM ACTION PRE-DESIGN INVESTIGATION REPORT

Georgia-Pacific West Site
Bellingham, Washington

Prepared for: Port of Bellingham

Project No. 070188-001-11 • April 28, 2011

Aspect CONSULTING

earth + water

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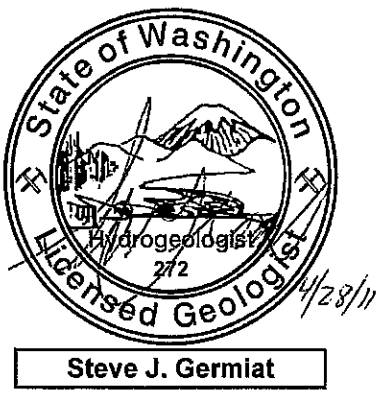

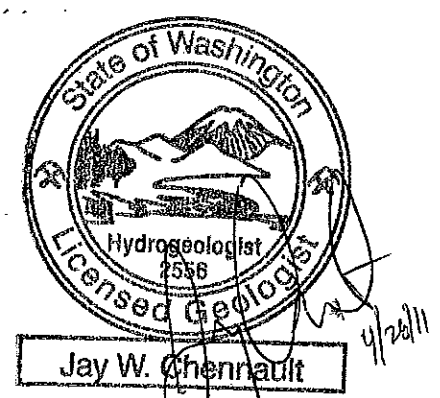

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Contents

List of Tables

List of Figures

List of Appendices

1 Introduction

Based on the findings of the ongoing remedial investigation (RI) for the GP West Site (Site) being conducted in accordance with Agreed Order No. 6834, the Port of Bellingham (Port) has performed pre-design investigations to support scoping, cost estimating, and design of potential early interim actions (IAs) that would address areas of known contamination on the Site. In addition to further informing the Site RI/FS, the investigation findings will be used to evaluate the practicality and timing for conducting one or more IAs, including environmental review (SEPA), permitting substantive requirements, Agreed Order amendment, and public participation.

This report documents findings from the pre-design investigation, the scope of which was outlined in Addendum 2 to the RI/FS Work Plan (Addendum 2; Aspect, 2010) and a follow-up memorandum to Ecology proposing the second phase of investigation (Aspect, 2011). Ecology approved Addendum 2 and the proposed second phase investigation memorandum prior to the Port undertaking the respective phases of investigation. The results from the investigations will be incorporated into a revised draft RI to be submitted to Ecology following decision making for conducting an early IA, and, if conducted, its completion.

This report does not reach conclusions regarding undertaking a potential IA at the Site; rather, the Port and Ecology will use the investigation information to help make an informed decision of whether to conduct an IA. If an IA is determined to be warranted, it would be conducted under an amendment to Agreed Order No. 6834 with public comment.

The pre-design investigations occurred in four areas of the Site being considered for IAs (Figure 1):

- Mercury source area of the Caustic Plume subarea;
- Law-1 area of the Confined Nearshore Fill/Chemfix subarea;
- Million Gallon Tanks subarea; and
- Bunker C Tank subarea.

The rest of this report presents the investigation methods and results for the four areas. Appendix A provides exploration logs from the investigation. Appendix B provides MTCATPH calculations supporting subarea-specific, risk-based TPH soil screening levels. Appendix C provides MTCAstat calculations for assessing compliance of TPH concentrations with the derived subarea-specific TPH soil screening levels. Appendix D provides information supporting a Site-specific TPH soil residual saturation concentration. The raw laboratory data reports from the investigation are not included in this report, but will be included in the revised draft remedial investigation, and are available from Aspect Consulting (Aspect) upon request.

2 Investigation Methods and Results for Four Areas

This section describes the investigation methods and results for the four areas of the Site being considered for potential early IAs. The purpose of the work was to collect data to assist with scoping, cost estimating, and potential design of IAs in one or more of the areas, should the Port choose to conduct them. The current investigation builds upon data collected previously as part of the ongoing RI, and the collective data (new and prior) will be used to scope potential IAs. To that end, Figures 2 through 6 and 8 through 13 in this report show all explorations completed within each investigation area – including those completed during pre-RI investigations, the RI prior to the current IA investigation, and the current IA investigation. The media-specific chemistry data for explorations presented on the figures are tabulated in the report's tables. Data for area-specific constituents of concern collected during the current IA investigation are posted on the figures, and the explorations are color coded based on comparison of concentrations to RI screening levels, as detailed in the subsections below.

The sampling and analysis described below was conducted in accordance with the procedures outlined in the Sampling and Analysis Plan and Quality Assurance Project Plan of the Site RI/FS Work Plan (Appendices C and D of Aspect, 2009).

Note: Consistent with previous Site reports, this report contains directional references relative to "Mill north" as established by GP, with the "Mill north" axis approximately 45 degrees west of true north (see direction arrows on figures). In the "Mill north" reference, the Whatcom Waterway is oriented east-west on the north side of the Site.

2.1 Mercury Source Area of Caustic Plume Subarea

Overview

Mercury and pH are constituents of concern for the Caustic Plume subarea, as defined in the RI/FS Work Plan (Aspect, 2009). The sources of mercury are historical releases of mercury-containing process wastes and wastewaters from the Chlor-Alkali Plant (Chlorine Plant), which used a mercury cell electrolysis process to generate chlorine gas, sodium hydroxide (caustic), and hydrogen gas, as described in Section 3.1 of Aspect (2009).

Previous investigations determined that elevated soil mercury concentrations occur below the water table in the area of the former Chlor-Alkali Plant where process wastewaters and sludges were managed, notably at the location of the former 72 Catch Basin (up to 30,000 milligrams/kilograms [mg/kg] mercury). Soil vapor (soil gas) mercury concentrations in this area exceed the RI soil gas screening level for industrial land use by two orders of magnitude and the OSHA permissible exposure limit (PEL) for workers by 6 times or more. The elevated soil mercury concentrations in this area are also a source for elevated dissolved-phase mercury in groundwater (caustic plume). The RI data indicate that the areas with highest mercury concentrations in soil vapor versus groundwater do not overlap spatially, and the locations of highest dissolved-phase

mercury do not have elevated vapor-phase mercury concentrations. The existing data suggest that elemental mercury – the volatile form of mercury and thus a source for mercury soil vapor – may be present in shallow soils, or possibly buried foundations/ pipes/process sumps etc., above the water table in this area. However, such a source had not been reported in the prior investigations.

Additional data for mercury in soil, soil vapor, and groundwater were collected to better define the source(s) of mercury contributing to higher groundwater and soil vapor concentrations, and therefore assess whether a source control interim action is warranted for the area.

Investigation Methods

Fifteen new soil borings (CP-SB02 through CP-SB13, CP-MW13, CP-MW14, CP-MW15) were drilled and sampled for soil mercury during the first phase of investigation (December 2010), as proposed in the Addendum 2. Minute droplets of elemental mercury were visible in the soil core recovered from two of the borings: between depths of approximately 4 and 8 feet at CP-MW15 within the footprint of the former Caustic Filter House, and between depths of approximately 5 and 8 feet at CP-SB06 within the footprint of the former Mercury Recovery Unit. Consequently, during the second phase of investigation (February 2011), an additional eight soil borings (CP-SB14 through CP-SB22[1]) were installed around the perimeters of the two former structures to delineate the extent of visible elemental mercury, in accordance with Aspect (2011). In addition, boring CP-SB06A was drilled within a couple feet of CP-SB06 in an attempt to obtain a soil sample from within the 11- to 19-foot depth interval in which there was very poor soil recovery, and thus no soil sample collection, during drilling of CP-SB06 in December 2010. Figure 2 shows locations of the new soil borings in this area, with previous explorations.

Three of the first phase borings were completed as monitoring wells for groundwater sampling (CP-MW13, CP-MW14, and CP-MW15). Groundwater samples were collected from them in December 2010 and analyzed for dissolved mercury, sulfide, sulfate, dissolved organic carbon (DOC), dissolved iron and manganese, alkalinity, total dissolved solids (TDS), and field parameters.

Also during the second phase of investigation, six shallow soil vapor probes (CP-VP05 through CP-VP10) were installed and sampled to further refine the extent of elevated mercury soil vapor in the mercury source area. The vapor probe locations were based on the collective soil and groundwater data, as described in Aspect (2011). Consistent with previous sampling, the new probe screens were installed at depths of 1.5 to 3.0 feet below grade where possible but, at locations groundwater was encountered at depths shallower than 3 feet, a shorter screen length was installed just above the water table. In addition to the subsurface annular seal, hydrated bentonite was placed around each probe casing above grade as an additional measure to prevent intrusion of surface air into the subsurface probe. A valid soil vapor sample could not be collected from vapor probe CP-

[1] Boring CP-SB21 as proposed in Aspect (2011) was not completed due to subsurface obstructions in the originally planned location (several attempts) and proximity of other borings.

VP06, located on the west side of the Cell Building, because water from the very shallow water table was drawn into the sample trap over the course of the day-long sampling.

In addition, a sample of ambient indoor air was collected to document mercury air concentrations within the Mercury Cell Building (CP-AA01). For reference, an area background sample of ambient outdoor air (BG-AA01) was also collected. The area background air sample was collected within the Bellingham Shipping Terminal southwest of the former Chlor-Alkali Plant, at a location determined to be generally upwind of the Cell Building at the time of sampling; mercury was not detected in subsurface soil vapor at the adjacent location CP-MW01V during the Fall 2009 RI sampling (Figure 4).

Frontier Geosciences conducted the soil vapor and ambient air sampling and mercury analyses, consistent with the RI data collection to date, which included sample collection continuously over a period of approximately 1 day. Frontier's full report for their vapor sampling and analysis will be included in the forthcoming draft RI.

Investigation Results

Soil

The reported mercury concentrations from new soil samples collected within the mercury source area are illustrated on Figure 2. Table 1 presents the new data in addition to the prior data for the explorations depicted on Figure 2. Locations of previous soil explorations that have soil mercury data are also presented on Figure 2, but the specific data are not presented due to data density. On Figure 2, the exploration symbols for new and previous explorations, and the new sample data, are color coded based on soil mercury concentration range relative to RI soil screening levels. Specifically, the exploration symbols are color coded based on detected soil mercury concentrations: green for concentrations below 1 mg/kg; blue for concentrations between 1 and 24 mg/kg (RI soil screening level for unrestricted use); brown for concentrations exceeding 24 mg/kg. If an exploration has multiple soil samples with concentrations above and below one of the concentration thresholds, the symbol color for the higher-concentration sample is displayed. On the figure, the sample depth interval and mercury concentration text for the new samples are also color coded: black for concentrations below 1 mg/kg; blue for concentrations between 1 and 24 mg/kg; brown for concentrations exceeding 24 mg/kg. Figure 2 also presents soil mercury concentration contours for the RI soil screening levels of 24 mg/kg (unrestricted land use) and 1,050 mg/kg (industrial land use), based on the sample with the highest concentration for each exploration. Estimated extents of visible elemental mercury in soil are also delineated. These boundaries are delineated based on the collective new and old data, which are presented in Table 1.

With the addition of the new investigation data, two locations containing visible elemental mercury in subsurface soil are documented – one beneath the former Caustic Filter House and one beneath the former Mercury Recovery Unit, as illustrated on Figure 2. The elemental mercury was observed at a similar depth range (roughly 4 to 8 feet) in both locations. Note that the current surface grade in this area, from which our soil sample depths are measured, is in the range of 0.5 to 2 feet above the historical grade that existed when the Chlor-Alkali Plant was operating and when surface releases presumably occurred. Beneath current grade is typically 4 to 8 inches of asphalt over 0 to 16 inches of base course gravel placed when Georgia-Pacific decommissioned the Chlor-Alkali Plant

and re-paved the area in 2000. Visible occurrences of elemental mercury had not been reported previously at the Site, but, as the volatile form of mercury, its presence is consistent with the higher soil vapor mercury concentrations previously measured in this area.

At boring CP-MW15 (former Caustic Filter House), detected soil mercury concentrations ranged from 7,180 to 14,500 mg/kg within the 5- to 8-foot depth interval where droplets of elemental mercury were visible in soil beneath the 3.5-foot concrete foundation[2]. The detected soil mercury concentration declined to 26 mg/kg in the 10- to 11-foot sample, and 2 mg/kg in the 12- to 14-foot sample from the boring. Soil samples collected from supplemental second-phase borings CP-SB18, CP-SB19, and CP-SB20 advanced around the former structure's perimeter did not encounter visible elemental mercury, and had correspondingly much lower soil mercury concentrations (Figure 2), as follows:

- CP-SB18, off the northwest corner, had 191 mg/kg mercury detected in the 5- to 6-foot sample, with concentrations below 5 mg/kg in the other four shallower and deeper samples;
- CP-SB19, on the east side, had 620 mg/kg mercury in the 0.5 to 1.5-foot sample, and concentrations below 0.3 mg/kg in the four deeper samples; and
- CP-SB20, on the south side, had 64 mg/kg mercury in the 0.5 to 1.5-foot sample, and concentrations below 10 mg/kg in the four deeper samples.

At boring CP-SB06 (former Mercury Recovery Unit), detected soil mercury concentrations ranged from 5,310 to 38,700 mg/kg within the 5- to 8-foot depth interval where elemental mercury was visible in soil. There was very poor recovery of soil core during drilling between depths of about 11 and 19 feet in this boring, which prevented sampling of soil in that depth interval (saturated, non-cohesive sand and gravel). Mercury was detected at 3.5 mg/kg in the 19- to 20-foot soil sample.

At follow-up boring CP-SB06A, immediately adjacent to CP-SB06, elemental mercury was observed in same depth range and similarly poor recovery of saturated and gravel soil was encountered in the core retrieved from the 10- to 15-foot depth interval. Adequate soil was retained from that depth interval for collection of one soil sample. The depth interval represented by the small volume of retained soil was not certain, so it was labeled as 10- to 15-feet. However, it is likely that, since soil sliding out of the core barrel bottom represents the lower portion of the core interval, the soil retained is from the upper portion of the core interval (e.g., within the 10- to 12-foot interval). The soil sample contained visible elemental mercury, and had a detected soil mercury concentration of 14,000 mg/kg.

During drilling of four supplemental second-phase borings CP-SB14 (north), CP-SB15 (east), CP-SB16 (south), and CP-SB17 (west) around the former structure's perimeter, a smaller occurrence of elemental mercury was observed only in CP-SB14 on the north

[2] Triplicate laboratory analyses were conducted for soil samples containing visible elemental mercury (three aliquots from same jar) to assess variability in associated soil mercury concentrations. Total mercury concentrations in the triplicate samples ranged from 5,090 to 38,700 mg/kg (Table 1), with the relative percent differences (RPD) between lowest and highest triplicate sample results for each sample ranging from 3 to 78 percent and an average of 36 percent.

edge – an approximately 4-inch layer within woody debris fill at a depth of about 6.5 feet. Soil mercury concentrations in this boring were approximately 1 mg/kg in the upper 3 feet, 1,630 mg/kg at 4 to 5 feet, 7,940 mg/kg at 6 to 7 feet (visible elemental mercury), 61.9 mg/kg at 8 to 9 feet, and 423 mg/kg at 10 to 11 feet (Figure 2). The Geoprobe drill rig hit refusal on apparent concrete at 12 feet.

Based on the presence of visible elemental mercury at CP-SB14, a fifth boring, CP-SB22, was advanced approximately 10 feet northwest of CP-SB14. No visible elemental mercury was observed in soil from CP-SB22, and soil mercury concentrations were below 24 mg/kg to a depth of 7 feet, where refusal was encountered on apparent concrete.

Likewise, at the other three perimeter borings, elemental mercury was not observed and detected soil mercury concentrations were correspondingly lower, as follows (Figure 2):

- CP-SB15, on the east side, had detected mercury concentrations of 424 and 45 mg/kg between depths of 2 and 5 feet, and concentrations of 25 mg/kg or below in the three deeper samples;
- CP-SB16, on the south side, had detected mercury concentrations of 1,220 and 777 mg/kg between depths of 3 and 6 feet, and concentrations below 19 mg/kg in the three deeper samples; and
- CP-SB17, on the west side, had detected mercury concentrations of 118 and 382 mg/kg between depths of 4 and 7.5 feet, and concentrations below 29 mg/kg in the two deeper samples.

In summary, the elemental mercury occurrences at the Caustic Filter House and Mercury Recovery Unit represent sources of mercury to soil vapor and groundwater within the Caustic Plume subarea. At both locations, the volume of soil containing visible elemental mercury is inferred to be within approximately the footprint of the former structure, and there is a substantial decrease in soil mercury concentrations below the depth zone where the elemental mercury is visible. Figure 2 depicts the inferred areas where visible elemental mercury is present.

Outside of the Caustic Filter House and Mercury Recovery Unit locations, none of the new borings had detected soil mercury concentrations exceeding a 1,050 mg/kg industrial soil screening level (Figure 2). Notably, new boring CP-SB05 bounds the northern extent of soil mercury above 1,050 mg/kg at the former 72 Catch Basin[3]. Within the center of the 72 Catch Basin excavation, new boring CP-MW13, drilled adjacent to the 1992 boring STB-11 where 33,000 mg/kg soil mercury was reported (7.5 to 9-foot depth; Table 1), did not confirm soil mercury concentrations nearly that high, although the highest soil mercury detected at CP-MW13 (87.5 mg/kg at 8 to 9 feet) is in the same depth range.

New borings with detected soil mercury concentrations between 24 and 1,050 mg/kg include (Figure 2):

- CP-SB02, at the location of the Mercury Reclaim Storage Tanks, had detected soil mercury above 24 mg/kg only in the 9- to 10-foot sample (29 mg/kg).

[3] The 72 Catch Basin area and its 1993 soil removal action during construction of the Remerc facility are described in Section 6.1.1 of Aspect (2009).

- CP-SB03, drilled within the footprint of a former Wastewater Collection Tank, and within the footprint of the older Wastewater Settling Basin, had detected soil mercury above 24 mg/kg only in the 11- to 12-foot sample (560 mg/kg). We infer that this elevated concentration corresponds to the bottom of the former Settling Basin, where elevated soil mercury is known to be present based on previously collected data (Table 1). Refusal was encountered at a depth of 12 feet while drilling CP-SB03.
- At borings CP-SB07, CP-SB08, and CP-SB10, within the central portion of the investigation area, detected soil mercury concentrations above 24 mg/kg are vertically bounded to depths of 6 feet or less. This pattern also exists at boring CP-SB13, immediately west of the Cell Building, where 463 mg/kg mercury is detected in the 2- to 4-foot soil sample, and concentrations below 7 mg/kg are detected in samples to 16 feet (Figure 2).
- CP-MW13, within the 72 Catch Basin excavation footprint, had mercury at 27.6 mg/kg in the 1- to 2-foot sample, and higher concentrations in the 8- to 9-foot sample (87.5 mg/kg) and 12- to 14-foot sample (42.4 mg/kg), with a lower concentration again (4.7 mg/kg) in the 15- to 16-foot sample.

The following new borings had detected soil mercury concentrations below 24 mg/kg (Figure 2):

- CP-SB04 within the footprint of the former Surge Storage Tank;
- CP-SB05 north of the former 72 Catch Basin;
- CP-SB09 within the footprint of a Sump;
- CP-SB10 within the footprint of the former Wastewater Clarifier;
- CP-SB11 and CP-SB12 within the footprints of the former Caustic Storage Tanks;
- CP-MW14 located between the Clarifier and northern Caustic Tank; and
- CP-SB22 located north of the former Mercury Recovery Unit.

Throughout the mercury source area, extensive subsurface concrete exists in the upper few feet, with thicknesses to about 3 feet, representing slabs/foundations of structures and tanks from the former Chlor-Alkali Plant. Demolition and handling of the buried concrete would create additional effort if soil removal is considered as a component of a cleanup remedy for this area (whether for an interim action or part of final action). Note that several new soil borings also hit refusal during drilling at deeper depths (e.g., 6 to 12 feet) in the area, as noted on Figure 2, but the cause of the refusal appeared variable (e.g., wood, concrete, etc.).

Leachable Soil Mercury (by TCLP Analysis)

The two samples of soil with highest detected total mercury concentrations (and visible elemental mercury) were submitted for analysis of leachable mercury by the Toxicity Characteristic Leaching Procedure (TCLP) analysis, in accordance with Addendum 2. This information helps determine whether the soil, if excavated, would designate as

characteristic dangerous waste based on leachable mercury (dangerous waste code D009; WAC 173-303-090).

Soil sample CP-MW15-4-5, collected from within the footprint of the former Caustic Filter House and having a total mercury concentration of 14,500 mg/kg (11,200 to 20,600 mg/kg in triplicate analyses) had detectable TCLP-leachable mercury of 0.212 milligrams per liter (mg/L), marginally above the 0.2 mg/L toxicity characteristic criterion. The sample aliquot analyzed for TCLP mercury was obtained from the same sample jar as the triplicate analyses for total mercury.

Sample CP-SB06-6-8, from within the footprint of the former Mercury Recovery Unit containing visible elemental mercury and having a total mercury concentration of 38,700 mg/kg (28,900 to 38,700 mg/kg in triplicate analyses) had detectable TCLP-leachable mercury of 0.0429 mg/L, below the toxicity characteristic criterion of 0.2 mg/L. The sample aliquot analyzed for TCLP mercury was obtained from the same sample jar as the triplicate analyses for total mercury.

The relatively low TCLP-leachable mercury concentrations, and the variability in TCLP-leachable versus total mercury concentrations, are consistent with pre-RI data collected from the Chlor-Alkali Area including areas outside that depicted on Figure 2. In the pre-RI samples, including samples containing total mercury concentrations up to 12,000 mg/kg, exceeded the 0.2 mg/L criterion (pre-RI TCLP mercury data are presented in Table 3 of Aspect [2009]).

The TCLP data suggest that a bulk volume of soil, some containing visible elemental mercury, at the former Caustic Filter House and Mercury Recovery Unit, if sampled representatively, would likely not designate as characteristic dangerous waste.

Groundwater

The highest dissolved mercury concentrations detected at the Site to date are present in new monitoring well CP-MW15 (619 µg/L), located within the footprint of the former Caustic Filter House, where visible elemental mercury is present in soil below the water table, and highly caustic groundwater conditions exist. Based on the December 2010 sampling and analysis, groundwater at this well exhibits the characteristics of the caustic plume core – namely very high pH (11.2), high concentrations of dissolved organic carbon (DOC) and sulfide (2,520 and 98.9 mg/L, respectively), and low oxidation reduction potential (ORP) (-376 millivolts [mv]) – conditions which facilitate the leaching and mobility of mercury in its dissolved phase, as discussed generally in Aspect (2009). The new groundwater chemistry data are presented on Figure 3, and the new and older groundwater chemistry data for the area are tabulated in Table 2.

Dissolved mercury concentrations were much lower at the new monitoring wells installed within the footprint of the 72 Catch Basin excavation (0.41 micrograms per liter [µg/L] at CP-MW13) and between the Clarifier and Caustic Tanks (1.26 µg/L at CP-MW14). Despite having only slighter higher dissolved mercury, well CP-MW14 has a stronger "caustic plume signature" (pH = 9.1, ORP = -339, DOC = 786 mg/L, sulfide = 16.1 mg/L) than does CP-MW13 (pH = = 7.9, ORP = -41, DOC = 11.6 mg/L, sulfide = 0.4 mg/L). Note that CP-MW13 is positioned just downgradient of the former Mercury Recovery Unit, where elemental mercury is observed in soil, as detailed above. While a

substantial mercury source is present, the lack of caustic groundwater appears to be greatly limiting leachability and dissolved phase mobility of the mercury in this area. Conversely, CP-MW14 has the caustic groundwater conditions to favor dissolved phase mobility, but is lacking a nearby source of mercury.

The collective new groundwater data collected during this investigation further corroborate the conceptual site model that groundwater geochemical conditions – primarily in response to releases of caustic produced at the Chlor-Alkali plant – control the fate and transport of mercury in groundwater at the Site. Higher concentrations of dissolved mercury at the Site are generated only where caustic groundwater occurs in combination with a substantial source of mercury in soil.

Soil Vapor

Mercury in the elemental form (Hg^0) has a much higher vapor pressure than the divalent form (Hg^{+2}), but relatively low solubility in water. Divalent mercury, primarily present at the Site as mercury-sulfide and dissolved organic matter (DOM) complexes, has very low volatility but may become soluble, particularly in caustic groundwater.

Mercury concentrations detected in each of the new subsurface soil vapor samples are below the 1.4 micrograms per cubic meter of air ($\mu g/m^3$) RI unrestricted soil vapor screening level, including the sample collected at the former Caustic Filter House where visible elemental mercury is present. The new soil vapor chemistry data are presented on Figure 4 and in Table 3. Figure 4 also shows the previous soil vapor mercury data, and based on the collective data, the updated inferred area with mercury soil vapor concentrations above the unrestricted soil vapor screening level. The RI soil vapor mercury screening level for industrial use (3.0 $\mu g/m^3$) is only slightly higher than that for unrestricted land use, so the inferred area exceeding the industrial screening level would be roughly the same as that exceeding the unrestricted screening level.

We infer that, despite the lack of elevated soil vapor mercury concentrations detected at CP-VP05 next to the former Caustic Filter House, the elemental mercury observed there is a source of mercury to soil vapor, but only when the water table is low enough to expose it to unsaturated soil conditions (vadose zone). The new soil vapor samples were collected in February 2011, representing wet season conditions when the water table is relatively high (but still rising seasonally). The groundwater level measured in well CP-MW15, located within the footprint of the Caustic Filter House, indicates that the water table is up to the bottom of the 3-foot-thick concrete foundation of the former structure during wet-season conditions, including when the February 2011 vapor sample was collected. As a result, there is no vadose zone beneath the former Caustic Filter House during the wet season, and the groundwater effectively forms a seal to generation and migration of mercury vapor from the elemental mercury. We infer that the mercury source is contributing dissolved divalent mercury to caustic groundwater year-round (e.g., 232 and 619 µg/L at CP-MW15 in December 2010 and February 2011, respectively; Table 2), but the elemental mercury, where present, cannot generate vapors when the water table is high enough to saturate the source material. Elemental mercury's low solubility in water inhibits the formation of mercury vapor under saturated conditions, while divalent mercury may dissolve in caustic water, but does not have a high enough vapor pressure to generate significant mercury vapor. Note that CP-VP05 is

located just outside the footprint of the Caustic Filter House foundation, based on drilling of adjacent boring CP-SB19 (no concrete encountered); therefore, there is a thin vadose zone at that location during the wet season.

Based on seasonal water level changes measured previously across the Site, we expect that, during the dry season, the water table typically drops to a depth of 4 or more feet at the Caustic Filter House location – sufficient to unsaturate soils within which elemental mercury is present. Consequently, we infer that there is a dry season source of mercury to soil vapor in the vadose zone at the former Caustic Filter House. This is indicated by the fact that, during drilling of boring CP-SB19, 43 $\mu g/m^3$ mercury was detected (using Lumex real-time instrument) in air at the top of the borehole once the asphalt pavement was penetrated; the detected concentration at the top of the borehole declined to below 1 µg/m3 as drilling advanced below 2 feet.

Likewise, within the footprint of the Mercury Recovery Unit, the shallowest observed elemental mercury was approximately at the depth of the water table during drilling of borings CP-SB06 and CP-SB06A. During drilling of CP-SB06A, approximately 50 $\mu g/m^3$ mercury was detected in air at the top of the borehole during the start of drilling. A soil vapor sample was not collected at the former Mercury Recovery Unit since it was presupposed that soil vapor mercury concentrations would be high there, and the samples were better used to define concentrations away from it. Previously collected soil vapor mercury concentrations decline with increasing distance southwest from the former Mercury Recovery Unit: 720 $\mu g/m^3$ at AS-03 (May 2003 sample) and 340 $\mu g/m^3$ at CP-MW06V (September 2009 sample; Table 3). We expect that, during the dry season, the water table at the Mercury Recovery Unit location drops sufficiently to unsaturate soils within which elemental mercury is present.

The collective data indicate that the elemental mercury occurrences in soil at the Caustic Filter House and Mercury Recovery Unit are the primary sources for mercury in soil vapor within the Mercury Source Area of the Caustic Plume subarea; however, the highly concentrated elemental mercury only volatilizes mercury during the dry season when the water table is low enough to unsaturate that soil (i.e., a seasonal source).

Indoor Air within Mercury Cell Building

Initial sampling and analysis of interior building materials within the Mercury Cell building confirmed that the materials contain total mercury concentrations up to 358 mg/kg (Anchor Environmental, 2008). The mercury on interior building surfaces was presumably transported in vapor phase from elemental mercury used as a cathode in the Chlor-Alkali electrolysis process. As such, residual mercury on the interior building surfaces is expected to remain volatile.

In the current investigation, a mercury concentration of 1.28 $\mu g/m^3$ was detected in the sample of ambient air collected within the interior of the Mercury Cell Building (CP-AA01; Figure 4). The ambient air sampling and analysis was conducted using the same protocols as applied for the soil gas samples, except the sample was drawn from a height of approximately 4 feet above grade within the building instead of from a subsurface vapor probe. The detected mercury air concentration is nearly 9 times above the 0.14 $\mu g/m^3$ standard Method B air cleanup level for unrestricted [residential] occupation, and 4 times above the 0.3 $\mu g/m^3$ standard Method C air cleanup level for industrial workers;

however, it is well below the Occupational Safety and Health Administration (OSHA) 50 $\mu g/m^3$ 8-hour permissible exposure limit (PEL) for workers.

For comparative purposes, a mercury concentration of 0.003 $\mu g/m^3$ was detected in the sample of area background outdoor air (BG-AA01; Figure 4 and Table 3) collected over a time period of approximately 24 hours. The data indicate that air mercury concentrations within the Mercury Cell Building are roughly 400 times higher than background ambient air outside the building.

Note that soil mercury was detected at relatively low concentrations (less than 12 mg/kg) in samples of soil collected beneath the slab of the Mercury Cell Building "at locations where the potential for mercury migration through the floor into underlying soils was high" (ENSR, 1994). Table 1 presents the data for the five soil samples (EHA-1 through EHA-5). According to the ENSR (1994) report, at the time of sampling, the concrete slab was about 1 foot thick, below which there was an approximately 1-foot void above the soil. The soil samples were collected in the upper 1 foot of soil below the void – so represented soil to depths of about 3.3 feet below the current slab grade inside the building. Following the 2000 Chlor-Alkali plant decommissioning (removal of process equipment etc.), GP poured an additional minimum 4-inch concrete slab across the Cell Building floor, which should further reduce intrusion of potential subsurface vapors into the building (Foster Wheeler, 2000). Consequently, it appears that the interior building materials are a source of mercury detected in indoor air within the building.

2.2 Law-1 Area

Overview

Law-1 is a monitoring well installed along the Log Pond shoreline within the Confined Nearshore Fill subarea, as defined in Aspect (2009). The Confined Nearshore Fill was formerly the southern portion of the Log Pond where, in 1974, fill dredged from the Whatcom Waterway was placed to construct an upland log handling facility, as described in Section 3.1 of Aspect (2009). In 1970, prior to placement of the dredge fill, GP constructed a bermed earthen Wastewater Settling Basin along the Confined Nearshore Fill subarea's western edge to settle suspended solids in the Chlor-Alkali Plant's wastewater prior to its discharge to the Log Pond. Monitoring well Law-1 was installed along the Log Pond shoreline as part of the first assessment of mercury concentrations in soils and groundwater throughout the area surrounding the former Chlorine Plant (Law Environmental, 1992).

The 2009 and 2010 RI groundwater data from monitoring well Law-1 had anomalously high dissolved mercury concentrations (20 to 33 µg/L) relative to the nearest upgradient and other surrounding wells (e.g., less than 1 µg/L at CP-MW03) and considerably higher than observed there in 1992-1993 (1.4 to 4 µg/L) (Table 5). Elevated soil mercury concentrations exist in subsurface soils within the footprint of the former Wastewater Settling Basin upgradient of Law-1 (e.g., up to 1,050 mg/kg at CP-MW05; Table 4), but groundwater mercury concentrations measured within the Basin footprint were at least 10 times less than those detected at Law-1 during 2009-2010 sampling, suggesting the Basin soils are not the source of dissolved mercury at Law-1.

Additional data for mercury in soil and groundwater were collected to better define the source of elevated dissolved mercury at Law-1, the extent of elevated dissolved mercury in groundwater around Law-1, and whether the groundwater poses a risk to the Log Pond's ecological environment, to better assess whether a source control IA was warranted.

Investigation Methods

In December 2010, five new soil borings (L1-MW01 through L1-MW05) were installed and sampled for soil mercury to further assess a potential source for the elevated dissolved mercury measured at monitoring well Law-1, in accordance with Addendum 2. The new borings are as follows (Figure 5):

- L1-MW01, completed within about 5 feet of the existing well Law-1 to verify conditions there;
- L1-MW02, west of Law-1, located within the Salt Storage Pad area, west of the 1974 dredge fill (Nearshore Confined Fill);
- L1-MW03, located east of Law-1 and within the silty soil berm constructed to confine the 1974 dredge fill (as is Law-1).
- L1-MW04 and L1-MW05, located upgradient of Law-1, within the footprint of the former Wastewater Settling Basin where elevated soil mercury concentrations are documented at depth, near the base of the historical basin (prior to its backfilling).

Each new boring was completed as a monitoring well, and groundwater was sampled from the new wells and selected existing wells to better delineate the extent of elevated dissolved mercury in groundwater around Law-1. Additionally, a wellpoint (L1-WP1) was installed in the intertidal shoreline downgradient (north) of Law-1 to monitor groundwater quality closer to its discharge to surface water. The wellpoint was screened from a depth of approximately 1.5 to 4.5 feet below the beach grade at that location. It is located at or above the upper edge of the thin layer capping area of the current Log Pond sediment cap, where the cap has reportedly been thinned slightly by wave erosion (RETEC, 2005); therefore, the wellpoint is screened into the underlying contaminated sediment. Groundwater samples collected in December 2010 from the six new locations and four existing monitoring wells (AMW-01, CP-MW03, CP-MW10, and Law-1) were analyzed for dissolved mercury, sulfide, sulfate, DOC, dissolved iron and manganese, alkalinity, TDS, and field parameters.

During the second phase investigation, two new intertidal wellpoints (L1-WP2 and L1-WP3) and monitoring well L1-MW06 were installed (Figure 6). Like wellpoint L1-WP1, the new wellpoints were screened to a depth of about 4.5 feet below current beach grade, and are expected to be screened into contaminated sediment. Groundwater samples were collected from wells Law-1, L1-MW01, L1-MW02, L1-MW03, and L1-MW06, and wellpoints L1-WP1, L1-WP2, and L1-WP3 to verify the December 2010 data, and further refine the extent of groundwater mercury in the Law-1 area. The three intertidal wellpoints L1-WP1, L1-WP2, and L1-WP3 installed for this investigation were sampled twice over an approximately 4-hour period when the wellpoints were exposed during lower tidal stages to assess concentration variability throughout a portion of the low tide

cycle. Soil samples collected from new well L1-MW06 were also submitted for mercury analysis.

Investigation Results

Soil

The new drilling did not identify an obvious source of mercury to explain the higher dissolved phase mercury concentrations observed at Law-1 during the 2009-2010 RI sampling. At the time of Law-1's drilling in 1992, soil mercury concentrations in the boring[4] were less than 1 mg/kg (data from STB-1 in Table 5), suggesting there is not a localized source of soil mercury at the well location itself. The new boring L1-MW01, drilled within about 5 feet of Law-1, generally confirmed those data, with detected soil mercury concentrations below 4 mg/kg except in the 14- to 15-foot sample (51.5 mg/kg) which is at the top of the Tidal Flat Aquitard. The higher soil mercury in this depth interval is consistent with other borings in this area, and is interpreted to be the result of the mercury-containing wastewater discharges to the original Log Pond configuration prior to 1974 placement of the dredge fill. Elevated soil pH was measured in the soil core from L1-MW01, with readings above pH 9 between depths of about 8.5 and 11 feet (soil pH readings are presented on the borings logs in Appendix A). The soil mercury data collected from each new boring in the Law-1 area are presented on Figure 5. Table 4 presents the soil data from the new and older explorations shown on Figure 5.

At boring L1-MW03, located east of Law-1, soil mercury was detected at 3 mg/kg in the 4- to 5-foot soil sample, and below 0.4 mg/kg in the four deeper samples. Soil pH readings were between 8 and 9 throughout the L1-MW03 soil core.

Within the footprint of the former Wastewater Settling Basin upgradient of Law-1, soil mercury concentrations up to 1,050 mg/kg have previously been documented within the layer of soil between depths of about 10 and 15 feet, interpreted to represent the base of the former Settling Basin (Table 4). At new boring L1-MW04 within the former Basin footprint, soil mercury concentrations of 49 and 62 mg/kg were detected in samples collected between depths of 3 and 7 feet, and the highest detected concentration (1,760 mg/kg) was detected in the 8- to 10-foot sample interpreted to represent soil at the base of the former Basin. The deeper soil sample from this boring (13- to 15-foot depth) contained 3.3 mg/kg mercury. Soil pH readings were between 7 and 8 throughout the L1-MW04 soil core.

Likewise, at new boring L1-MW05 located at the northern edge of the former Basin footprint, the highest detected soil mercury concentration (108 mg/kg) occurred in the 7- to 9-foot sample, with concentrations below 24 mg/kg in shallower and deeper samples. Soil pH readings from the L1-MW05 soil core were generally above 9 from surface to total depth, with the highest readings (10.8 to 11.0) in the 8- to 10-foot interval where the higher soil mercury is also present (note that the L1-MW05 monitoring well, screened at 5 to 10 feet, straddles this interval).

The maximum soil mercury concentrations detected at L1-MW04 and L1-MW05 occur at somewhat shallower depths than observed at previous RI borings CP-MW03 and CP-

[4] Boring STB-1 was completed as monitoring well Law-1 (Law Environmental, 1992).

MW05 (10- to 15-foot depths) located to the south and closer to the center of the former Basin (Figure 5). The collective soil mercury data suggest that the former Basin was shallower near its northern end than in its center.

Low soil mercury concentrations were detected in the two new soil borings completed west of Law-1 within the Salt Pad area - outside of the 1974 dredge fill (aka Nearshore Confined Fill). The fill in this area was placed prior to construction and operation of the Chlor-Alkali Plant. Soil mercury concentrations were below 7 mg/kg in boring L1-MW02, and soil pH readings ranged between 7.7 and 9.4 with readings above pH 9 in the depth interval of 10.5 to 14 feet. Due north of this boring, new boring L1-MW06 had detected soil mercury concentrations uniformly below 0.3 mg/kg, and soil pH between 7.3 and 8.5. There is no evidence from the analytical data (new and prior) or the Site history that there is a mercury source within the Salt Pad area west of the 1974 dredge fill to explain the December 2010 groundwater mercury detection at L1-MW02.

In summary, the collective soil data, in relation to the groundwater data, do not identify an obvious soil mercury source contributing to localized elevated dissolved mercury concentrations in the Law-1 area. Elevated soil mercury and elevated soil pH occur in soils at depth within the footprint of the former Wastewater Settling Basin, but dissolved mercury concentrations and groundwater pH in the wells there are consistently less than those detected at Law-1/L1-MW01 and L1-MW02 (groundwater data described below). The data suggest the presence of a localized occurrence of contaminated debris or fill upgradient of Law-1 but not observed during the investigation to date, is contributing localized mercury and higher pH to groundwater in the Law-1 area.

Leachable Soil Mercury (by TCLP Analysis)

In accordance with Addendum 2, the two new samples of soil from the Law-1 area containing the highest detected total mercury concentrations were submitted for analysis of leachable mercury by the TCLP analysis. Soil samples L1-MW04-8-10 (1,760 mg/kg mercury) and L1-MW05-7-9 (108 mg/kg mercury), collected from the base of the former Wastewater Settling Basin, contained TCLP mercury concentrations of 0.0078 and 0.0859 mg/L (Table 4), respectively - both below the 0.2 mg/L dangerous waste criterion. The 1,760 mg/kg total mercury detected in the L1-MW04-8-10 soil sample is the highest concentration detected at the base of the former Wastewater Settling Basin. Thus, the TCLP data suggest that, if soil at the base of the former Wastewater Settling Basin were excavated, it would not designate as characteristic dangerous waste. The data are consistent with previous Site data, including new data from the Mercury Source Area of the Caustic Plume Subarea described above, indicating limited leachability of soil mercury, except in caustic conditions.

Groundwater

The new groundwater data, combined with previous RI data, indicate variability in dissolved mercury concentrations in the Law-1 area. The new groundwater chemistry data are presented in Table 5, with selected data illustrated on Figure 6. Table 5 also includes the prior groundwater data.

Compared to the dissolved mercury concentrations detected at Law-1 in the 2009-2010 RI monitoring (20 to 33 µg/L), the concentration detected at Law-1 was much lower (1.0

µg/L) in the December 2010 sample, and comparable (17.8 µg/L) in the February 2011 sample (Table 5). The dissolved mercury concentrations detected in groundwater samples from well L1-MW01, located within about 5 feet of Law-1, generally tracked with the Law-1 results (0.46 and 14.6 µg/L in December 2010 and February 2011, respectively).

East of Law-1, very low dissolved mercury concentrations were detected at new well L1-MW03 (0.025 µg/L in December 2010 and 0.022 µg/L in February 2011), and, consistent with the previous RI data, at prior well CP-MW10 (0.0098 µg/L in December 2010; Table 5).

West of Law-1 and outside the 1974 dredge fill, dissolved mercury concentrations at well L1-MW02 declined from 35 µg/L to 2.1 µg/L between the December 2010 and February 2011 samples – opposite of the change observed at Law-1/L1-MW01 (Table 5). We interpret the variable groundwater quality at Law-1/L1-MW01 and L1-MW02 to be a result of seasonally variable groundwater flow directions, as discussed at the end of this subsection.

Downgradient of L1-MW02, dissolved mercury was detected at 0.43 µg/L during the February 2011 sampling of the newest well L1-MW06 (Figure 6). At well AMW-01, located further north of L1-MW06, the December 2010 groundwater sample contained 0.0032 µg/L dissolved mercury, similar to concentrations detected in the previous 2009-2010 RI samplings (0.001 and 0.0003 µg/L; Table 5).

Upgradient of Law-1 and within the footprint of the former Wastewater Settling Basin, the December 2010 dissolved mercury concentrations detected at prior well CP-MW03 and new wells L1-MW04 and L1-MW05 (0.48, 0.32, and 4.1 µg/L, respectively) were considerably lower than the higher concentrations detected at Law-1, L1-MW01, and L1-MW02. The detected dissolved mercury concentration at CP-MW03 is consistent with that detected in the previous 2009-2010 samplings (0.76 and 0.39 µg/L; Table 5).

Downgradient of Law-1, dissolved mercury concentrations detected in the intertidal wellpoint L1-WP1, north of Law-1, declined from 1.3 µg/L in December 2010 to approximately 0.1 µg/L in February 2011 (0.125 and 0.074 µg/L in two samples collected about 4 hours apart). At the two newer intertidal wellpoints, dissolved mercury concentrations in the two groundwater samples collected about 4 hours apart during the February 2011 sampling event were 0.13 and 0.16 µg/L at L1-WP2, and 0.051 and 0.053 µg/L at L1-WP3 (Figure 6; Table 5).

Consistent with the current conceptual site model for mercury mobility and transport, the higher dissolved mercury concentrations observed in the Law-1 area occur in association with relatively higher groundwater pH, DOC, and sulfide, and lower ORP than measured in surrounding/upgradient wells with lower dissolved mercury concentrations. Figure 6 depicts the groundwater geochemical data with the dissolved mercury data. The groundwater in this area is not as strongly caustic (pH between about 8.5 and 10.0) as that observed in the Caustic Plume subarea, but there is a clear relationship between measured pH and dissolved mercury. Higher soil pH was measured during drilling of wells CP-MW03, L1-MW04, and L1-MW05, located within the former Wastewater Settling Basin, but groundwater in those wells is not caustic (below pH 7.8; Figure 6). Consequently, an obvious source for the higher pH groundwater at wells Law-1, L1-MW01, and L1-MW02 is not documented.

Local Groundwater Flow Directions

The variable dissolved mercury concentrations detected at L1-MW02 and Law-1/L1-MW01 suggests variations in local groundwater flow directions, potentially in response to seasonal changes, such as changes in recharge through the unpaved former Wastewater Settling Basin area. Table 6 presents the water level data collected from the Law-1 area wells and wellpoints in February 2011, and the corresponding groundwater elevation contours are depicted on Figure 7.

The groundwater elevation data suggest that nearshore groundwater in the Law-1 area flows toward the north-northeast, with ultimate discharge to the Log Pond. During the second phase of IA investigation, continuous water level data were collected over a period of 72 hours in wells Law-1, L1-MW02, and L1-MW06 to provide refined assessment of whether there may be a preferred groundwater flow path to the northwest, around the west end of the low permeability soil berm containing the 1974 dredge fill, which is known to mute tidal fluctuations in groundwater within and behind it. If a greater tidal response were observed in new well L1-MW06 compared to Law-1, it would suggest that Log Pond surface water is in more direct hydraulic continuity with groundwater in the Salt Pad area than with groundwater behind the soil berm, which in turn could suggest a local preferred groundwater flow pathway to the Log Pond via the L1-MW06 location.

However, the new tidal monitoring data confirm only subtle tidal response in each of the three wells, and a smaller response (tidal efficiency of 1.5 percent) at L1-MW06 located closest to the tide than in either Law-1 or L1-MW02 (tidal efficiencies of 3.4 and 4.1 percent respectively; Figure 7). The new data suggest that the existing north-south bulkhead, behind which L1-MW06 is positioned, provides a greater restriction to groundwater interaction with Log Pond surface water than does the soil berm. Well L1-MW02 has a higher groundwater elevation throughout the tidal cycle than either Law-1 or L1-MW06, indicating a gradient in both directions. However, the collective tidal monitoring data and contoured groundwater elevations for the area suggest that groundwater across the Law-1 area discharges primarily to the Log Pond via its southern shoreline, through the soil berm.

That said, the December 2010 groundwater quality data suggest temporary westward movement of impacted groundwater from source material within the 1974 dredge fill area to the L1-MW02 location. The former Wastewater Settling Basin is an unpaved area and thus an area of concentrated groundwater recharge within the otherwise-paved Site; the groundwater elevation data indicate a groundwater mound beneath the former Basin, away from which groundwater flows radially. We expect that larger seasonal recharge events temporarily increase the size of the groundwater mound, pushing groundwater within the 1974 dredge fill farther to the west (e.g., to L1-MW02). As a recharge event subsides, the mound shrinks. The western flow component likely ebbs and flows with changing recharge, resulting in the observed temporal groundwater quality changes at L1-MW02 and Law-1/L1-MW01. While there is localized flow toward the west, the water level data indicate that the net groundwater flow in the Law-1 area is predominantly toward the north-northeast with discharge to the Log Pond through the soil berm, as outlined above.

2.3 Million Gallon Tanks Subarea

Overview

Total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbons (PAHs) are known constituents of concerns for the Million Gallon Tanks subarea, as described in Sections 6.1.2 and 8.5 of the RI/FS Work Plan (Aspect, 2009). The source of the petroleum is the former Million Gallon Tank 2, which historically stored fuel oil, and fueling areas were also located just east of the tanks area. The other seven tanks in this subarea were used for storage of lignin-related products associated with the former Pulp Mill.

The RI investigations to date in the Million Gallon Tanks subarea indicate a localized volume of soil containing total petroleum hydrocarbon (TPH) concentrations somewhat above 10,000 mg/kg – equal to a proposed soil screening level based on residual saturation (i.e., generation of mobile non-aqueous phase liquid [NAPL]). These soil concentrations would suggest a possible source of mobile NAPL; however, NAPL had not been observed in subarea monitoring wells. In addition, soil beneath and next to the former fuel oil storage tank (Tank 2) contains naphthalenes concentrations above the RI soil screening level based on the soil-to-groundwater-to-vapor pathway. Although measured groundwater naphthalenes concentrations are below the 170 µg/L RI screening level based on the groundwater-to-vapor pathway, Ecology had previously indicated that vapor intrusion in this subarea could drive more stringent soil cleanup levels than those based on protecting surface water or human direct contact. Furthermore, it appears that the soils containing elevated hydrocarbon concentrations appear to be relatively localized and accessible; therefore, a potential early interim action could also be considered for this subarea.

Consequently, additional sampling of soil, groundwater, and soil vapor was conducted to inform the RI/FS and to support scoping/cost estimating for a potential early interim action in this subarea.

Investigation Methods

A total of eight soil borings (MG-SB11 through MG-SB16, MG-MW04 and MG-MW05) were installed, with MG-MW04 and MG-MW05 completed as monitoring wells, to support scoping/cost estimating for a potential early IA in this subarea. Five soil samples were analyzed from each boring for diesel- and oil-range petroleum (NWTPH-Dx), and two soil samples from each boring were analyzed for polycyclic aromatic hydrocarbon (PAH) analysis. Four soil samples were analyzed by the Extractable Petroleum Hydrocarbon (EPH) method, providing additional data to refine the analysis of subarea-specific risk-based TPH soil screening levels as outlined in the RI/FS Work Plan (Aspect, 2009). Soil total organic carbon (TOC) content was also measured for eight soil samples in the subarea. Soil samples were selected in the field for TOC analysis based on visual and olfactory evidence as having limited TPH contamination.

The two new wells MG-MW04 and MG-MW05 and existing wells MG-MW01, MG-MW03, EMW-16S were sampled and analyzed for diesel- and oil-range petroleum hydrocarbons (NWTPH-Dx), extractable petroleum hydrocarbons (EPH), PAHs, total suspended solids (TSS), and field parameters.

In a second mobilization, four soil vapor probes (MG-VP01 through MG-VP04) were installed and sampled to provide for empirical assessment of vapor intrusion (VI) risk and thereby help establish appropriate soil and groundwater cleanup levels/remediation levels for the subarea. The vapor probe locations were based on the collective soil and groundwater data, as presented in Aspect (2011). The soil vapor samples were analyzed for petroleum fractions (aliphatics C5-C6, C6-C8, C8-C10, C10-12; aromatics C8-10, C10-C12) and naphthalene using Air Toxics laboratory's Method TO15-APH.

Investigation Results

Soil

Detected soil TPH concentrations exceeded the 2,000 mg/kg RI screening level in new borings MG-SB11 on the north edge of Tank 1 (2- to 3-foot depth), MG-SB12 on the north edge of Tank 2 (between depths of 6 and 14 feet), MG-SB13 along the former railroad grade approximately 50 feet north of Tank 2 (between depths of 2 and 13 feet), and MG-SB16 approximately 40 feet east of Tank 1 (5- to 6-foot depth). The highest detected soil TPH concentration in the new borings was 4,970 mg/kg (5- to 6-foot sample from MG-SB13), less than half the proposed 10,000 mg/kg soil screening level based on groundwater protection (leachability and NAPL mobility). Appendix D presents information supporting the 10,000 mg/kg TPH residual saturation soil concentration (NAPL mobility) for the Million Gallon Tanks subarea and Bunker C Tank subarea.

Soil TPH concentrations detected at new borings MG-SB14, MG-SB15, and MG-MW05 northeast of the tanks, and MG-MW04 just north of the former tanks, were below 2,000 mg/kg. Concentrations of total cPAHs[5] in the new soil samples commonly exceed the stringent 0.14 mg/kg unrestricted screening level, and there is little correlation of these concentrations with TPH concentrations, consistent with the previous subarea data (Table 7).

With the benefit of the new soil data, soils in the Million Gallon Tanks subarea containing TPH concentrations above the 10,000 mg/kg groundwater protection-based soil screening level are limited to the MG-SB09 boring location (Figure 8).

Table 7 presents the new soil chemistry data for this subarea. Figure 8 illustrates the new soil TPH and PAH data; the new and older explorations are color coded based on TPH, cPAH, and naphthalene concentrations relative to RI soil screening levels.

Subarea-Specific Risk Based Soil TPH Concentrations

Four of the new soil samples from the Million Gallon Tanks subarea (MG-SB12-6-7, MG-SB13-7-8, MG-SB14-12-13, and MG-SB15-9-10) were analyzed by the EPH method to refine analysis of subarea-specific risk-based TPH soil screening levels. These samples supplement the previously collected soil EPH data for this subarea (samples MG-SB07-6-8 and MG-SB09-6-7; Table 7). The EPH analysis quantifies concentrations of aromatic and aliphatic hydrocarbons in five carbon ranges covering the diesel and oil ranges. Soil TOC content was also measured for eight soil samples in the subarea, since it is a site-specific parameter used to assess the soil-to-groundwater pathway as a

[5] Calculated using toxicity equivalency factors (TEF) in accordance with MTCA.

component of developing the soil screening levels. The soil EPH and TOC data are presented in Table 7.

To represent soil exposure across the subarea, the average petroleum fraction concentrations (average petroleum composition) from the six EPH analyses (prior and new) conducted for this subarea were input into Ecology's MTCATPH workbook (http://www.ecy.wa.gov/programs/tcp/tools/toolmain.html). The arithmetic average concentration is the appropriate exposure point concentration for risk-based analysis. The MTCATPH workbook can assess risks at higher or lower TPH concentrations than measured, assuming the same relative proportion of petroleum fractions (i.e., proportionally increasing or decreasing their concentrations for the calculations). Assuming the average TPH composition for the subarea, the workbook was used to assess soil TPH concentrations protective of both direct contact pathway under unrestricted and industrial land uses, and the soil-to-groundwater pathway which is irrespective of land use.

Using the MTCATPH analysis with the subarea's average TPH composition, a subarea-specific total TPH Method B (unrestricted) soil screening level of 4,029 mg/kg, rounded to 4,000 mg/kg, is calculated based on non-carcinogenic risk (Hazard Index = 1). However, to achieve acceptable direct contact risk for unrestricted use, soils also need to have total cPAH concentrations below the 0.14 mg/kg total cPAH screening level based on carcinogenic risk. Both of these screening levels are used to assess soil direct contact compliance for unrestricted use. For soil direct contact under industrial land use, the Method C soil screening levels are 49,345 mg/kg total TPH (rounded to 49,000 mg/kg) based on subarea-specific MTCATPH analysis, and 18 mg/kg total cPAH. Both of these screening levels are used to assess soil direct contact compliance for industrial use.

In addition, the MTCATPH workbook was used to predict leachable concentrations of petroleum fractions and PAH compounds, assuming the contaminated soil has the average proportion of petroleum fractions and the average aquifer fractional organic carbon content (f_{oc}) of 0.017 (1.7 percent) for the subarea, and is located below the water table (dilution factor = 1). The model-predicted groundwater total cPAH concentration is compared against the conservative 0.03 µg/L RI screening level based on human consumption of organisms in marine water[6], and the predicted groundwater total naphthalenes concentration is compared against the 170 µg/L RI groundwater screening level based on VI protection.

Assuming a TPH soil concentration of 10,000 mg/kg (soil screening level based on residual saturation as described in Appendix D), the predicted total cPAH concentration leached to groundwater is 0.007 µg/L, which, applying toxicity equivalency factors (TEF) in accordance with MTCA, equates to a groundwater total cPAH concentration of 0.001 µg/L – an order of magnitude below the 0.03 µg/L groundwater screening level, which is consistent with the low leachability of cPAHs. The predicted groundwater concentration of (the more mobile) total naphthalenes leached from the same soil concentration/ composition is 103 µg/L, below the 170 µg/L VI-based screening level.

[6] The point of compliance for the screening level is within the sediment bioactive zone of the Whatcom Waterway, but the screening level is applied Site-wide is applied for conservatism in the RI.

However, to assess worst-case leaching of soil napthalenes for the Million Gallon Tanks subarea, the soil-to-groundwater analysis was also run with a total napthalenes soil concentration equal to 60 mg/kg, the maximum concentration detected in subarea soil (Table 7). Because the measured average total napthalenes concentration was 7.8 mg/kg for the six soil samples analyzed for EPH, the calculation was run assuming a total TPH concentration of 24,087 mg/kg, which, by proportion for the average soil, equates to a total naphthalenes concentration of 60 mg/kg. By this analysis, leaching of 60 mg/kg total naphthalenes produced a predicted groundwater naphthalenes concentration of 114 µg/L, below the 170 µg/L VI-based screening level. Furthermore, empirical data described below indicate that the 170 µg/L groundwater screening level is overly conservative with respect to vapor intrusion for this subarea, thus providing an additional measure of protectiveness for the soil screening levels.

Appendix B presents the MTCATPH workbook sheets with input data and results for the direct contact and soil-to-groundwater pathways. The soil-to-groundwater pathway and VI pathway are also assessed using empirical data (WAC 173-340-747[9]), as described in the following subsections.

Conclusion. Incorporating the collective subarea-specific soil TPH composition data, the refined analysis of soil EPH data for the Million Gallon Tanks subarea supports a 10,000 mg/kg soil TPH concentration as protective of groundwater via leachability (generating dissolved phase) and NAPL mobility (e.g., NAPL was not observed when drilling prior boring MG-SB09 where soil TPH exceeds 10,000 mg/kg). The subarea-specific Method B TPH soil screening for unrestricted use is 4,000 mg/kg, based on direct contact as the most restrictive exposure pathway. The subarea-specific Method C TPH soil screening level for industrial land use is 10,000 mg/kg, based on residual saturation (NAPL mobility) as the most restrictive exposure pathway.

Compliance with Subarea-Specific Soil TPH Screening Levels

Based on the collective soil chemistry data, and applying the MTCA three-fold compliance criteria (WAC 173-340-740(7)(d)[7]), TPH concentrations in the upper 15 feet of soil[8] within the Million Gallon Tanks subarea do not comply with the 4,000 mg/kg subarea-specific Method B soil screening level (protective of all exposure pathways). This is because there are two locations with soil TPH concentrations more than twice the screening level (8,000 mg/kg): at 6- to 7-foot depth at MG-SB09, and 6- to 8-foot depth at MG-SB07 (Figure 8). The soil TPH concentrations pass the other two MTCA compliance criteria:

- Using Ecology's MTCAstat software (Site97.xlt; http://www.ecy.wa.gov/programs/tcp/tools/toolmain.html#Statistical_Tools) to statistically analyze the 85 TPH sample results from the upper 15 feet of subarea soil, the data set is determined to be lognormally distributed, with a 95 percent upper confidence limit on the mean concentration (95% UCL) of 2,300 mg/kg - below the Method B soil screening level. The MTCAstat output is presented in Appendix C; and

[7] Three-fold criteria: 95% UCL on mean below cleanup level. No single concentration more than two times the cleanup level. Less than 10% of the samples exceed the cleanup level.
[8] 0 to 15 feet is the depth of compliance for applying soil cleanup levels based on direct contact.

- Four of the 85 samples, less than 10 percent, exceed the screening level.

Based on the current data set, compliance with the 4,000 mg/kg Method B soil screening level could be achieved through removal of the soil from the two identified locations with soil TPH exceeding 8,000 mg/kg. However, soil cPAH concentrations above the 0.14 mg/kg unrestricted screening level would remain distributed throughout the subarea soils, typical of fill soil at long-term industrial sites.

The subarea soil TPH concentrations meet the three MTCA criteria for compliance with the 10,000 mg/kg Method C soil screening level for industrial land use. Because the screening level is based on groundwater protection, it applies to soil at all depths; therefore, the complete subarea soil TPH data set (89 samples from all depths) was analyzed. Using the MTCAstat software, the calculated 95% UCL soil TPH concentration is 2,200 mg/kg (Appendix C). One of the 89 samples (1 percent) exceeds the screening level, and the maximum concentration (10,400 mg/kg) is less than two times the screening level. No further action is required to meet the Method C soil screening level for TPH.

Groundwater

The December 2010 groundwater TPH concentrations (by NWTPH-Dx method) were not detected above analytical reporting limits (RLs) in the five subarea wells. The reported TPH concentrations in Table 8 are estimated values above the method detection limit (MDL) but below the RL. The low groundwater TPH concentrations are consistent with those measured in the Spring 2010 RI sampling event (Table 8). The new groundwater TPH, total naphthalenes (sum of naphthalene and 2-methylnaphthalene), and total cPAH data are displayed on Figure 9.

Total cPAHs were detected in each of the five wells at concentrations above the 0.03 µg/L groundwater screening level. The highest total cPAH concentration, 1.6 µg/L, was detected at new well MG-MW05 where the highest naphthalenes concentration was also detected. Given the low solubility of cPAHs, the low detected concentrations are likely attributable in part to suspended solids in the groundwater samples.

A total naphthalenes concentration of 511 µg/L, above the 170 µg/L RI groundwater screening level based on VI, was detected at newly installed well MG-MW05, located immediately downgradient of the highest detected TPH soil concentration (at MG-SB09). A total naphthalenes concentration of 168 µg/L, just below the VI-based screening level, was detected at well MG-MW03, located further downgradient. Detected total naphthalenes concentrations in the other three wells were 50 µg/L or less (Table 8). As discussed below, petroleum fractions and naphthalene were not detected in soil vapor sample MG-VP02, collected next to well MG-MW05, empirically indicating that the 511 µg/L groundwater naphthalenes do not pose a vapor intrusion risk, and the 170 µg/L RI groundwater screening level based on that exposure pathway is overly conservative for this subarea.

EPH analyses were conducted for the December 2010 groundwater samples primarily to assess correlation of specific petroleum fractions between groundwater and soil vapor, since the vapor analyses quantify petroleum fractions, not TPH (mixture of fractions). Because the EPH analysis divides the TPH mixture into its component carbon fractions, it

provides lower analytical reporting limits (RLs) for each fraction (40 µg/L) than can be obtained for the full TPH mixture using the NWTPH-Dx analysis (RLs typically above 200 µg/L).

The EPH data indicate that the detected petroleum fractions in subarea groundwater are aromatic hydrocarbons, with the highest concentrations being within aromatic carbon ranges C10-C12 (in which naphthalene occurs) and C16-C21 in both near-source wells (MG-MW04 and MG-MW05[9]) and downgradient wells (MG-MW03 and EMW-16S). Aliphatic hydrocarbon fractions were essentially not detected in the five groundwater samples, and the highest aromatics concentrations were detected in MG-MW05 where the elevated naphthalenes were detected (Table 8).

Soil Vapor

Of the four soil vapor samples collected in accordance with Aspect (2011), petroleum hydrocarbons were not detected in the following three locations (Table 9; Figure 10):

- MG-VP01, located adjacent to the former fuel storage tank 2 and between boring MG-SB07 (9,300 mg/kg soil TPH, 28 mg/kg naphthalenes) and MG-SB12 (4,580 mg/kg TPH, 21 mg/kg naphthalenes);
- MG-VP02, located between boring MG-SB09, where the subarea's highest soil TPH has been detected (10,400 mg/kg), and MG-MW05 where 236 µg/L TPH and the subarea's highest total naphthalenes concentration (511 µg/L) have been detected in groundwater; and
- MG-VP03, located adjacent to boring MG-SB13, where higher TPH concentrations occur in the upper several feet of soil.

Conversely, the soil vapor sample collected from the MG-VP04 location, adjacent to monitoring well EMW-16S, contained detectable petroleum concentrations including a detected concentration of one fraction (3,000 µg/m^3 of aliphatic C8-C10) slightly more than twice its 1,400 µg/m^3 soil vapor screening level[10] for unrestricted land use. The detected vapor concentration of this fraction is equal to but does not exceed the 3,000 µg/m^3 industrial soil vapor screening level (Table 9). As discussed above, aliphatic petroleum hydrocarbons were not detected in the groundwater sample from the EMW-16S well (Table 8). The well was installed as part of the 1994 Chlor-Alkali site RI/FS (ENSR, 1994), and petroleum was not analyzed for in soil during its drilling.

Naphthalene was not detected in any of the soil vapor samples collected, including at the MG-VP02 vapor location adjacent to well MG-MW05 where 450 µg/L naphthalene (511 µg/L total naphthalenes) was detected in groundwater.

[9] Petroleum fractions were not detected in the MG-MW01 groundwater sample by EPH analysis.

[10] Soil vapor screening levels are established as 10x the MTCA air cleanup levels, assuming a 10x slab attenuation factor per EPA guidance (refer to Section 5.3 of Aspect, 2009). Ecology's 2009 draft Vapor Intrusion Guidance presents a pair of soil vapor screening levels, assuming attenuation factors of 10x and 100x. Note that the calculated soil vapor screening levels for naphthalene and the aromatic C10-C12 petroleum fraction, for which naphthalene is the surrogate compound for toxicity, are below the respective analytical practical quantitation limits for Air Toxics' TO15-APH analysis, therefore the screening levels are set as the PQLs in accordance with MTCA.

Based on the empirical soil vapor data, we conclude that subarea soil TPH concentrations protective of groundwater (i.e., to 10,000 mg/kg) are also protective of the soil-to-air pathway, in accordance with WAC 173-340-740(3)(b)(iii)(C)(III). In addition, the groundwater petroleum hydrocarbon concentrations (including naphthalene to 450 µg/L) adjacent to the highest petroleum soil concentrations are protective of the groundwater-to-air pathway.

2.4 Bunker C Tank Subarea

Overview

Previous investigations have indicated Bunker C oil-saturated soil exists beneath the former Bunker C storage tank, and soil TPH concentrations are high enough (above residual saturation) that it may continue to generate mobile NAPL. As evidence of this, there is a thin accumulation of NAPL on the water table at monitoring well BC-MW01 located next to the former tank containment structure. The existing data indicated that lower soil concentrations of Bunker C extend away from the former tank.

Investigation Methods

Twelve new soil borings (BC-SB11 through BC-SB20, BC-MW04, and BC-MW05) were installed to support scoping/cost estimating for a potential early IA in this subarea as described in the Work Plan Addendum. Two borings were completed as monitoring wells BC-MW04 and BC-MW05. Groundwater samples from the two new wells and three existing wells (BC-MW01, BC-MW02, BC-MW03) were sampled and analyzed for TPH-Dx, EPH, PAHs, TSS, and field parameters.

In a second phase of investigation, four soil vapor probes (BC-VP01 through BC-VP04) were installed and sampled to provide for empirical assessment of VI risk and thereby help establish appropriate soil and groundwater cleanup levels/remediation levels for the subarea. The vapor probe locations were based on the collective soil and groundwater data, as outlined in Aspect (2011), and the soil vapor samples were analyzed for petroleum fractions and naphthalene using Air Toxics laboratory's Method TO15-APH.

Investigation Results

Soil

The new soil data for the Bunker C Tank subarea are presented on Figure 11. Table 10 presents the prior and new soil data for the subarea.

The new soil data indicate subsurface soil adjacent to the former Steam Plant contains TPH concentrations above 10,000 mg/kg: between depths of 8 and 10 feet (refusal at 10 feet) at boring BC-SB17, and between depths of 9 and 13 feet at BC-SB18.

The 8- to 9-foot and 9- to 10-foot soil samples from boring BC-SB17 had saturation-level TPH concentrations (31,000 and 37,000 mg/kg), as well as the subarea's highest total naphthalenes concentration (134 and 123 mg/kg, respectively; 120 and 110 mg/kg of which is 2-methylnaphthalene). The soil naphthalenes concentrations at BC-SB17 are substantially higher than observed with saturation levels of TPH elsewhere in the subarea (Figure 11; Table 10): at boring BC-SB18, 70 feet to the northeast along a subsurface

pipeline (4.6 mg/kg naphthalenes with 33,000 mg/kg TPH), and at the former storage tank (5.7 mg/kg naphthalenes with 88,000 mg/kg TPH at BC-SB01 inside the tank containment; 34 mg/kg naphthalenes with 30,000 mg/kg at BC-SB02 immediately outside it; Table 10). Because naphthalenes are readily degraded in the environment, the data indicate less weathering of the subsurface petroleum release at the BC-SB17 location than at BC-SB18 or former tank locations.

The TPH occurrence at the BC-17/BC-18 locations does not appear to be continuous with similarly high TPH concentrations beneath the former Bunker C tank's secondary containment area, since intervening borings BC-SB09, BC-SB15, BC-SB03, and BC-SB16 have low soil TPH concentrations (Figure 11; Table 10). Consequently, the TPH observed at the BC-SB17 and BC-SB18 locations is inferred to be a separate release occurring from the former Steam Plant where the fuel was burned to produce steam heat, and/or from subsurface conveyance piping within which the fuel was pumped (under heat and pressure) to the Plant from the storage tank.

Total cPAH concentrations are relatively low in the new soil samples, with detected concentrations above the 0.14 mg/kg unrestricted screening level (up to 6.7 mg/kg) only in samples with TPH concentrations above 4,000 mg/kg.

Subarea-Specific Risk Based Soil TPH Concentrations

Three new soil samples from the Bunker C Tank subarea (BC-SB14-6.5-7.5, BC-SB17-8-9, and BC-SB18-9-10) were analyzed by the EPH method to refine analysis of subarea-specific risk-based TPH soil cleanup levels. Soil TOC content was also measured for six soil samples in the subarea, with an average f_{oc} of 0.021 (2.1 percent). The soil EPH and TOC data are presented in Table 10.

To represent soil exposure across the subarea, the average petroleum fraction concentrations from the seven EPH analyses conducted for this subarea were input into Ecology's MTCATPH workbook, using the same methodology as described above.

Using the MTCATPH analysis, a subarea-specific Method B (unrestricted) soil screening level for total TPH is 3,061 mg/kg, rounded to 3,100 mg/kg, based on non-carcinogenic risk (Hazard Index = 1). For soil direct contact under industrial land use, the Method C soil screening level is 37,679 mg/kg, rounded to 38,000 mg/kg total TPH. These subarea-specific TPH screening levels, and the respective total cPAH screening levels (0.14 and 18 mg/kg), are used to assess soil direct contact compliance for respective land uses.

Assuming a TPH soil concentration of 10,000 mg/kg (soil screening level based on residual saturation), the predicted total cPAH concentration leached to groundwater is 0.005 µg/L, which, applying toxicity equivalency factors in accordance with MTCA, equates to a groundwater total cPAH (TEF) concentration of 0.0008 µg/L – two orders of magnitude below the 0.03 µg/L groundwater screening level. The predicted groundwater concentration of total naphthalenes leached from the same soil concentration/composition is 102 µg/L, below the 170 µg/L VI-based screening level.

As described above, soil sample BC-SB17-8-9 had the highest total naphthalenes concentration (134 mg/kg) detected in the subarea. As such, assumed 'worst-case' leaching of soil naphthalenes is assessed by simulating leaching of the newly determined average TPH composition at a concentration that would proportionally produce a soil

total naphthalenes concentration of 134 mg/kg (TPH = 47,450 mg/kg). In the analysis, leaching of 134 mg/kg total naphthalenes produced a predicted groundwater naphthalenes concentration of 119 µg/L, below the 170 µg/L VI-based screening level. Based on the empirical groundwater data to date (including new data described below), the maximum total napthalenes concentration detected in the Bunker C Tank subarea groundwater is about 0.5 µg/L, indicating the residual Bunker C's naphthalene content has been degraded considerably over decades of weathering. Furthermore, empirical soil vapor data collected next to BC-SB17 had no detectable petroleum fractions or naphthalene (described below).

Appendix B presents the refined MTCATPH workbook sheets with input data and results for the direct contact and soil-to-groundwater pathways.

Conclusion. The refined analysis of soil EPH data for the Bunker C Tank subarea supports a 10,000 mg/kg soil TPH concentration as protective of groundwater via leachability (generating dissolved phase) and NAPL mobility. The subarea-specific Method B TPH soil screening for unrestricted use is 3,100 mg/kg, based on direct contact as the most restrictive exposure pathway. The subarea-specific Method C TPH soil screening level for industrial land use is 10,000 mg/kg, based on residual saturation (NAPL mobility) as the most restrictive exposure pathway.

Compliance with Subarea-Specific Soil TPH Screening Levels

Based on the collective soil chemistry data, TPH concentrations in the upper 15 feet of soil within the Bunker C Tank subarea do not comply with the 3,100 mg/kg subarea-specific Method B soil screening level, based on any of the MTCA three-fold compliance criteria: the calculated 95% UCL is 4,300 mg/kg, several locations have TPH greater than twice the screening level, and 12 percent (14 of 117) of the samples exceed the screening level. The MTCAstat output is presented in Appendix C. Soil cPAH concentrations also need to be assessed for the direct contact exposure pathway.

Evaluating soil TPH data from all depths, the subarea soil does not comply with the 10,000 mg/kg Method C soil screening level, because soil TPH concentrations at some locations, beneath the former storage tank and Steam Plant, are greater than twice the screening level. The other two compliance criteria are met: the calculated 95% UCL is 3,000 mg/kg, and 4 percent of the samples (5 of 117) exceed the screening level (Appendix C). Based on the current data set, removing soil containing TPH concentrations above twice the screening level (20,000 mg/kg) could achieve compliance with the Method C screening level.

Groundwater

TPH and PAH concentrations in the Bunker C Tank subarea groundwater are very low, consistent with previous data. The new groundwater data are presented on Figure 12. Table 11 presents the prior and new groundwater data for the subarea.

TPH was not detected above analytical reporting limits, with estimated concentrations below 300 µg/L. Total naphthalenes concentrations were below 0.4 µg/L, well below the 170 µg/L VI-based screening level. Total cPAH concentrations are marginally above the 0.03 µg/L screening level in well BC-MW01, immediately downgradient of the tank

containment structure, and in BC-MW02 downgradient of it; concentrations in BC-MW03, BC-MW04, and BC-MW05 are below the screening level.

Sediment bioassay testing conducted in the Whatcom Waterway offshore of the Bunker C Tank subarea met Sediment Quality Standards biological criteria (Anchor and Landau, 2003). Based on the empirical bioassay testing, Ecology has concluded that TPH and PAH concentrations in Bunker C Tank subarea groundwater is protective of Whatcom Waterway sediment (Brian Sato, Ecology, personal communication via email to Steve Germiat, Aspect Consulting; January 6, 2011).

Soil Vapor

Of the four soil vapor samples collected in accordance with Aspect (2011), naphthalene was not detected in any of the samples, and petroleum hydrocarbons were not detected above screening levels in three samples (Table 12; Figure 13):

- BC-VP02, located adjacent to BC-MW01, where up to 8,600 mg/kg TPH and 4 mg/kg naphthalenes were detected in soil, and a thin accumulation of LNAPL has been observed on the water table, next to the former Bunker C tank containment;

- BC-VP03, located between boring BH-SB02, where up to 6,900 mg/kg TPH and 108 mg/kg soil naphthalenes were detected in the subarea, and monitoring well BC-MW04 where up to 6,100 mg/kg TPH is detected in soil and 161 µg/L TPH is detected in groundwater; and

- BC-VP04, located adjacent to boring BC-SB17, where 3,800 mg/kg TPH is present in shallow soil (3-4 feet) and up to 37,000 mg/kg TPH and 134 mg/kg naphthalenes were detected in soil to 10 feet.

The soil vapor sample collected at BC-VP01, on the southeast edge of the tank containment, had detectable petroleum vapor concentrations above the unrestricted soil vapor screening level in the aliphatics C8-C10 fraction (19,000 µg/m^3) and aromatics C8-C10 fraction (2,100 µg/m^3); the aliphatics C8-C10 concentration is also above the industrial soil vapor screening level. This vapor probe is located adjacent to boring BC-SB02, where up to 30,000 mg/kg TPH and 34 mg/kg naphthalenes were detected in shallow and deeper soil. Soil concentrations at this location are considered representative of soils beneath the footprint of the tank containment area.

Based on the empirical soil vapor data, we conclude that subarea soil concentrations protective of groundwater (i.e., to 10,000 mg/kg) are also protective of the soil-to-air pathway, in accordance with WAC 173-340-740(3)(b)(iii)(C)(III). Higher soil TPH concentrations in unsaturated soil within and immediately adjacent to the tank containment (Figure 11) are generating soil vapor TPH concentrations above unrestricted and industrial screening levels. However, where equally high soil TPH concentrations occur only at depth, below the water table, the soil vapor concentrations generated are below unrestricted screening levels (BC-VP04/BC-SB17 location).

The empirical soil vapor data demonstrate that the current TPH soil concentrations within the tank containment could pose a vapor intrusion risk to structures built over it in the future redevelopment, even if for industrial use. Away from the tank area, subarea soil

and groundwater poses a negligible VI risk for an unrestricted site use. We conclude that the 10,000 mg/kg Method C TPH soil screening level and 3,100 mg/kg Method B TPH soil screening level are protective of soil vapor pathways for this subarea.

3 References

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Limitations

Work for this project was performed and this document prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Port of Bellingham for specific application to the referenced property. This document does not represent a legal opinion. No other warranty, expressed or implied, is made.

Table 1 - Soil Chemistry Data, Mercury Source Area of Caustic Plume Subarea

GP West RI/FS 070188

				Mercury in mg/kg	Methylmercury in mg/kg	TCLP Mercury in µg/L
			Unrestricted Soil Screening Level	24 mg/kg	8 mg/kg	
			Industrial Soil Screening Level	***1050 mg/kg***	***350 mg/kg***	
Location Name	**Sample Name**	**Sample Date**	**Depth Interval**			
AS-01	AS-01SO-A	05/28/03	0 to 2.5 feet	1.95		
AS-01	AS-01SO-B	05/28/03	2.5 to 5 feet	0.218		
AS-01	AS-01SO-C	05/28/03	5 to 7.5 feet	0.338		
AS-01	AS-01SO-D	05/28/03	7.5 to 10 feet	0.045		
AS-02	AS-02SO-A	05/28/03	0 to 2.5 feet	6.86		
AS-02	AS-02SO-B	05/28/03	2.5 to 5 feet	94.2		
AS-02	AS-02SO-C	05/28/03	5 to 7.5 feet	19.7		
AS-02	AS-02SO-D	05/28/03	7.5 to 10 feet	0.667		
AS-03	AS-03SO-A	05/28/03	0 to 2.5 feet	220		
AS-03	AS-03SO-B	05/28/03	2.5 to 5 feet	53.1		
AS-03	AS-03SO-C	05/28/03	5 to 6 feet	118	0.087	
ATW-AB4	ATW-AB4-10.5-12	05/05/04	10.5 to 12 feet	0.07		
BT-I	BT-I-5-6.5	01/11/93	5 to 6.5 feet	190		
BT-I	BT-I-7.5-9	01/11/93	7.5 to 9 feet	180		
BT-I	BT-I-10-11.5	01/11/93	10 to 11.5 feet	330		3.9
BT-I	BT-I-13.5-15	01/11/93	13.5 to 15 feet	1.8		
BT-II	BT-II-5-6.5	01/11/93	5 to 6.5 feet	49		
BT-II	BT-II-7.5-9	01/11/93	7.5 to 9 feet	43		
BT-II	BT-II-15-16.5	01/11/93	15 to 16.5 feet	8.1		
BT-III	BT-III-5-6.5	01/11/93	5 to 6.5 feet	390		
BT-III	BT-III-7.5-9	01/11/93	7.5 to 9 feet	43		
BT-III	BT-III-15-16.5	01/11/93	15 to 16.5 feet	21		
BT-IV	BT-IV-5-6.5	01/12/93	5 to 6.5 feet	120		0.2 U
BT-IV	BT-IV-7.5-9	01/12/93	7.5 to 9 feet	50		
BT-IV	BT-IV-15-16.5	01/12/93	15 to 16.5 feet	3.1		
BT-IX	BT-IX-2.5-4	01/13/93	2.5 to 4 feet	12		
BT-IX	BT-IX-5-6.5	01/13/93	5 to 6.5 feet	310		
BT-IX	BT-IX-7.5-9	01/13/93	7.5 to 9 feet	2.4		
BT-IX	BT-IX-15-16.5	01/13/93	15 to 16.5 feet	3.2		
BT-V	BT-V-7.5-9	01/12/93	7.5 to 9 feet	1.2		
BT-V	BT-V-15-16.5	01/12/93	15 to 16.5 feet	3.1		
BT-VI	BT-VI-5-6.2	01/12/93	5 to 6.2 feet	34		
BT-VI	BT-VI-7.5-9	01/12/93	7.5 to 9 feet	36		
BT-VI	BT-VI-15-16.5	01/12/93	15 to 16.5 feet	1.9		
BT-VII	BT-VII-5-6.5	01/12/93	5 to 6.5 feet	200		
BT-VII	BT-VII-7.5-9	01/12/93	7.5 to 9 feet	24		
BT-VII	BT-VII-17-18.5	01/12/93	17 to 18.5 feet	5.9		
BT-VIII	BT-VIII-3.5-9	01/12/93	3.5 to 9 feet	2.2		
BT-VIII	BT-VIII-15-16.5	01/12/93	15 to 16.5 feet	1.6		
BT-X	BT-X-2.5-4	01/13/93	2.5 to 4 feet	63		
BT-X	BT-X-5-6.5	01/13/93	5 to 6.5 feet	3.8		
BT-X	BT-X-7.5-9	01/13/93	7.5 to 9 feet	0.4		
BT-X	BT-X-15-16.5	01/13/93	15 to 16.5 feet	8.8		
BT-XI	BT-XI-2.5-4	01/13/93	2.5 to 4 feet	39		
BT-XI	BT-XI-5-6.5	01/13/93	5 to 6.5 feet	***2500***		
BT-XI	BT-XI-7.5-9	01/13/93	7.5 to 9 feet	***12000***		48
BT-XI	BT-XI-10-11.5	01/13/93	10 to 11.5 feet	39		
BT-XI	BT-XI-15-16.5	01/13/93	15 to 16.5 feet	23		
BT-XII	BT-XII-5-5.5	01/13/93	5 to 5.5 feet	6.2		
BT-XII	BT-XII-5.5-6	01/13/93	5.5 to 6 feet	200		
CB-EW	CB-EW	04/01/93	0 to 1 feet	65		
CB-SW	CB-SW	04/01/93	0 to 1 feet	34		
CB-SW-04	CB-SW-04	04/01/93	0 to 1 feet	16		
CELL BUILDING	CELL BUILDING-0.5-0.8	01/13/93	0.5 to 0.8 feet	***5200***		62
CP-MW04	CP-MW04-2.5-4	09/17/09	2.5 to 4 feet	22		

Table 1 - Soil Chemistry Data, Mercury Source Area of Caustic Plume Subarea

GP West RI/FS 070188

				Mercury in mg/kg	Methylmercury in mg/kg	TCLP Mercury in µg/L
			Unrestricted Soil Screening Level	24 mg/kg	8 mg/kg	
			Industrial Soil Screening Level	***1050 mg/kg***	***350 mg/kg***	
Location Name	**Sample Name**	**Sample Date**	**Depth Interval**			
CP-MW04	CP-MW04-5-6.5	09/17/09	5 to 6.5 feet	11.6		
CP-MW04	CP-MW04-7.5-9	09/17/09	7.5 to 9 feet	6.09		
CP-MW04	CP-MW04-10-11.5	09/17/09	10 to 11.5 feet	4.77		
CP-MW04	CP-MW04-12.5-14	09/17/09	12.5 to 14 feet	3.9		
CP-MW04	CP-MW04-15-16.5	09/17/09	15 to 16.5 feet	2.4		
CP-MW04	CP-MW04-17.5-19	09/17/09	17.5 to 19 feet	0.737		
CP-MW04	CP-MW04-22-23	09/21/09	22 to 23 feet	0.372		
CP-MW04	CP-MW04-26-27	09/21/09	26 to 27 feet	0.029		
CP-MW04	CP-MW04-38-39	09/21/09	38 to 39 feet	0.01 J		
CP-MW04	CP-MW04-30-31	09/21/09	30 to 31 feet	0.017 J		
CP-MW04	CP-MW04-34-35	09/21/09	34 to 35 feet	0.017 J		
CP-MW06	CP-MW06-1-2	09/16/09	1 to 2 feet	3.83		
CP-MW06	CP-MW06-13-15	09/16/09	13 to 15 feet	0.072		
CP-MW13	CP-MW13-1-2	12/16/10	1 to 2 feet	27.6		
CP-MW13	CP-MW13-2-3	12/16/10	2 to 3 feet	1.55		
CP-MW13	CP-MW13-4-5	12/16/10	4 to 5 feet	1.81		
CP-MW13	CP-MW13-8-9	12/16/10	8 to 9 feet	87.5		
CP-MW13	CP-MW13-12-14	12/16/10	12 to 14 feet	42.4		
CP-MW13	CP-MW13-15-16	12/16/10	15 to 16 feet	4.74		
CP-MW14	FD-CP-31	12/21/10	5 to 6 feet	4.74		
CP-MW14	CP-MW14-3-4	12/21/10	3 to 4 feet	8.76		
CP-MW14	CP-MW14-5-6	12/21/10	5 to 6 feet	4.76		
CP-MW14	CP-MW14-8-9	12/21/10	8 to 9 feet	0.276		
CP-MW14	CP-MW14-14-15	12/21/10	14 to 15 feet	9.68		
CP-MW14	CP-MW14-17-18	12/21/10	17 to 18 feet	0.899		
CP-MW15	FD-CP-11	12/20/10	4 to 5 feet	***25500 J***		
CP-MW15	FD-CP-11D	12/20/10	4 to 5 feet	***16100***		
CP-MW15	FD-CP-11T	12/20/10	4 to 5 feet	***11200 J***		
CP-MW15	FD-CP-12	12/20/10	5 to 6 feet	***5390***		
CP-MW15	FD-CP-12D	12/20/10	5 to 6 feet	***5850***		
CP-MW15	FD-CP-12T	12/20/10	5 to 6 feet	***6460***		
CP-MW15	FD-CP-13	12/20/10	6 to 8 feet	***10300***		
CP-MW15	FD-CP-13D	12/20/10	6 to 8 feet	***8990***		
CP-MW15	FD-CP-13T	12/20/10	6 to 8 feet	***10800***		
CP-MW15	FD-CP-14	12/20/10	10 to 11 feet	26.4		
CP-MW15	CP-MW15-4-5	12/20/10	4 to 5 feet	***14500 J***		212
CP-MW15	CP-MW15-4-5D	12/20/10	4 to 5 feet	***20600***		
CP-MW15	CP-MW15-4-5T	12/20/10	4 to 5 feet	***11200***		
CP-MW15	CP-MW15-5-6	12/20/10	5 to 6 feet	***7180***		
CP-MW15	CP-MW15-5-6D	12/20/10	5 to 6 feet	***6990***		
CP-MW15	CP-MW15-5-6T	12/20/10	5 to 6 feet	***7140***		
CP-MW15	CP-MW15-6-8	12/20/10	6 to 8 feet	***7760***		
CP-MW15	CP-MW15-6-8D	12/20/10	6 to 8 feet	***12200***		
CP-MW15	CP-MW15-6-8T	12/20/10	6 to 8 feet	***10600***		
CP-MW15	CP-MW15-10-11	12/20/10	10 to 11 feet	26.1		
CP-MW15	CP-MW15-12-14	12/20/10	12 to 14 feet	2.03		
CP-MW15	FD-CP15	12/22/10	12 to 14 feet	2.63		
CP-MWA1	CP-MWA1-2-3	09/21/09	2 to 3 feet	0.022		
CP-MWA1	CP-MWA1-14-15	09/21/09	14 to 15 feet	0.125		
CP-MWC1	CP-MWC1-2-3	09/21/09	2 to 3 feet	0.026		
CP-MWC1	CP-MWC1-12-13	09/21/09	12 to 13 feet	0.088		
CP-SB02	CP-SB02-1-2	12/21/10	1 to 2 feet	0.284		
CP-SB02	CP-SB02-3-4	12/21/10	3 to 4 feet	0.259		
CP-SB02	CP-SB02-5-6	12/21/10	5 to 6 feet	0.791		
CP-SB02	CP-SB02-9-10	12/21/10	9 to 10 feet	29.2		
CP-SB02	CP-SB02-17-18	12/21/10	17 to 18 feet	0.036		

Table 1 - Soil Chemistry Data, Mercury Source Area of Caustic Plume Subarea

GP West RI/FS 070188

				Mercury in mg/kg	Methylmercury in mg/kg	TCLP Mercury in µg/L
			Unrestricted Soil Screening Level	24 mg/kg	8 mg/kg	
			Industrial Soil Screening Level	***1050 mg/kg***	***350 mg/kg***	
Location Name	**Sample Name**	**Sample Date**	**Depth Interval**			
CP-SB03	FD-CP30	12/22/10	2 to 3 feet	2.35 J		
CP-SB03	CP-SB03-8-9	12/22/10	8 to 9 feet	18.2		
CP-SB03	CP-SB03-2-3	12/22/10	2 to 3 feet	1.14 J		
CP-SB03	CP-SB03-4-5	12/22/10	4 to 5 feet	0.330		
CP-SB03	CP-SB03-11.5-12	12/22/10	11.5 to 12 feet	560		
CP-SB04	CP-SB04-2-3	12/22/10	2 to 3 feet	2.64		
CP-SB04	CP-SB04-4-5	12/22/10	4 to 5 feet	18.5		
CP-SB04	CP-SB04-5-6	12/22/10	5 to 6 feet	1.98		
CP-SB05	FD-CP-16	12/21/10	12 to 14 feet	7.71		
CP-SB05	CP-SB05-1-2	12/21/10	1 to 2 feet	3.16		
CP-SB05	CP-SB05-3-4	12/21/10	3 to 4 feet	3.22		
CP-SB05	CP-SB05-4-5	12/21/10	4 to 5 feet	5.51		
CP-SB05	CP-SB05-8-9	12/21/10	8 to 9 feet	22.6		
CP-SB05	CP-SB05-12-14	12/21/10	12 to 14 feet	6.09		
CP-SB06	FD-CP-17	12/21/10	6 to 8 feet	***51000 J***		
CP-SB06	CP-SB06-2-3	12/21/10	2 to 3 feet	***1430***		
CP-SB06	CP-SB06-4-5	12/21/10	4 to 5 feet	197		
CP-SB06	CP-SB06-5-6	12/21/10	5 to 6 feet	***5310***		
CP-SB06	CP-SB06-5-6D	12/21/10	5 to 6 feet	***5090***		
CP-SB06	CP-SB06-5-6T	12/21/10	5 to 6 feet	***7380***		
CP-SB06	CP-SB06-6-8	12/21/10	6 to 8 feet	***38700 J***		42.9
CP-SB06	CP-SB06-6-8D	12/21/10	6 to 8 feet	***28900***		
CP-SB06	CP-SB06-6-8T	12/21/10	6 to 8 feet	***31800***		
CP-SB06	CP-SB06-19-20	12/21/10	19 to 20 feet	3.51		
CP-SB06A	CP-SB06A-10-15	02/02/11	10 to 15 feet	***14000***		
CP-SB07	CP-SB07-8-9	12/22/10	8 to 9 feet	12.6		
CP-SB07	CP-SB07-6.5-7.5	12/22/10	6.5 to 7.5 feet	0.783		
CP-SB07	CP-SB07-3-4	12/22/10	3 to 4 feet	183		
CP-SB07	CP-SB07-4-5	12/22/10	4 to 5 feet	13.7		
CP-SB08	CP-SB08-1-2	12/23/10	1 to 2 feet	0.049		
CP-SB08	CP-SB08-2-3	12/23/10	2 to 3 feet	350		
CP-SB08	CP-SB08-4-5	12/23/10	4 to 5 feet	31.3		
CP-SB08	CP-SB08-8-9	12/23/10	8 to 9 feet	1.54		
CP-SB08	CP-SB08-12-14	12/23/10	12 to 14 feet	0.460		
CP-SB09	FD-CP-20	12/21/10	12 to 14 feet	0.128		
CP-SB09	CP-SB09-2-3	12/21/10	2 to 3 feet	0.281		
CP-SB09	CP-SB09-4-5	12/21/10	4 to 5 feet	0.219		
CP-SB09	CP-SB09-5-6	12/21/10	5 to 6 feet	0.552		
CP-SB09	CP-SB09-8-9	12/21/10	8 to 9 feet	0.749		
CP-SB09	CP-SB09-12-14	12/21/10	12 to 14 feet	0.126		
CP-SB10	CP-SB10-14-15	12/22/10	14 to 15 feet	0.882		
CP-SB10	CP-SB10-5-6	12/22/10	5 to 6 feet	64.4		
CP-SB10	CP-SB10-6-7	12/22/10	6 to 7 feet	2.79		
CP-SB10	CP-SB10-8-9	12/22/10	8 to 9 feet	0.220		
CP-SB10	CP-SB10-12-13	12/22/10	12 to 13 feet	0.760		
CP-SB11	FD-CP-19	12/21/10	7 to 9 feet	0.262		
CP-SB11	CP-SB11-3-5	12/21/10	3 to 5 feet	0.431		
CP-SB11	CP-SB11-5-6	12/21/10	5 to 6 feet	1.90		
CP-SB11	CP-SB11-7-9	12/21/10	7 to 9 feet	0.258		
CP-SB11	CP-SB11-12-14	12/21/10	12 to 14 feet	3.08		
CP-SB11	CP-SB11-15-16	12/21/10	15 to 16 feet	19.2		
CP-SB12	FD-CP39	12/22/10	12 to 13 feet	2.68		
CP-SB12	CP-SB12-0.5-1	12/23/10	0.5 to 1 feet	1.06		
CP-SB12	CP-SB12-5-6	12/23/10	5 to 6 feet	0.736		
CP-SB12	CP-SB12-9-10	12/23/10	9 to 10 feet	1.52		
CP-SB12	CP-SB12-12-13	12/23/10	12 to 13 feet	2.40		

Table 1 - Soil Chemistry Data, Mercury Source Area of Caustic Plume Subarea

GP West RI/FS 070188

				Mercury in mg/kg	Methylmercury in mg/kg	TCLP Mercury in µg/L
			Unrestricted Soil Screening Level	24 mg/kg	8 mg/kg	
			Industrial Soil Screening Level	***1050 mg/kg***	***350 mg/kg***	
Location Name	**Sample Name**	**Sample Date**	**Depth Interval**			
CP-SB12	CP-SB12-15-16	12/23/10	15 to 16 feet	13.9		
CP-SB13	FD-CP-18	12/21/10	8 to 9 feet	0.216		
CP-SB13	CP-SB13-2-4	12/21/10	2 to 4 feet	463		
CP-SB13	CP-SB13-5-6	12/21/10	5 to 6 feet	6.53		
CP-SB13	CP-SB13-8-9	12/21/10	8 to 9 feet	0.262		
CP-SB13	CP-SB13-12-13	12/21/10	12 to 13 feet	0.777		
CP-SB13	CP-SB13-15-16	12/21/10	15 to 16 feet	2.79		
CP-SB14	CP-SB14-1-2	01/31/11	1 to 2 feet	1.42		
CP-SB14	CP-SB14-2-3	01/31/11	2 to 3 feet	0.949		
CP-SB14	CP-SB14-4-5	01/31/11	4 to 5 feet	***1630***		
CP-SB14	CP-SB14-6-7	01/31/11	6 to 7 feet	***7940***		
CP-SB14	CP-SB14-8-9	01/31/11	8 to 9 feet	61.9		
CP-SB14	CP-SB14-10-11	01/31/11	10 to 11 feet	423		
CP-SB15	CP-SB15-2-3	01/31/11	2 to 3 feet	424		
CP-SB15	CP-SB15-4-5	01/31/11	4 to 5 feet	45.8		
CP-SB15	CP-SB15-6-7	01/31/11	6 to 7 feet	18.1		
CP-SB15	CP-SB15-8-9	01/31/11	8 to 9 feet	25.1		
CP-SB15	CP-SB15-11-12	01/31/11	11 to 12 feet	2.520		
CP-SB16	FD-CP-100	01/31/11	5 to 6 feet	0.987		
CP-SB16	CP-SB16-3-4	02/01/11	3 to 4 feet	***1220***		
CP-SB16	CP-SB16-5-6	02/01/11	5 to 6 feet	777		
CP-SB16	CP-SB16-7-8	02/01/11	7 to 8 feet	18.7		
CP-SB16	CP-SB16-9-10	02/01/11	9 to 10 feet	1.54		
CP-SB16	CP-SB16-11-12	02/01/11	11 to 12 feet	0.310		
CP-SB17	CP-SB17-2-3	01/31/11	2 to 3 feet	1.170		
CP-SB17	CP-SB17-4-5	01/31/11	4 to 5 feet	118		
CP-SB17	CP-SB17-6.7-7.5	01/31/11	6.7 to 7.5 feet	382		
CP-SB17	CP-SB17-9-10	01/31/11	9 to 10 feet	19.5		
CP-SB17	CP-SB17-14-15	01/31/11	14 to 15 feet	27.8		
CP-SB17	FD-CP-102	02/01/11	2 to 3 feet	531		
CP-SB18	CP-SB18-12-13	02/01/11	12 to 13 feet	1.16		
CP-SB18	CP-SB18-0.5-1.5	02/01/11	0.5 to 1.5 feet	0.475		
CP-SB18	CP-SB18-5-6	02/01/11	5 to 6 feet	191		
CP-SB18	CP-SB18-7-8	02/01/11	7 to 8 feet	4.43		
CP-SB18	CP-SB18-9-10	02/01/11	9 to 10 feet	0.383		
CP-SB19	CP-SB19-0.5-1.5	01/31/11	0.5 to 1.5 feet	620		
CP-SB19	CP-SB19-2-3	01/31/11	2 to 3 feet	0.137		
CP-SB19	CP-SB19-4-5	01/31/11	4 to 5 feet	0.174		
CP-SB19	CP-SB19-9-10	01/31/11	9 to 10 feet	0.152		
CP-SB19	CP-SB19-15-16	01/31/11	15 to 16 feet	3.320		
CP-SB19	CP-SB19-6.5-7.5	02/01/11	6.5 to 7.5 feet	0.296		
CP-SB20	CP-SB20-0.5-1.5	01/31/11	0.5 to 1.5 feet	64.4		
CP-SB20	CP-SB20-3-4	01/31/11	3 to 4 feet	3.02		
CP-SB20	CP-SB20-5-6	01/31/11	5 to 6 feet	9.16		
CP-SB20	CP-SB20-9-10	01/31/11	9 to 10 feet	0.485		
CP-SB20	CP-SB20-13-14	01/31/11	13 to 14 feet	0.272		
CP-SB22	FD-CP-101	01/31/11	6 to 7 feet	17.9		
CP-SB22	CP-SB22-2-3	01/31/11	2 to 3 feet	2.740		
CP-SB22	CP-SB22-4-5	01/31/11	4 to 5 feet	4.320		
CP-SB22	CP-SB22-6-7	01/31/11	6 to 7 feet	18.7		
EHA-1	EHA-1-060393	06/03/93	0 to 0.5 feet	3.8		
EHA-2	EHA-2-060393	06/03/93	0 to 0.5 feet	12		
EHA-3	EHA-3-060393	06/03/93	0 to 0.5 feet	2.5		
EHA-4	EHA-4-060393	06/03/93	0 to 0.5 feet	12		
EHA-5	EHA-5-060393	06/03/93	0 to 0.5 feet	6.1		
EMW-14S	EMW-14S-5	11/24/93	5 to 6.5 feet	3.6		

Table 1 - Soil Chemistry Data, Mercury Source Area of Caustic Plume Subarea

GP West RI/FS 070188

				Mercury in mg/kg	Methylmercury in mg/kg	TCLP Mercury in µg/L
			Unrestricted Soil Screening Level	24 mg/kg	8 mg/kg	
			Industrial Soil Screening Level	***1050 mg/kg***	***350 mg/kg***	
Location Name	**Sample Name**	**Sample Date**	**Depth Interval**			
EMW-14S	EMW-14S-10	11/24/93	10 to 11.5 feet	160		
EMW-14S	EMW-14S-16	11/24/93	16 to 17.5 feet	47		
EMW-15S	EMW-15S-5	11/24/93	5 to 6.5 feet	2.6		
EMW-1S	EMW-1S-05	06/04/93	5 to 6.5 feet	0.14 U		
EMW-1S	6-4-10	06/04/93	10 to 11.5 feet	0.12 U		
EMW-1S	EMW-1S-10	06/04/93	10 to 11.5 feet	0.12 U		
EMW-1S	EMW-1S-12	06/04/93	12 to 13.5 feet	0.51		
EMW-2S	EMW-2S-05	06/03/93	5 to 6.5 feet	4.2		0.2
EMW-2S	EMW-2S-10	06/03/93	10 to 11.5 feet	2.1		
EMW-2S	EMW-2S-14	06/03/93	14 to 15.5 feet	4.5		
ESB-15S	ESB-15S-05	06/03/93	5 to 6.5 feet	0.11 U		
ESB-15S	ESB-15S-10	06/03/93	10 to 11.5 feet	56		8.9
ESB-15S	ESB-15S-22	06/03/93	22 to 23.5 feet	0.23		
HA-1	HA-1-0-6	03/30/92	0 to 0.5 feet	29		
HA-1	HA-1-18-24	03/30/92	1.5 to 2 feet	0.74		
HA-10	HA-10-0-6	03/31/92	0 to 0.5 feet	***3400***		
HA-10	HA-10-18-24	03/31/92	1.5 to 2 feet	410		
HA-10	HA-10-36-42	03/31/92	3 to 3.5 feet	290		
HA-11	HA-11-0-6	03/31/92	0 to 0.5 feet	1.5		
HA-11	HA-11-18-24	03/31/92	1.5 to 2 feet	1.4		
HA-11	HA-11-36-42	03/31/92	3 to 3.5 feet	0.61		
HA-12	HA-12-0-6	03/31/92	0 to 0.5 feet	4.9		
HA-12	HA-12-18-24	03/31/92	1.5 to 2 feet	1.3		
HA-12	HA-12-34-36	03/31/92	2.83 to 3 feet	1.6		
HA-13	HA-13-0-6	03/31/92	0 to 0.5 feet	0.68		
HA-13	HA-13-18-24	03/31/92	1.5 to 2 feet	0.12		
HA-13	HA-13-34-36	03/31/92	2.83 to 3 feet	0.1 U		
HA-14	HA-14-0-6	03/30/92	0 to 0.5 feet	6		
HA-14	HA-14-18-24	03/30/92	1.5 to 2 feet	2.4		
HA-14	HA-14-36-42	03/30/92	3 to 3.5 feet	0.36		
HA-15	HA-15-0-6	03/30/92	0 to 0.5 feet	15		
HA-15	HA-15-18-24	03/30/92	1.5 to 2 feet	0.1 U		
HA-15	HA-15-36-42	03/30/92	3 to 3.5 feet	0.1 U		
HA-16	HA-16-0-6	03/31/92	0 to 0.5 feet	180		
HA-16	HA-16-18-24	03/31/92	1.5 to 2 feet	300		
HA-16	HA-16-36-42	03/31/92	3 to 3.5 feet	62		
HA-2	HA-2-0-6	03/30/92	0 to 0.5 feet	230		
HA-2	HA-2-18-24	03/30/92	1.5 to 2 feet	41		
HA-2	HA-2-36-42	03/30/92	3 to 3.5 feet	43		
HA-3	HA-3-0-6	03/30/92	0 to 0.5 feet	140		
HA-3	HA-3-18-24	03/30/92	1.5 to 2 feet	100		
HA-3	HA-3-36-42	03/30/92	3 to 3.5 feet	65		
HA-4	HA-4-0-6	03/30/92	0 to 0.5 feet	32		
HA-4	HA-4-18-24	03/30/92	1.5 to 2 feet	100		
HA-4	HA-4-36-42	03/30/92	3 to 3.5 feet	63		
HA-5	HA-5-0-6	03/31/92	0 to 0.5 feet	***4000***		
HA-5	HA-5-18-24	03/31/92	1.5 to 2 feet	29		
HA-5	HA-5-37-39	03/31/92	3.08 to 3.25 feet	530		
HA-6	HA-6-0-6	03/30/92	0 to 0.5 feet	740		
HA-6	HA-6-18-24	03/30/92	1.5 to 2 feet	1.3		
HA-6	HA-6-36-42	03/30/92	3 to 3.5 feet	0.14		
HA-7	HA-7-0-6	03/30/92	0 to 0.5 feet	39		
HA-7	HA-7-18-20	03/30/92	1.5 to 1.67 feet	17		
HA-8	HA-8-0-6	03/30/92	0 to 0.5 feet	13		
HA-8	HA-8-18-24	03/30/92	1.5 to 2 feet	0.14		
HA-9	HA-9-0-6	03/31/92	0 to 0.5 feet	300		

Table 1 - Soil Chemistry Data, Mercury Source Area of Caustic Plume Subarea

GP West RI/FS 070188

				Mercury in mg/kg	Methylmercury in mg/kg	TCLP Mercury in µg/L
			Unrestricted Soil Screening Level	24 mg/kg	8 mg/kg	
			Industrial Soil Screening Level	***1050 mg/kg***	***350 mg/kg***	
Location Name	**Sample Name**	**Sample Date**	**Depth Interval**			
HA-9	HA-9-18-24	03/31/92	1.5 to 2 feet	2.7		
HA-9	HA-9-36-42	03/31/92	3 to 3.5 feet	1.6		
SITE-1	SITE-1-GP-CP-EX	07/01/98	0 to 0.5 feet	38		0.5
SITE-7	SITE-7-GP-CP-EX	07/01/98	0 to 0.5 feet	18		0.1 U
SITE-8	SITE-8-GP-CP-EX	07/01/98	0 to 0.5 feet	119		0.5
STB-04	STB-04-3.5-5	05/12/92	3.5 to 5 feet	3.1		
STB-04	STB-04-7.5-9	05/12/92	7.5 to 9 feet	0.1 U		
STB-08	STB-08-0-1.5	05/13/92	0 to 1.5 feet	0.1 U		
STB-08	STB-08-3.5-5	05/13/92	3.5 to 5 feet	2.0		
STB-08	STB-08-7.5-9	05/13/92	7.5 to 9 feet	0.3		
STB-09	STB-09-0-1.5	05/13/92	0 to 1.5 feet	0.2		
STB-09	STB-09-3.5-5	05/13/92	3.5 to 5 feet	0.1		
STB-09	STB-09-7.5-9	05/13/92	7.5 to 9 feet	7.3		
STB-10	STB-10-0-1.5	05/14/92	0 to 1.5 feet	0.8		
STB-10	STB-10-3.5-5	05/14/92	3.5 to 5 feet	0.1 U		
STB-10	STB-10-7.5-9	05/14/92	7.5 to 9 feet	1.3		
STB-11	STB-11-1-2.5	05/14/92	1 to 2.5 feet	23		
STB-11	STB-11-3.5-5	05/14/92	3.5 to 5 feet	84		
STB-11	STB-11-7.5-9	05/14/92	7.5 to 9 feet	***33000***		
STB-13	STB-13-5-6.5	05/14/92	5 to 6.5 feet	1.1		
STB-14	STB-14-3.5-5	05/15/92	3.5 to 5 feet	1.7		
STB-14	STB-14-7.5-9	05/15/92	7.5 to 9 feet	7.8		
STB-14	STB-14-10.5-12	05/15/92	10.5 to 12 feet	0.5		
STB-14	STB-14-15-16.5	05/15/92	15 to 16.5 feet	0.1 U		
STB-16	STB-16-0.5-2	05/15/92	0.5 to 2 feet	0.7		
STB-16	STB-16-3.5-5	05/15/92	3.5 to 5 feet	15		
STB-16	STB-16-7.5-9	05/15/92	7.5 to 9 feet	47		
STB-20	STB-20-0-1.5	05/17/92	0 to 1.5 feet	0.1 U		
STB-20	STB-20-3.5-5	05/17/92	3.5 to 5 feet	0.2		
STB-20	STB-20-7.5-9	05/17/92	7.5 to 9 feet	0.1 U		
STB-21	STB-21-0-1.5	05/17/92	0 to 1.5 feet	1.0		
STB-21	STB-21-3.5-5	05/17/92	3.5 to 5 feet	3.0		
STB-22	STB-22-0-1.5	05/17/92	0 to 1.5 feet	0.7		
STB-22	STB-22-3.5-5	05/17/92	3.5 to 5 feet	0.1		
STB-22	STB-22-7.5-9	05/17/92	7.5 to 9 feet	0.4		
STB-23	STB-23-0-1.5	05/17/92	0 to 1.5 feet	0.5		
STB-23	STB-23-3.5-5	05/17/92	3.5 to 5 feet	0.1 U		
STB-23	STB-23-7.5-9	05/17/92	7.5 to 9 feet	0.1		
STB-24	STB-24-0-1.5	05/18/92	0 to 1.5 feet	0.2		
STB-24	STB-24-3.5-5	05/18/92	3.5 to 5 feet	0.1 U		
STB-24	STB-24-7.5-9	05/18/92	7.5 to 9 feet	1.3		
STB-25	STB-25-0-1.5	05/18/92	0 to 1.5 feet	0.1 U		
STB-25	STB-25-3.5-5	05/18/92	3.5 to 5 feet	0.1 U		
STB-25	STB-25-7.5-9	05/18/92	7.5 to 9 feet	1.3		
SW-SB01	SW-SB01-0-0.5	03/25/10	0 to 0.5 feet	0.509		
SW-SB01	SW-SB01-0.5-1	03/25/10	0.5 to 1 feet	0.246		
SW-SB01	SW-SB01-2-3	03/25/10	2 to 3 feet	0.035		
SW-SB01	SW-SB01-5-6	03/25/10	5 to 6 feet	0.064		
SW-SB01	SW-SB01-8-9	03/25/10	8 to 9 feet	0.128		

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Level.

Concentrations in shaded cells with bold italicized text indicate value exceeds Industrial Soil Screening Level.

U - Analyte was not detected at or above the reported result.

Table 2 - Groundwater Chemistry Data, Mercury Source Area of Caustic Plume Subarea

GP West RI/FS 070188

Chemical Name	Preliminary Groundwater Screening Level for Unrestricted Land Use	Preliminary Groundwater Screening Level for Industrial Land Use	AMW-02 10/02/09 RI	AMW-02 04/06/10 RI	AMW-03 05/29/03 Pre-RI	AMW-03 10/02/09 RI	AMW-03 04/06/10 RI	ATW-A04 05/05/04 Pre-RI	ATW-AB04 05/05/04 Pre-RI	ATW-B01 05/05/04 Pre-RI	CP-MW04 09/29/09 RI	CP-MW04 04/05/10 RI	CP-MW06 10/02/09 RI	CP-MW06 04/05/10 RI	CP-MW13 12/17/10 RI	CP-MW13 12/17/10 Field Dup RI	CP-MW14 12/23/10 RI	CP-MW15 12/21/10 RI	CP-MW15 02/01/11 RI
Mercury																			
Dissolved Mercury in ug/L	0.94	0.94	41.7	28.1		14.1	11.1		0.8		0.00467	0.0169	4.9	8.65	0.406	0.399	1.26	619	232
Mercury Speciation																			
Dimethylmercury in ug/L																			
Mercury (acid-labile) in ug/L																			
Mercury (elemental) in ug/L																			
Methylmercury in ug/L	0.94	0.94																	
Toxic Metals																			
Dissolved Arsenic in ug/L	5	5																	97.2
Dissolved Cadmium in ug/L	8.8	8.8																	1.440
Dissolved Chromium in ug/L	240,000	240,000																	999
Dissolved Copper in ug/L	3.1	3.1																	56.9
Dissolved Lead in ug/L	8.1	8.1																	20.2
Dissolved Nickel in ug/L	8.2	8.2																	587
Dissolved Zinc in ug/L	81	81																	155
Conventional Chemistry Parameters (including other metals)																			
Alkalinity (Bicarbonate) in mg/L as CaCO3																			
Alkalinity (Carbonate) in mg/L as CaCO3																			
Alkalinity (Hydroxide) in mg/L as CaCO3																			
Alkalinity (Total) in mg/L as CaCO3			8,450	5,350		5,240	6,070						1,550	1,470	241 J	680 J	12,000	10,200	9,510
Bicarbonate in mg/L																	7,750	9.0 U	
Nitrate as Nitrogen in mg/L			5 UJ			2 U							5 UJ						2.5 U
Nitrite as Nitrogen in mg/L			20 U			2 U							10 U						
Bromide in ug/L			1,100 J			300 J							400 J						
Carbonate in mg/L																	4,240	9,500	
Chloride in mg/L			5,490	3,800		261	318						3,270	2,690					1,320
Fluoride in mg/L			2.1 J			5.7							2.3 J						
Sulfate in mg/L			52	10 J		25	23						30	23	0.64	0.67	20 U	32	18
Sulfide in mg/L			7.55	199		3.57	46.3						13.4	0.92	0.4	0.37	16.1	98.9	75.4
Calcium in mg/L																			
Dissolved Calcium in mg/L			14.3	12		6.69	4.33						6.92	12					15.4
Dissolved Iron in mg/L			7.27			4.94							2.3		0.102	0.0927	5.1	32.7	24.5
Magnesium in mg/L																			
Dissolved Magnesium in mg/L			0.692	1.04		0.163	0.0481 J						0.681	1.48					0.071 J
Manganese in mg/L																			
Dissolved Manganese in mg/L			0.0873			0.096							0.028		0.014	0.0132	0.0373	0.0201 UJ	0.014
Potassium in mg/L																			
Dissolved Potassium in mg/L			26.4	20.7		14.9	20.2						5.65	4.96					23
Sodium in mg/L																			
Dissolved Sodium in mg/L			7,550	5,080		2,660	3,160						2,820	2,490					4,730
Carbon, Dissolved Organic (DOC) in mg/L							644								11.6	10.9	786	2,580	2,600
Total Dissolved Solids in mg/L			21,800	14,900		9,770	11,000						8,240	6,640	1,590	1,610	38,100	10,900	19,000
Total Organic Carbon in ug/L																			
Total Suspended Solids in mg/L																			
Field Parameters																			
Conductivity in us/cm			27,700	18,920		9,018	1,030	16,070	10,150	7,843	72,340	70,130	12,870	10,500	2,551		49,760	17,250	
Dissolved Oxygen in mg/L			0.5	0.3		0.3	0.5	0.3	1.2		0.5	0.2	0.4	0.2	0.5		0.3	0.2	
Eh (ORP) in mVolts			-725	-417		-429	-493	-291	-346	-308	-306	-335	-598	-273	-41		-339	-376	
pH in pH units	6.0 - 8.5	6.0 - 8.5	10.0	9.8		11.8	12.2	10.9	8.0	10.0	7.1	6.8	9.3	8.9	7.9		9.1	11.2	
Salinity in g/L									5.75	4.36									
Temperature in deg C			17.6	11.5		17.9	12.3	14.5	16.4	16.4	16.2	15.0	18.8	14.2	15.0		16.0	15.5	

Notes

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Concentrations within bold border indicate value exceeds Preliminary Groundwater Screening Level for Industrial Land Use

J - Analyte was positively identified. The reported result is an estimate.

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Table 2 - Groundwater Chemistry Data, Mercury Source Area of Caustic Plume Subarea

GP West RI/FS 070188

Chemical Name	Preliminary Groundwater Screening Level for Unrestricted Land Use	Preliminary Groundwater Screening Level for Industrial Land Use	CP-MWA1 10/02/09 RI	CP-MWA1 10/02/09 Field Dup RI	CP-MWA1 04/06/10 RI	CP-MWA1 04/06/10 Field Dup RI	CP-MWC1 10/01/09 RI	CP-MWC1 04/06/10 RI	EMW-01S 07/08/93 Pre-RI	EMW-01S 12/09/93 Pre-RI	EMW-01S 05/29/03 Pre-RI	EMW-01S 10/02/09 RI	EMW-01S 03/31/10 RI	EMW-02S 07/08/93 Pre-RI	EMW-02S 12/09/93 Pre-RI	EMW-02S 10/01/09 RI	EMW-02S 04/05/10 RI	EMW-14S 12/09/93 Pre-RI	EMW-14S 10/01/09 RI	EMW-14S 04/05/10 RI
Mercury																				
Dissolved Mercury in ug/L	0.94	0.94	10.8	11.3	14.3 J	9.61 J	1.84	2.75	0.2 U	0.2 U		0.0167	0.0079	0.22	0.53	2.39	1.63	0.96	2.53	5.03
Mercury Speciation																				
Dimethylmercury in ug/L														5.00E-06						
Mercury (acid-labile) in ug/L														0.601						
Mercury (elemental) in ug/L														0.000176						
Methylmercury in ug/L	0.94	0.94												0.06125						
Toxic Metals																				
Dissolved Arsenic in ug/L	5	5																		
Dissolved Cadmium in ug/L	8.8	8.8																		
Dissolved Chromium in ug/L	240,000	240,000																		
Dissolved Copper in ug/L	3.1	3.1																		
Dissolved Lead in ug/L	8.1	8.1																		
Dissolved Nickel in ug/L	8.2	8.2																		
Dissolved Zinc in ug/L	81	81																		
Conventional Chemistry Parameters (including other metals)																				
Alkalinity (Bicarbonate) in mg/L as CaCO3										334				1,270	1,230			1,030		
Alkalinity (Carbonate) in mg/L as CaCO3										5 U				5 U	5 U			5 U		
Alkalinity (Hydroxide) in mg/L as CaCO3										5 U				5 U	5 U			5 U		
Alkalinity (Total) in mg/L as CaCO3			11,800	11,300	13,400	11,800	1,160	1,080		334				1,270	1,230	862	768	1,030	512	549
Bicarbonate in mg/L																				
Nitrate as Nitrogen in mg/L			5 U	5 UJ			5 U									5 U			5 U	
Nitrite as Nitrogen in mg/L			5 U	5 U			5 U									5 U			5 U	
Bromide in ug/L			100 U	5,000 U			200 J									300 J			5,000 U	
Carbonate in mg/L																				
Chloride in mg/L			1,980	1,920	2,160	1,780	598	658		180				20,200	16,800	700	391	26,000	514	628
Fluoride in mg/L			4.34 J	3.95 J			0.52 J									0.39 J			0.44 J	
Sulfate in mg/L			65	56	62	51	2 J	15		10 U				193	160	43	55.6	245	23	21.7
Sulfide in mg/L			13.5	14.3	296	269	6.2	6.76		0.05 U				0.45	0.05 U	0.643	2.06	1.9	1.19	0.769
Calcium in mg/L										51				170	77			46		
Dissolved Calcium in mg/L			19.1	18.3	6.11	6.52	4.57	3.8								10.2	3.8		5.78	6.96
Dissolved Iron in mg/L			9.84	9.74	10.1		0.455									1.68			0.924	
Magnesium in mg/L										8.1				85	33			13		
Dissolved Magnesium in mg/L			2.61	2.44	0.135	0.132	0.414	0.381								1.9	0.56		0.638	0.609
Manganese in mg/L										1.4				2.8	0.79			1.3		
Dissolved Manganese in mg/L			0.207	0.192	0.0199 J		0.0427									0.125			0.158	
Potassium in mg/L										3.4				58	34			12		
Dissolved Potassium in mg/L			52.3	52.3	61	64.6	3.61	3.1								3.81	2.22		1.79	2.06
Sodium in mg/L										210				13,000	9,600			4,300		
Dissolved Sodium in mg/L			7,730	7,570	7,740	8,070	983	978								880	663		531	712
Carbon, Dissolved Organic (DOC) in mg/L					2,270	2,320														
Total Dissolved Solids in mg/L			23,600	23,400	27,700	24,100	2,610	2,580						27,000		2,380	1,640		1,600	1,870
Total Organic Carbon in ug/L										600				13,100	2,200			5,100		
Total Suspended Solids in mg/L																				
Field Parameters																				
Conductivity in us/cm			22,830		18,000		3,956	3,910	2,280	1,410		1,347	1,175	49,400	42,600	3,354	2,643	19,630	2,601	2,926
Dissolved Oxygen in mg/L					0.4		0.4	0.5	1.5	1.9		0.7	0.4	3.3	1.8	0.7	0.4	1.2	0.4	0.3
Eh (ORP) in mVolts			-745		-432		-350	-321	-99	-107		-294	-129	-113	-78	-357	-255	-115	-332	-224
pH in pH units	6.0 - 8.5	6.0 - 8.5	11.0		11.1		9.6	9.8	7.3	7.3		7.0	7.0	7.0	6.5	7.7	8.9	7.9	8.5	9.2
Salinity in g/L									0.7	0.2				32.4	27.4			11.5		
Temperature in deg C			17.1		12.6		19.0	11.6	19.3	12.7		19.8	11.7	17.6	15.2	19.6	12.5	13.4	18.8	11.9

Notes

Concentrations in shaded cells indicate value exceeds Preliminary Groundwater Screening Level for Unrestricted Land Use

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Table 2 - Groundwater Chemistry Data, Mercury Source Area of Caustic Plume Subarea

GP West RI/FS 070188

Chemical Name	Preliminary Groundwater Screening Level for Unrestricted Land Use	Preliminary Groundwater Screening Level for Industrial Land Use	EMW-15S 12/16/93 Pre-RI	EMW-19S 12/10/93 Pre-RI	EMW-19S 02/18/94 Pre-RI	EMW-19S 10/02/09 RI	EMW-19S 04/05/10 RI	LAW-04 05/20/92 Pre-RI	LAW-04 07/07/92 Pre-RI	LAW-04 07/20/93 Pre-RI	LAW-04 12/10/93 Pre-RI	LAW-05 05/20/92 Pre-RI	LAW-05 07/07/92 Pre-RI	LAW-05 07/09/93 Pre-RI	LAW-05 12/16/93 Pre-RI
Mercury															
Dissolved Mercury in ug/L	0.94	0.94	1.3	460		18.5	28.5	0.2 U	1 U	0.2 U	0.2 U	0.2 U	1 U	9.4	2.7
Mercury Speciation															
Dimethylmercury in ug/L															
Mercury (acid-labile) in ug/L															
Mercury (elemental) in ug/L															
Methylmercury in ug/L	0.94	0.94													
Toxic Metals															
Dissolved Arsenic in ug/L	5	5													
Dissolved Cadmium in ug/L	8.8	8.8													
Dissolved Chromium in ug/L	240,000	240,000													
Dissolved Copper in ug/L	3.1	3.1													
Dissolved Lead in ug/L	8.1	8.1													
Dissolved Nickel in ug/L	8.2	8.2													
Dissolved Zinc in ug/L	81	81													
Conventional Chemistry Parameters (including other metals)															
Alkalinity (Bicarbonate) in mg/L as CaCO3			1,080	5.0 U							856				1,200
Alkalinity (Carbonate) in mg/L as CaCO3			5 U	5,440							5 U				5 U
Alkalinity (Hydroxide) in mg/L as CaCO3			5	3,940							5 U				5
Alkalinity (Total) in mg/L as CaCO3			1,080	9,380		1,710	4,900				856				1,200
Bicarbonate in mg/L															
Nitrate as Nitrogen in mg/L						5 UJ									
Nitrite as Nitrogen in mg/L						5 U									
Bromide in ug/L						5,000 U									
Carbonate in mg/L															
Chloride in mg/L			1,090	1,370		557	3,310				31,100				865
Fluoride in mg/L						10 U									
Sulfate in mg/L			10 U	1,220		601	296				266				10 U
Sulfide in mg/L			0.5 U	0.5 U		7.57	82.7				0.05 U				0.5 U
Calcium in mg/L			89	4.6							280				80
Dissolved Calcium in mg/L						5.96	9.9								
Dissolved Iron in mg/L						6.6									
Magnesium in mg/L			38	0.05 U							97				22
Dissolved Magnesium in mg/L						0.0411	0.0215 J								
Manganese in mg/L			0.81	0.01 U							4.3				0.28
Dissolved Manganese in mg/L						0.0451									
Potassium in mg/L			27	25							60				25
Dissolved Potassium in mg/L						8.87	25.2								
Sodium in mg/L			1,000	4,700							32,000				970
Dissolved Sodium in mg/L						1,480	4,310								
Carbon, Dissolved Organic (DOC) in mg/L															
Total Dissolved Solids in mg/L						4,520	13,700		20,000				6,900		
Total Organic Carbon in ug/L			48,800	55,100							500 U				45,800
Total Suspended Solids in mg/L								4,400	550			10,000	3,300		
Field Parameters															
Conductivity in us/cm			5,980	15,000		6,342	1,779				26,300			6,870	
Dissolved Oxygen in mg/L			2.8	0.6	3.0	0.4	0.4				2.9			1.2	
Eh (ORP) in mVolts				-312	-317	-641	-478				-125			52	
pH in pH units	6.0 - 8.5	6.0 - 8.5		11.9	13.2	10.9	11.1				6.8			8.0	
Salinity in g/L				8.5							15.8			2.2	
Temperature in deg C			10.4	10.5	11.4	19.2	12.4				12.0			19.5	

Notes

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Concentrations within bold border indicate value exceeds Preliminary Groundwater Screening Level for Industrial Land Use

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Table 3 - Soil Vapor and Ambient Air Chemistry Data, Mercury Source Area of Caustic Plume Subarea

GP West RI/FS 070188

			Soil Vapor							
Chemical Name	Unrestricted Soil Gas Screening Level	Industrial Soil Gas Screening Level	AS-03 05/28/2003 Pre-RI	AS-07 05/27/2003 Pre-RI	AS-12 05/28/2003 Pre-RI	AS-13 05/27/2003 Pre-RI	AS-14 05/28/2003 Pre-RI	AS-15 05/28/2003 Pre-RI	CP-MW01V 09/29/2009 RI	CP-MW02V 09/29/2009 RI
Mercury in ug/m3	1.4	3.0	**720.3**	0.158	0.142	0.779	0.143	0.117	0.01 U	0.02
Dimethylmercury in ug/m3			0.36	0.0084	0.0025	0.0025	0.0058	0.0011		

			Soil Vapor							
Chemical Name	Unrestricted Soil Gas Screening Level	Industrial Soil Gas Screening Level	CP-MW03V 09/29/2009 RI	CP-MW06V 09/29/2009 RI	CP-MWA1V 09/29/2009 RI	CP-MWA2V 09/29/2009 RI	CP-MWB1V 09/29/2009 RI	CP-MWC1V 09/29/2009 RI	CP-MWC2V 09/29/2009 RI	CP-VP01 04/01/2010 RI
Mercury in ug/m3	1.4	3.0	0.04	**339.9**	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.1
Dimethylmercury in ug/m3										

			Soil Vapor							
Chemical Name	Unrestricted Soil Gas Screening Level	Industrial Soil Gas Screening Level	CP-VP02 04/01/2010 RI	CP-VP03 04/01/2010 RI	CP-VP04 04/01/2010 RI	CP-VP05 02/18/2011 RI	CP-VP07 02/18/2011 RI	CP-VP08 02/18/2011 RI	CP-VP09 02/18/2011 RI	CP-VP10 02/18/2011 RI
Mercury in ug/m3	1.4	3.0	0.01	0.05	0.89	0.022	0.025	0.013	0.028	0.01
Dimethylmercury in ug/m3										

			Ambient Air	
Chemical Name	Unrestricted Air Screening Level	Industrial Air Screening Level	BG-AA01 02/19/2011 RI	CP-AA01 02/18/2011 RI
Mercury in ug/m3	0.14	0.3	0.003	1.28

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Gas or Air Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Gas or Air Screening Level

U - Analyte was not detected at or above the reported result.

Table 4 - Soil Chemistry Data, Law-1 Area

GP West RI/FS 070188

				Mercury Speciation				
				Mercury in mg/kg	Methylmercury in mg/kg	Elemental Mercury in mg/kg	Total Mercury in mg/kg	TCLP Mercury in µg/L
			Unrestricted Soil Screening Level	24 mg/kg	8 mg/kg			
			Industrial Soil Screening Level	***1050 mg/kg***	***350 mg/kg***			
Location Name	**Sample Name**	**Sample Date**	**Depth Interval**					
AS-04	AS-04SO-A	05/28/03	0 to 2.5 feet	0.217				
AS-04	AS-04SO-B	05/28/03	2.5 to 5 feet	0.065				
AS-04	AS-04SO-C	05/28/03	5 to 7.5 feet	0.063				
AS-04	AS-54SO-C	05/28/03	5 to 7.5 feet	0.064				
AS-04	AS-04SO-D	05/28/03	7.5 to 10 feet	0.119				
CP-MW02	CP-MW02-1.5-2.5	09/16/09	1.5 to 2.5 feet	0.038				
CP-MW02	CP-MW02-10-12	09/16/09	10 to 12 feet	0.064				
CP-MW03	CP-MW03-1.5-2.5	09/16/09	1.5 to 2.5 feet	0.709				
CP-MW03	CP-MW03-13-15	09/16/09	13 to 15 feet	1050				
CP-MW05	CP-MW05-2.5-4	09/17/09	2.5 to 4 feet	32.2				
CP-MW05	CP-MW05-5-6.5	09/17/09	5 to 6.5 feet	4.67				
CP-MW05	CP-MW05-7.5-9	09/17/09	7.5 to 9 feet	23.7				
CP-MW05	CP-MW05-10-11.5	09/17/09	10 to 11.5 feet	101				
CP-MW05	CP-MW05-12.5-14	09/17/09	12.5 to 14 feet	375				
CP-MW05	CP-MW05-15-16.5	09/17/09	15 to 16.5 feet	14.6				
CP-MW05	CP-MW05-17.5-19	09/17/09	17.5 to 19 feet	33.8				
CP-MW05	CP-MW05-20-21.5	09/17/09	20 to 21.5 feet	4.02				
CP-MW05	CP-MW05-22-23	09/21/09	22 to 23 feet	0.078				
CP-MW05	CP-MW05-26-27	09/21/09	26 to 27 feet	0.031				
CP-MW05	CP-MW05-38-39	09/21/09	38 to 39 feet	0.014 J				
CP-MW05	CP-MW05-30-31	09/21/09	30 to 31 feet	0.015 J				
CP-MW05	CP-MW05-34-35	09/21/09	34 to 35 feet	0.019				
EMW-3S	EMW-3S-05	06/04/93	5 to 6.5 feet	0.12 U				
EMW-3S	EMW-3S-10	06/04/93	10 to 11.5 feet	0.12 U				
EMW-3S	EMW-3S-18	06/04/93	18 to 19.5 feet	0.12 U				
ESB-14S	ESB-14S-05	06/03/93	5 to 6.5 feet	0.60				
ESB-14S	ESB-14S-10	06/03/93	10 to 11.5 feet	200				27
ESB-14S	ESB-14S-22	06/03/93	22 to 23.5 feet	0.13 U				
ESB-16S	ESB-16S-05	06/03/93	5 to 6.5 feet	140				
ESB-16S	ESB-16S-10	06/03/93	10 to 11.5 feet	31				4.8
ESB-16S	ESB-16S-18	06/03/93	18 to 19.5 feet	5.7				
ESB-17S	ESB-17S-07	06/01/93	7 to 8.5 feet	0.37				
ESB-17S	ESB-17S-11	06/01/93	11 to 12.5 feet	1.5323	0.001837	0.0015	1.5323	
ESB-17S	ESB-17S-11	06/01/93	11 to 12.5 feet	0.14	0.001837	0.0015	1.5323	
ESB-17S	ESB-17S-20	06/01/93	20 to 21.5 feet	1.1				
ESB-18S	ESB-18S-05	06/01/93	5 to 6.5 feet	0.13				
ESB-18S	ESB-18S-10	06/01/93	10 to 11.5 feet	0.43				
ESB-18S	ESB-18S-14	06/01/93	14 to 15.5 feet	74				
ESB-18S	ESB-18S-25	06/01/93	25 to 26.5 feet	0.11 U				
L1-MW01	FD-L1-2	12/16/10	7 to 9 feet	1.22				
L1-MW01	L1-MW01-3-4	12/16/10	3 to 4 feet	0.195				
L1-MW01	L1-MW01-7-9	12/16/10	7 to 9 feet	1.02				
L1-MW01	L1-MW01-11-13	12/16/10	11 to 13 feet	3.72				
L1-MW01	L1-MW01-14-15	12/16/10	14 to 15 feet	51.5				
L1-MW02	FD-L1-3	12/17/10	7 to 9 feet	7.57				
L1-MW02	L1-MW02-4-5	12/17/10	4 to 5 feet	0.219				
L1-MW02	L1-MW02-7-9	12/17/10	7 to 9 feet	6.49				
L1-MW02	L1-MW02-11-12	12/17/10	11 to 12 feet	3.37				
L1-MW02	L1-MW02-13-14	12/17/10	13 to 14 feet	0.075				
L1-MW02	L1-MW02-16-17	12/17/10	16 to 17 feet	0.143				
L1-MW03	FD-L1-1	12/15/10	7 to 9 feet	0.120				
L1-MW03	L1-MW03-4-5	12/15/10	4 to 5 feet	3.01				
L1-MW03	L1-MW03-7-9	12/15/10	7 to 9 feet	0.121				
L1-MW03	L1-MW03-11-12	12/15/10	11 to 12 feet	0.356				

Table 4 - Soil Chemistry Data, Law-1 Area

GP West RI/FS 070188

					Mercury Speciation			
				Mercury in mg/kg	Methylmercury in mg/kg	Elemental Mercury in mg/kg	Total Mercury in mg/kg	TCLP Mercury in µg/L
			Unrestricted Soil Screening Level	24 mg/kg	8 mg/kg			
			Industrial Soil Screening Level	***1050 mg/kg***	***350 mg/kg***			
Location Name	**Sample Name**	**Sample Date**	**Depth Interval**					
L1-MW03	L1-MW03-13-14	12/15/10	13 to 14 feet	0.256				
L1-MW03	L1-MW03-15-16	12/15/10	15 to 16 feet	0.147				
L1-MW04	L1-MW04-3-4	12/16/10	3 to 4 feet	62.0				
L1-MW04	L1-MW04-5-7	12/16/10	5 to 7 feet	48.7				
L1-MW04	L1-MW04-8-10	12/16/10	8 to 10 feet	***1760***				7.8
L1-MW04	L1-MW04-10-12	12/16/10	10 to 12 feet	5.65				
L1-MW04	L1-MW04-13-15	12/16/10	13 to 15 feet	3.31				
L1-MW05	L1-MW05-3-5	12/15/10	3 to 5 feet	22.5				
L1-MW05	L1-MW05-7-9	12/15/10	7 to 9 feet	108				85.9
L1-MW05	L1-MW05-11-12	12/15/10	11 to 12 feet	5.26				
L1-MW05	L1-MW05-13-14	12/15/10	13 to 14 feet	7.08				
L1-MW05	L1-MW05-16-18	12/15/10	16 to 18 feet	1.27				
L1-MW06	L1-MW06-3-5	01/31/11	3 to 5 feet	0.031				
L1-MW06	L1-MW06-5-7	01/31/11	5 to 7 feet	0.276				
L1-MW06	L1-MW06-13-14	01/31/11	13 to 14 feet	0.065				
L1-MW06	L1-MW06-16-17	01/31/11	16 to 17 feet	0.856				
SITE-2	SITE-2-GP-CP-EX	07/01/98	0 to 0.5 feet	42				0.1 U
SITE-3	SITE-3-GP-CP-EX	07/01/98	0 to 0.5 feet	82				0.7
SITE-4	SITE-4-GP-CP-EX	07/01/98	0 to 0.5 feet	10				0.1 U
SITE-5	SITE-5-GP-CP-EX	07/01/98	0 to 0.5 feet	21				0.1 U
SITE-6	SITE-6-GP-CP-EX	07/01/98	0 to 0.5 feet	1				0.3
STB-01	STB-01-3.5-5	05/11/92	3.5 to 5 feet	0.9				
STB-01	STB-01-7.5-9	05/11/92	7.5 to 9 feet	0.1 U				
STB-01	STB-01-11.5-13	05/11/92	11.5 to 13 feet	0.6				
STB-01	STB-01-15-16.5	05/11/92	15 to 16.5 feet	0.8				
STB-12	STB-12-3.5-5	05/14/92	3.5 to 5 feet	0.9				
STB-12	STB-12-7.5-9	05/14/92	7.5 to 9 feet	16				
STB-15	STB-15-3.5-5	05/15/92	3.5 to 5 feet	69				
STB-15	STB-15-7.5-9	05/15/92	7.5 to 9 feet	0.9				

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Level.

Concentrations in shaded cells with bold italicized text indicate value exceeds Industrial Soil Screening Level.

U - Analyte was not detected at or above the reported result.

Table 5 - Groundwater Chemistry Data, Law-1 Area

GP West RI/FS 070188

Chemical Name	Preliminary Groundwater Screening Level for Unrestricted Land Use	Preliminary Groundwater Screening Level for Industrial Land Use	CP-MW02 10/01/09 RI	CP-MW02 04/05/10 RI	CP-MW03 09/28/09 RI	CP-MW03 03/31/10 RI	CP-MW03 12/17/10 RI	CP-MW05 09/28/09 RI	CP-MW05 09/28/09 Field Dup RI	CP-MW05 03/31/10 RI	CP-MW10 04/05/10 RI	CP-MW10 12/16/10 RI	EMW-03S 07/08/93 Pre-RI	EMW-03S 07/20/93 Pre-RI	EMW-03S 12/09/93 Pre-RI
Mercury															
Dissolved Mercury in ug/L	0.94	0.94	0.0812	0.0979	0.763	0.391	0.48	0.00599	0.00439	0.0027	0.0297	0.00979		0.2 U	0.2 U
Mercury Speciation															
Dimethylmercury in ug/L															
Mercury (acid-labile) in ug/L															
Mercury (elemental) in ug/L															
Methylmercury in ug/L	0.94	0.94													
Conventional Chemistry Parameters (including other metals)															
Alkalinity (Bicarbonate) in mg/L as CaCO3															621
Alkalinity (Carbonate) in mg/L as CaCO3															5 U
Alkalinity (Hydroxide) in mg/L as CaCO3															5 U
Alkalinity (Total) in mg/L as CaCO3					714	846	964								621
Bicarbonate in mg/L															
Bromide in ug/L					1,500 J										
Calcium in mg/L															330
Carbon, Dissolved Organic (DOC) in mg/L							60					73			
Carbonate in mg/L															
Chloride in mg/L					4,140	2,160									3,530
Conductivity in umhos/cm							9,440					32,600			
Dissolved Calcium in mg/L					32.4	60.4									
Dissolved Iron in mg/L					1.2		2.01								
Dissolved Magnesium in mg/L					9.1	39.6									
Dissolved Manganese in mg/L					1.09		1.47								
Dissolved Potassium in mg/L					14.4	25									
Dissolved Sodium in mg/L					3,180	2,100									
Fluoride in mg/L					4 U										
Magnesium in mg/L															100
Manganese in mg/L															2.9
Nitrate as Nitrogen in mg/L					2 U										
Nitrite as Nitrogen in mg/L					2 U										
pH in pH units	6.0 - 8.5	6.0 - 8.5													
Potassium in mg/L															90
Sodium in mg/L															85,000
Sulfate in mg/L					276	222	434					44.9			356
Sulfide in mg/L					0.346	0.025	0.03					2.18			0.05 U
Total Dissolved Solids in mg/L					8,520	5,260	6,500					22,500			
Total Organic Carbon in ug/L															1,800
Total Suspended Solids in mg/L															
Field Parameters															
Conductivity in us/cm			104,300	9,026	14,580	8,454	10,120	28,600		27,380	4,954	40,010	234,200		158,030
Dissolved Oxygen in mg/L			0.3	0.4	0.2	0.7	0.7	0.5		0.7	2.2	2.6	0.3		1.7
Eh (ORP) in mVolts			-216	-171	-292	-142	-74	-278		-225	-89	-70	-44		36
pH in pH units	6.0 - 8.5	6.0 - 8.5	7.1	7.2	7.2	7.3	7.0	7.5		7.5	6.9	7.0	6.1		5.7
Salinity in g/L													274.1		145.6
Temperature in deg C			18.3	12.5	15.3	10.7	13.9	13.7		12.9	10.4	10.8	14.5		12.6

Notes

Concentrations in shaded cells indicate value exceeds Preliminary Groundwater Screening Level for Unrestricted Land Use

Concentrations within bold border indicate value exceeds Preliminary Groundwater Screening Level for Industrial Land Use

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

Table 5 - Groundwater Chemistry Data, Law-1 Area

GP West RI/FS 070188

Chemical Name	Preliminary Groundwater Screening Level for Unrestricted Land Use	Preliminary Groundwater Screening Level for Industrial Land Use	L1-MW01 12/19/10 RI	L1-MW01 01/31/11 RI	L1-MW02 12/19/10 RI	L1-MW02 01/31/11 RI	L1-MW02 01/31/11 Field Dup RI	L1-MW03 12/16/10 RI	L1-MW03 01/31/11 RI	L1-MW04 01/06/11 RI	L1-MW05 12/16/10 RI	L1-MW05 12/16/10 Field Dup RI	L1-MW06 01/31/11 RI	L1-WP01 12/16/10 RI	L1-WP01 01/31/11 RI	L1-WP01 02/01/11 RI
Mercury																
Dissolved Mercury in ug/L	0.94	0.94	0.46	14.6	35	2.09	2.06	0.025	0.0224	0.317	4.06	3.97	0.432	1.34	0.125	0.0738
Mercury Speciation																
Dimethylmercury in ug/L																
Mercury (acid-labile) in ug/L																
Mercury (elemental) in ug/L																
Methylmercury in ug/L	0.94	0.94														
Conventional Chemistry Parameters (including other metals)																
Alkalinity (Bicarbonate) in mg/L as CaCO3																
Alkalinity (Carbonate) in mg/L as CaCO3																
Alkalinity (Hydroxide) in mg/L as CaCO3																
Alkalinity (Total) in mg/L as CaCO3			1,500		1,340			1,410		1,120	1,020	1,020		335		
Bicarbonate in mg/L			1,260		913											
Bromide in ug/L																
Calcium in mg/L																
Carbon, Dissolved Organic (DOC) in mg/L			288	248	171	116	104	94	89.0	56.2	102	98	689	21	7.9	7.88
Carbonate in mg/L			240		422											
Chloride in mg/L																
Conductivity in umhos/cm			15,100		2,880			45,100		3,840	2,770			1,610		
Dissolved Calcium in mg/L																
Dissolved Iron in mg/L			3.78		5.68			25.1		0.602	30.7 J	2.89 J		0.191		
Dissolved Magnesium in mg/L																
Dissolved Manganese in mg/L			0.419		0.355			11.6		0.561	0.733 J	0.142 J		0.0032 J		
Dissolved Potassium in mg/L																
Dissolved Sodium in mg/L																
Fluoride in mg/L																
Magnesium in mg/L																
Manganese in mg/L																
Nitrate as Nitrogen in mg/L																
Nitrite as Nitrogen in mg/L																
pH in pH units	6.0 - 8.5	6.0 - 8.5								7.48						
Potassium in mg/L																
Sodium in mg/L																
Sulfate in mg/L			95		187			86		437	112	112		182		
Sulfide in mg/L			7.04	5.68	3.13	1.39	1.31	2.38	0.0511	0.124	1.98	2.1	85.3	2.75	0.0493	0.0056
Total Dissolved Solids in mg/L			10,400		2,470			35,000		2,670	2,780	3,040		1,060		
Total Organic Carbon in ug/L																
Total Suspended Solids in mg/L																
Field Parameters																
Conductivity in us/cm			15,430	1,245	30,510	2,578		45,710	43,890	4,053	2,521		3,587	1,631	3,152	4,260
Dissolved Oxygen in mg/L			0.3	0.3	0.1	0.5		1.9	1.0	0.6	0.8		-0.1	5.7	5.1	6.1
Eh (ORP) in mVolts			-161	-275	-128	-208		-65	-91	-591	-51		-351	-62	-96	-113
pH in pH units	6.0 - 8.5	6.0 - 8.5	8.9	10.1	8.8	9.0		6.9	9.6	7.2	7.7		7.8	7.8	7.5	7.7
Salinity in g/L																
Temperature in deg C			11.6	10.4	12.3	11.1		12.1	8.0	12.1	11.1		12.8	7.1	6.0	6.2

Notes

Concentrations in shaded cells indicate value exceeds Preliminary Groundwater Screening Level for Unrestricted Land Use

Concentrations within bold border indicate value exceeds Preliminary Groundwater Screening Level for Industrial Land Use

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U - Analyte was not detected at or above the reported result.

Table 5 - Groundwater Chemistry Data, Law-1 Area

GP West RI/FS 070188

Chemical Name	Preliminary Groundwater Screening Level for Unrestricted Land Use	Preliminary Groundwater Screening Level for Industrial Land Use	L1-WP02 01/31/11 RI	L1-WP02 02/01/11 RI	L1-WP03 01/31/11 RI	L1-WP03 02/01/11 RI	LAW-01 05/20/92 Pre-RI	LAW-01 07/07/92 Pre-RI	LAW-01 07/08/93 Pre-RI	LAW-01 12/08/93 Pre-RI	LAW-01 09/29/09 RI	LAW-01 03/31/10 RI	LAW-01 12/16/10 RI	LAW-01 01/31/11 RI	LAW-08 05/20/92 Pre-RI	LAW-08 07/07/92 Pre-RI
Mercury																
Dissolved Mercury in ug/L	0.94	0.94	0.131	0.164	0.0511	0.0533	2	4	1.5	1.4	20.4	32.6	1.03	17.8	0.2 U	1 U
Mercury Speciation																
Dimethylmercury in ug/L									0.000295							
Mercury (acid-labile) in ug/L									0.341							
Mercury (elemental) in ug/L									0.000516							
Methylmercury in ug/L	0.94	0.94							0.073061							
Conventional Chemistry Parameters (including other metals)																
Alkalinity (Bicarbonate) in mg/L as CaCO3									1,090	652						
Alkalinity (Carbonate) in mg/L as CaCO3									5 U	5 U						
Alkalinity (Hydroxide) in mg/L as CaCO3									5 U	5 U						
Alkalinity (Total) in mg/L as CaCO3									1,090	652	1,620	1,280	1,390			
Bicarbonate in mg/L																
Bromide in ug/L											2,600 J					
Calcium in mg/L									260	210						
Carbon, Dissolved Organic (DOC) in mg/L			29	22.6	17.9	18.6							226	176		
Carbonate in mg/L																
Chloride in mg/L									24,100	133,000	6,900	2,960				
Conductivity in umhos/cm													9,890			
Dissolved Calcium in mg/L											40.2	24.3				
Dissolved Iron in mg/L											3.26		4.07			
Dissolved Magnesium in mg/L											18.8	9.87				
Dissolved Manganese in mg/L											0.559		0.306			
Dissolved Potassium in mg/L											26.2	17.9				
Dissolved Sodium in mg/L											2,560	3,570				
Fluoride in mg/L											0.87 J					
Magnesium in mg/L									100	88						
Manganese in mg/L									7.9	3.4						
Nitrate as Nitrogen in mg/L											5 U					
Nitrite as Nitrogen in mg/L											10 U					
pH in pH units	6.0 - 8.5	6.0 - 8.5														
Potassium in mg/L									40	56						
Sodium in mg/L									12,000	16,000						
Sulfate in mg/L									142	733	110	166	154			
Sulfide in mg/L			3.78	3.08	0.0262	0.135			8.5	0.05 U	14.6	15.1	10.33	6.98		
Total Dissolved Solids in mg/L								33,000	25,000		14,600	7,840	6,770			15,000
Total Organic Carbon in ug/L									4,500	500 U						
Total Suspended Solids in mg/L							630	900							9,200	2,200
Field Parameters																
Conductivity in us/cm			6,642	2,972	10,820	6,983			62,300	48,930	22,220	11,240	9,044	9,415		
Dissolved Oxygen in mg/L			0.7	1.9	1.1	4.0			1.3	1.2	0.5	0.6	1.3	0.2		
Eh (ORP) in mVolts			-203	-120	-176	-115			-169	-46	-301	-296	-178	-311		
pH in pH units	6.0 - 8.5	6.0 - 8.5	8.5	8.4	8.0	8.2			7.0	7.3	8.1	8.9	8.6	10.2		
Salinity in g/L									41.9	32.4						
Temperature in deg C			7.4	7.0	6.7	6.8			14.0	11.3	15.4	10.1	12.2	10.3		

Notes

Concentrations in shaded cells indicate value exceeds Preliminary Groundwater Screening Level for Unrestricted Land Use

Concentrations within bold border indicate value exceeds Preliminary Groundwater Screening Level for Industrial Land Use

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

Table 6 - Groundwater Elevations in LAW-1 Area - 2/3/2011

GP West Site IA Investigation Report

Well	TOC Elevation in FT MLLW	Depth to Water in FT	Groundwater Elevation in FT MLLW
L1-WP-2	6.41	1.16	5.25
L1-WP-3	6.74	1.20	5.54
L1-WP-1	8.12	2.12	6.00
AMW-01	14.81	7.72	7.09
L1-MW03	13.30	6.04	7.26
L1-MW06	14.00	6.40	7.60
CP-MW02	12.37	4.66	7.71
L1-MW01	13.20	4.92	8.28
LAW-1	14.89	6.47	8.42
L1-MW02	13.60	4.31	9.29
CP-MW10	12.85	3.29	9.56
LAW-8	13.94	3.94	10.00
L1-MW04	14.32	1.25	13.07
L1-MW05	14.36	1.26	13.10
CP-MW03	14.85	1.74	13.11

Notes:

Depth to water measurements were taken at approximatly 12:00 pm on February 3, 2011, the tide elevation was approximatly 5 FT MLLW, near the high-low tide.

Table 7 - Soil Chemistry Data, Million Gallon Tanks Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	AS-08 (0-2.5 ft) 05/28/2003 Pre-RI	AS-08 (2.5-5 ft) 05/28/2003 Pre-RI	AS-08 (5-7.5 ft) 05/28/2003 Pre-RI	AS-08 (7.5-10 ft) 05/28/2003 Pre-RI	BK-04 (0-0.5 ft) 07/06/1992 Pre-RI	EMW-12S FD (5-6.5 ft) 05/25/1993 Pre-RI	EMW-12S (5-6.5 ft) 05/25/1993 Pre-RI	EMW-12S (10-11.5 ft) 05/25/1993 Pre-RI	EMW-12S (14-15.5 ft) 05/25/1993 Pre-RI	MG-MW01 (2.5-4 ft) 07/19/2004 Pre-RI	MG-MW01 (7.5-9 ft) 07/19/2004 Pre-RI	MG-MW02 (1-1.5 ft) 03/25/2010 RI	MG-MW02 (1.5-2 ft) 03/25/2010 RI	MG-MW02 (2-3 ft) 03/25/2010 RI	MG-MW02 FD (5-6 ft) 03/25/2010 RI	MG-MW02 (5-6 ft) 03/25/2010 RI
Total Petroleum Hydrocarbons																			
Gasoline Range Hydrocarbons in mg/kg	100	100										5.2 U	6.5 U						
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	410	220	84	1,400						160							
Oil (C25-C36) in mg/kg	2,000	2,000	2,400	630	200	890						1,100							
Bunker C in mg/kg	2,000	2,000											2,700						
Total TPHs in mg/kg	2,000	2,000	2,810	850	284	2,290						1,260	2,700						
Mercury																			
Mercury in mg/kg	24	1,050	4.217	0.199	0.809	0.351	0.6	0.12 U	0.11 U	0.11 U	0.13 U	0.12	0.22	0.235	0.515	0.054	0.514	0.482	
Other Metals																			
Arsenic in mg/kg	20	20										10 U	7 U						
Cadmium in mg/kg	2	2										0.5 U	0.5						
Chromium in mg/kg	1,000,000	1,000,000										41.0	44.2						
Copper in mg/kg	3,000	130,000										29.3	25.3						
Lead in mg/kg												10	19						
Nickel in mg/kg	1,600	70,000										19	21						
Zinc in mg/kg	24,000	1,100,000										50	55.0						
Polycyclic Aromatic Hydrocarbons (PAHs)																			
Acenaphthene in mg/kg	4,800	210,000																	
Acenaphthylene in mg/kg																			
Anthracene in mg/kg	24,000	1,100,000																	
Benzo(g,h,i)perylene in mg/kg																			
Fluoranthene in mg/kg	3,200	140,000																	
Fluorene in mg/kg	3,200	140,000																	
Phenanthrene in mg/kg																			
Pyrene in mg/kg	2,400	110,000																	
2-Methylnaphthalene in mg/kg	320	14,000																	
Naphthalene in mg/kg	5.3	11																	
Total Naphthalenes in mg/kg	5.3	11																	
Benz(a)anthracene in mg/kg																			
Benzo(a)pyrene in mg/kg	0.14	0.6																	
Benzo(b)fluoranthene in mg/kg																			
Benzo(k)fluoranthene in mg/kg																			
Chrysene in mg/kg																			
Dibenzo(a,h)anthracene in mg/kg																			
Indeno(1,2,3-cd)pyrene in mg/kg																			
Total cPAHs TEF in mg/kg	0.14	0.6																	
Other Semivolatiles																			
Dibenzofuran in mg/kg	160	7,000																	
Conventional Chemistry Parameters (including other metals)																			
pH in pH units												7.79	7.71						

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Screening Level

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 7 - Soil Chemistry Data, Million Gallon Tanks Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	MG-MW02 (8-9 ft) 03/25/2010 RI	MG-MW04 (2-3 ft) 12/17/2010 RI	MG-MW04 (6-7 ft) 12/17/2010 RI	MG-MW04 (7-8 ft) 12/17/2010 RI	MG-MW04 (9-10 ft) 12/17/2010 RI	MG-MW04 (11-12 ft) 12/17/2010 RI	MG-MW05 FD (2-3 ft) 12/16/2010 RI	MG-MW05 (2-3 ft) 12/16/2010 RI	MG-MW05 (5-6 ft) 12/16/2010 RI	MG-MW05 (7-8 ft) 12/16/2010 RI	MG-MW05 (9-10 ft) 12/16/2010 RI	MG-MW05 (11-12 ft) 12/16/2010 RI	MG-SB01 (0-2 ft) 07/21/2004 Pre-RI	MG-SB01 (2-3 ft) 07/21/2004 Pre-RI	MG-SB02 (0-4 ft) 07/22/2004 Pre-RI	MG-SB02 (4-8 ft) 07/22/2004 Pre-RI
Total Petroleum Hydrocarbons																		
Gasoline Range Hydrocarbons in mg/kg	100	100														6.0 U	5.1 U	6.4 U
Diesel Range Hydrocarbons in mg/kg	2,000	2,000		44	22 UJ	650	230	270	71	66	36	270	16 UJ	100	120 J	66	250	49
Oil (C25-C36) in mg/kg	2,000	2,000		480	69 UJ	1,100	360	900	290	300	110 UJ	900	41 UJ	200	320 J	130	2,400	240
Bunker C in mg/kg	2,000	2,000																
Total TPHs in mg/kg	2,000	2,000		524 J	91.0 J	1,750 J	590 J	1,170 J	361 J	366 J	146 J	1,170 J	57.0 J	300 J	440 J	196	2,650	289
Mercury																		
Mercury in mg/kg	24	1,050	0.058												0.67 J	2.26 J	0.50	0.09
Other Metals																		
Arsenic in mg/kg	20	20													5 U	5 U	5 U	6 U
Cadmium in mg/kg	2	2													0.3	0.2 U	0.2	0.8
Chromium in mg/kg	1,000,000	1,000,000													36.0	34.4	35.0 J	29.7 J
Copper in mg/kg	3,000	130,000													137	58.6	34.8 J	35.3 J
Lead in mg/kg															52	34	58 J	52 J
Nickel in mg/kg	1,600	70,000													24	26	35	29
Zinc in mg/kg	24,000	1,100,000													328 J	84.3 J	71.4 J	74.2 J
Polycyclic Aromatic Hydrocarbons (PAHs)																		
Acenaphthene in mg/kg	4,800	210,000				0.14		0.52	0.61 J	0.35 J			0.12					
Acenaphthylene in mg/kg						0.041		0.43	0.0085	0.0066			0.004					
Anthracene in mg/kg	24,000	1,100,000				0.063		2.3	0.13	0.092			0.029					
Benzo(g,h,i)perylene in mg/kg						0.041		1.7	0.04	0.037			0.028					
Fluoranthene in mg/kg	3,200	140,000				0.47		9.4	0.57	0.47			0.14					
Fluorene in mg/kg	3,200	140,000				0.1		1.1	0.67 J	0.39 J			0.11					
Phenanthrene in mg/kg						0.41		5.5	1.2	0.84			0.24					
Pyrene in mg/kg	2,400	110,000				0.27		6.9	0.41	0.38			0.12					
2-Methylnaphthalene in mg/kg	320	14,000				0.17		1.5	0.14	0.092			0.24					
Naphthalene in mg/kg	5.3	11				1.1		1.8	0.15	0.12			0.6					
Total Naphthalenes in mg/kg	5.3	11				1.27		3.3	0.29	0.212			0.84					
Benz(a)anthracene in mg/kg						0.052		3.2	0.098	0.098			0.03					
Benzo(a)pyrene in mg/kg	0.14	0.6				0.042		3.2	0.057	0.057			0.021					
Benzo(b)fluoranthene in mg/kg						0.06		3.2	0.1	0.099			0.026					
Benzo(k)fluoranthene in mg/kg						0.018		1.3	0.034	0.03			0.012					
Chrysene in mg/kg						0.052		3.5	0.13	0.093			0.044					
Dibenzo(a,h)anthracene in mg/kg						0.0053		0.32	0.0084	0.0084			0.0035 UJ					
Indeno(1,2,3-cd)pyrene in mg/kg						0.029		1.8	0.034	0.032			0.02					
Total cPAHs TEF in mg/kg	0.14	0.6				0.059		4.22	0.0857	0.0847			0.0306					
Other Semivolatiles																		
Dibenzofuran in mg/kg	160	7,000				0.11		0.87	0.4 J	0.22 J			0.11					
Conventional Chemistry Parameters (including other metals)																		
pH in pH units															7.89	7.60	8.29	8.10

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Leve

Concentrations within bold border indicate value exceeds Industrial Soil Screening Lev

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 7 - Soil Chemistry Data, Million Gallon Tanks Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	MG-SB03 (0-4 ft) 07/22/2004 Pre-RI	MG-SB03 (4-8 ft) 07/22/2004 Pre-RI	MG-SB03 (8-12 ft) 07/22/2004 Pre-RI	MG-SB04 (2-4 ft) 09/14/2009 RI	MG-SB04 (6-8 ft) 09/14/2009 RI	MG-SB04 (11-12 ft) 09/14/2009 RI	MG-SB04 (16-18 ft) 09/14/2009 RI	MG-SB05 (2-4 ft) 09/14/2009 RI	MG-SB05 (7-8 ft) 09/14/2009 RI	MG-SB05 (10-11 ft) 09/14/2009 RI	MG-SB05 (14-15 ft) 09/14/2009 RI	MG-SB06 (3-5 ft) 09/21/2009 RI	MG-SB06 (7-8 ft) 09/21/2009 RI	MG-SB06 (10-11 ft) 09/21/2009 RI
Total Petroleum Hydrocarbons																
Gasoline Range Hydrocarbons in mg/kg	100	100	5.7 U	6.1 U	6.6 U											
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	17	26	74	63	160	370	22 J	81	5.5 J	16 J	43 J	230	200	30 U
Oil (C25-C36) in mg/kg	2,000	2,000	180	190	760	61 J	440	760	50 J	290	12 J	18 J	110 J	150	250	49 J
Bunker C in mg/kg	2,000	2,000														
Total TPHs in mg/kg	2,000	2,000	197	216	834	124 J	600	1,130	72 J	371	17.5 J	34 J	153 J	380	450	64 J
Mercury																
Mercury in mg/kg	24	1,050	0.10	0.05 U												
Other Metals																
Arsenic in mg/kg	20	20	6 U	6 U												
Cadmium in mg/kg	2	2	1.3	0.2 U												
Chromium in mg/kg	1,000,000	1,000,000	21.0 J	27.3 J												
Copper in mg/kg	3,000	130,000	10.9 J	12.2 J												
Lead in mg/kg			11 J	8 J												
Nickel in mg/kg	1,600	70,000	15	17												
Zinc in mg/kg	24,000	1,100,000	26.3 J	26.9 J												
Polycyclic Aromatic Hydrocarbons (PAHs)																
Acenaphthene in mg/kg	4,800	210,000				0.01	0.52	0.063	0.013	0.036	0.0041	1.1	0.023	7.7	14	1.7
Acenaphthylene in mg/kg						0.001 J	0.0052	0.019	0.0041	0.0063	0.00039 J	0.0061	0.0015 J	0.02 U	0.034	0.0054 U
Anthracene in mg/kg	24,000	1,100,000				0.0085	0.084	0.032	0.0069	0.018	0.0013 J	0.072	0.0056 J	2.8	1.4	0.45
Benzo(g,h,i)perylene in mg/kg						0.024	0.028	0.059	0.01	0.15	0.00095 J	0.0095	0.0036 J	0.085	0.084	0.018
Fluoranthene in mg/kg	3,200	140,000				0.1	0.34	0.21	0.028	0.22	0.0078	0.46	0.053	6.9	4.9	1.2
Fluorene in mg/kg	3,200	140,000				0.0085	0.44	0.05	0.0078	0.039	0.0028	0.76	0.016	6.1	7.3	1.4
Phenanthrene in mg/kg						0.056	0.65	0.18	0.033	0.19	0.0099	1.3	0.036	14	15	4.1
Pyrene in mg/kg	2,400	110,000				0.088	0.34	0.24	0.03	0.35	0.0076	0.35	0.052	4.4 J	3.2 J	0.96 J
2-Methylnaphthalene in mg/kg	320	14,000				0.0067	0.18	0.044	0.0088	0.013	2.7 U	0.75	0.016	4.1	10	1.4
Naphthalene in mg/kg	5.3	11				0.0095 U	0.21	0.18	0.035	0.018	0.014 U	2.6	0.062	17	50	6.5
Total Naphthalenes in mg/kg	5.3	11				0.0115	0.39	0.224	0.0438	0.031	ND	3.35	0.078	21.1	60.0	7.9
Benz(a)anthracene in mg/kg						0.039	0.16	0.052	0.0093	0.36	0.002 J	0.056	0.0078 J	1	0.38	0.17
Benzo(a)pyrene in mg/kg	0.14	0.6				0.034	0.077	0.06	0.011	0.23	0.00099 J	0.015	0.0034 J	0.32	0.17	0.048
Benzo(b)fluoranthene in mg/kg						0.05	0.078	0.075	0.012	0.39	0.0017 J	0.029	0.0075 J	0.64	0.22	0.086
Benzo(k)fluoranthene in mg/kg						0.016	0.017	0.023	0.0042	0.11	0.00042 J	0.0062	0.0018 J	0.2	0.067	0.027
Chrysene in mg/kg						0.041	0.18	0.057	0.011	0.37	0.002 J	0.032	0.0035 J	1.1	0.37	0.17
Dibenzo(a,h)anthracene in mg/kg						0.006	0.018	0.0068	0.0013 J	0.04	0.0027 U	0.0011 J	0.011 U	0.029	0.016	0.0033 J
Indeno(1,2,3-cd)pyrene in mg/kg						0.025	0.016	0.047	0.0082	0.14	2.7 U	0.0064	0.0026 J	0.089	0.077	0.014
Total cPAHs TEF in mg/kg	0.14	0.6				0.048	0.108	0.081	0.0146	0.338	0.00162	0.0252	0.00596	0.527	0.25	0.0797
Other Semivolatiles																
Dibenzofuran in mg/kg	160	7,000				0.0062	0.25	0.034	0.0073	0.025	0.0017 J	0.67	0.013	4.6	6.5	1.3
Conventional Chemistry Parameters (including other metals)																
pH in pH units			7.96	7.80	8.30											

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Leve

Concentrations within bold border indicate value exceeds Industrial Soil Screening Lev

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UJ - Analyte was not detected at or above the reported estimate

Table 7 - Soil Chemistry Data, Million Gallon Tanks Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	MG-SB07 (1-2 ft) 09/14/2009 RI	MG-SB07 (6-8 ft) 09/14/2009 RI	MG-SB07 (12-13 ft) 09/14/2009 RI	MG-SB07 (15-16 ft) 09/14/2009 RI	MG-SB08 (1-2 ft) 09/14/2009 RI	MG-SB08 (7-8 ft) 09/14/2009 RI	MG-SB08 (11-12 ft) 09/14/2009 RI	MG-SB08 (15-16 ft) 09/14/2009 RI	MG-SB09 (2-4 ft) 09/14/2009 RI	MG-SB09 (6-7 ft) 09/14/2009 RI	MG-SB09 (11-12 ft) 09/14/2009 RI	MG-SB09 (19-20 ft) 09/14/2009 RI	MG-SB10 (1-2 ft) 09/14/2009 RI	MG-SB10 (7-8 ft) 09/14/2009 RI	MG-SB10 (11-12 ft) 09/14/2009 RI	MG-SB10 (15-16 ft) 09/14/2009 RI
Total Petroleum Hydrocarbons																		
Gasoline Range Hydrocarbons in mg/kg	100	100																
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	520	4,200	88	1,100	290	200	49	89	200	9,200	310	27 J	200	18 J	66	100
Oil (C25-C36) in mg/kg	2,000	2,000	490	5,100	110 J	970	980	600	130 J	220 J	110 J	1,200	1,000	75 J	990	57 J	130 J	220 J
Bunker C in mg/kg	2,000	2,000																
Total TPHs in mg/kg	2,000	2,000	1,010	9,300	198 J	2,070	1,270	800	179 J	309 J	310 J	10,400	1,310	102 J	1,190	75 J	196 J	320 J
Mercury																		
Mercury in mg/kg	24	1,050																
Other Metals																		
Arsenic in mg/kg	20	20																
Cadmium in mg/kg	2	2																
Chromium in mg/kg	1,000,000	1,000,000																
Copper in mg/kg	3,000	130,000																
Lead in mg/kg																		
Nickel in mg/kg	1,600	70,000																
Zinc in mg/kg	24,000	1,100,000																
Polycyclic Aromatic Hydrocarbons (PAHs)																		
Acenaphthene in mg/kg	4,800	210,000	0.7	2.4	0.06	0.011	0.1	0.0065	0.14	0.01	0.24	0.32	0.022	0.004 J	0.077	0.0021 J	0.14	0.02
Acenaphthylene in mg/kg			0.024	0.38 U	0.0075	0.0097	0.024	0.01	0.046	0.017	0.028	0.029 J	0.04	0.0059	0.18 J	0.0031 J	0.049	0.012
Anthracene in mg/kg	24,000	1,100,000	0.32	1.5	0.042	0.012	0.13	0.011	0.078	0.02	0.34	0.12	0.027	0.0065	0.12 J	0.0036 J	0.073	0.02
Benzo(g,h,i)perylene in mg/kg			0.085	0.88	0.019	0.02	0.39	0.03	0.096	0.043	0.54	0.68	0.034	0.013	0.77 J	0.0071	0.038	0.028
Fluoranthene in mg/kg	3,200	140,000	1.2	2.3	0.1	0.074	0.76	0.058	0.44	0.13	2.1	1.1	0.12	0.033	0.42	0.014	0.22	0.12
Fluorene in mg/kg	3,200	140,000	0.91	3	0.088	0.014	0.11	0.013	0.088	0.017	0.27	0.31	0.028	0.0067	0.18	0.0033 J	0.091	0.015
Phenanthrene in mg/kg			2.8	14	0.32	0.082	0.58	0.056	0.38	0.11	1.6	0.93	0.16	0.029	0.46	0.021	0.19	0.092
Pyrene in mg/kg	2,400	110,000	1	9	0.23	0.078	0.72	0.077	0.45	0.13	1.7	0.65	0.13	0.032	0.67	0.013	0.19	0.12
2-Methylnaphthalene in mg/kg	320	14,000	0.53	24	0.31	0.045	0.073	0.035	0.099	0.026	0.048	0.35	0.061	0.0089	0.061	0.013	0.15	0.024
Naphthalene in mg/kg	5.3	11	0.41	4.1	0.12	0.11	0.019	0.087	0.3	0.11	0.044	0.86	0.28	0.034	0.086	0.042	0.65	0.15
Total Naphthalenes in mg/kg	5.3	11	0.94	28.1	0.43	0.155	0.092	0.122	0.399	0.136	0.092	1.21	0.341	0.0429	0.147	0.055	0.8	0.174
Benz(a)anthracene in mg/kg			0.48	3.9	0.094	0.015	0.43	0.025	0.12	0.031	0.74	0.66	0.036	0.012	0.42 J	0.0044	0.05	0.021
Benzo(a)pyrene in mg/kg	0.14	0.6	0.22	2.8	0.057	0.022	0.48	0.031	0.13	0.04	0.79	0.83	0.036	0.017	1.9	0.0086	0.054	0.029
Benzo(b)fluoranthene in mg/kg			0.3	1.4	0.037	0.019	0.56	0.042	0.15	0.045	1	1.1	0.051	0.016	1.7	0.0082	0.057	0.026
Benzo(k)fluoranthene in mg/kg			0.063	0.27	0.0074	0.0055 J	0.19	0.01	0.041	0.013	0.31	0.36	0.012	0.0054	0.44 J	0.0025 J	0.017	0.0067 J
Chrysene in mg/kg			0.42	8.6	0.14	0.022	0.43	0.031	0.12	0.035	0.6	0.58	0.036	0.013	0.29 J	0.0062	0.044	0.019
Dibenzo(a,h)anthracene in mg/kg			0.037	0.8	0.012	0.0023 J	0.099	0.0062	0.013	0.0049 J	0.11	0.22	0.0058	0.0024 J	0.23 J	0.0012 J	0.0054	0.002 J
Indeno(1,2,3-cd)pyrene in mg/kg			0.075	0.27	0.011	0.013	0.4	0.026	0.091	0.033	0.62	0.73	0.029	0.011	0.99	0.0061	0.035	0.021
Total cPAHs TEF in mg/kg	0.14	0.6	0.32	3.55	0.0745	0.0277	0.652	0.0422	0.173	0.053	1.07	1.14	0.0497	0.0218	2.29	0.0109	0.0709	0.0369
Other Semivolatiles																		
Dibenzofuran in mg/kg	160	7,000	0.51	0.93	0.046	0.012	0.045	0.016	0.047	0.015	0.12	0.25	0.048	0.0062	0.083	0.016	0.11	0.014
Conventional Chemistry Parameters (including other metals)																		
pH in pH units																		

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Leve

Concentrations within bold border indicate value exceeds Industrial Soil Screening Lev

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Table 7 - Soil Chemistry Data, Million Gallon Tanks Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	MG-SB11 (2-3 ft) 12/20/2010 RI	MG-SB11 (5-6 ft) 12/20/2010 RI	MG-SB11 (7-8 ft) 12/20/2010 RI	MG-SB11 (9-10 ft) 12/20/2010 RI	MG-SB11 FD (12-13 ft) 12/20/2010 RI	MG-SB11 (12-13 ft) 12/20/2010 RI	MG-SB12 (2-3 ft) 12/22/2010 RI	MG-SB12 (6-7 ft) 12/22/2010 RI	MG-SB12 (8-9 ft) 12/22/2010 RI	MG-SB12 FD (10-11 ft) 12/22/2010 RI	MG-SB12 (10-11 ft) 12/22/2010 RI	MG-SB12 (12-13 ft) 12/22/2010 RI	MG-SB12 (13-14 ft) 12/22/2010 RI
Total Petroleum Hydrocarbons															
Gasoline Range Hydrocarbons in mg/kg	100	100													
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	220 UJ	170 UJ	150	24 UJ	110	110	82	580	630	390	370	650	940
Oil (C25-C36) in mg/kg	2,000	2,000	2,300	1,600	340	75 UJ	240	250	360	4,000	1,400	200	200	1,600	2,300
Bunker C in mg/kg	2,000	2,000													
Total TPHs in mg/kg	2,000	2,000	2,520 J	1,770 J	490 J	99.0 J	350 J	360 J	442 J	4,580 J	2,030 J	590 J	570 J	2,250 J	3,240 J
Mercury															
Mercury in mg/kg	24	1,050													
Other Metals															
Arsenic in mg/kg	20	20													
Cadmium in mg/kg	2	2													
Chromium in mg/kg	1,000,000	1,000,000													
Copper in mg/kg	3,000	130,000													
Lead in mg/kg															
Nickel in mg/kg	1,600	70,000													
Zinc in mg/kg	24,000	1,100,000													
Polycyclic Aromatic Hydrocarbons (PAHs)															
Acenaphthene in mg/kg	4,800	210,000			0.48	0.01				0.46		13	16		
Acenaphthylene in mg/kg					0.17	0.0074				0.017 J		0.058	0.07		
Anthracene in mg/kg	24,000	1,100,000			0.56	0.014				0.27		4.1	4.8		
Benzo(g,h,i)perylene in mg/kg					0.57	0.037				0.42		0.33	0.44		
Fluoranthene in mg/kg	3,200	140,000			2.6	0.11				1.6		21	27		
Fluorene in mg/kg	3,200	140,000			0.5	0.016				0.35		14	16		
Phenanthrene in mg/kg					2.4	0.082				1.4		41	48		
Pyrene in mg/kg	2,400	110,000			2.5	0.088				1.2		14	17		
2-Methylnaphthalene in mg/kg	320	14,000			0.56	0.031				0.27		6.7	8.1		
Naphthalene in mg/kg	5.3	11			0.81	0.063				1.3		9.3	13		
Total Naphthalenes in mg/kg	5.3	11			1.37	0.094				1.57		16	21.1		
Benz(a)anthracene in mg/kg					0.98	0.034				0.58		4.1	5.3		
Benzo(a)pyrene in mg/kg	0.14	0.6			1	0.039				0.56		1.4	1.8		
Benzo(b)fluoranthene in mg/kg					0.93	0.048				0.69		2.7	3.2		
Benzo(k)fluoranthene in mg/kg					0.35	0.018				0.27		0.79	0.91		
Chrysene in mg/kg					1.2	0.044				0.73		3.2	3.7		
Dibenzo(a,h)anthracene in mg/kg					0.1	0.0048				0.085		0.12	0.16		
Indeno(1,2,3-cd)pyrene in mg/kg					0.55	0.031				0.36		0.4	0.49		
Total cPAHs TEF in mg/kg	0.14	0.6			1.3	0.053				0.766		2.24	2.85		
Other Semivolatiles															
Dibenzofuran in mg/kg	160	7,000			0.33	0.017				0.25		9.4	11		
Conventional Chemistry Parameters (including other metals)															
pH in pH units															

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Leve

Concentrations within bold border indicate value exceeds Industrial Soil Screening Lev

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Table 7 - Soil Chemistry Data, Million Gallon Tanks Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	MG-SB13 (2-3 ft) 12/20/2010 RI	MG-SB13 (5-6 ft) 12/20/2010 RI	MG-SB13 FD (7-8 ft) 12/20/2010 RI	MG-SB13 (7-8 ft) 12/20/2010 RI	MG-SB13 (9-10 ft) 12/20/2010 RI	MG-SB13 (12-13 ft) 12/20/2010 RI	MG-SB14 (2-3 ft) 12/20/2010 RI	MG-SB14 (5-6 ft) 12/20/2010 RI	MG-SB14 FD (7-8 ft) 12/20/2010 RI	MG-SB14 (7-8 ft) 12/20/2010 RI	MG-SB14 (9-10 ft) 12/20/2010 RI	MG-SB14 (12-13 ft) 12/20/2010 RI
Total Petroleum Hydrocarbons														
Gasoline Range Hydrocarbons in mg/kg	100	100												
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	300	270 UJ	620	920	56	740	51	220 UJ	610	820	8.6 UJ	92
Oil (C25-C36) in mg/kg	2,000	2,000	4,400	2,700	1,400	1,700	170	2,100	150	1,600	870	880	28 UJ	180
Bunker C in mg/kg	2,000	2,000												
Total TPHs in mg/kg	2,000	2,000	4,700 J	2,970 J	2,020 J	2,620 J	226 J	2,840 J	201 J	1,820 J	1,480 J	1,700 J	36.6 J	272 J
Mercury														
Mercury in mg/kg	24	1,050												
Other Metals														
Arsenic in mg/kg	20	20												
Cadmium in mg/kg	2	2												
Chromium in mg/kg	1,000,000	1,000,000												
Copper in mg/kg	3,000	130,000												
Lead in mg/kg														
Nickel in mg/kg	1,600	70,000												
Zinc in mg/kg	24,000	1,100,000												
Polycyclic Aromatic Hydrocarbons (PAHs)														
Acenaphthene in mg/kg	4,800	210,000		1			0.018						0.037	0.082
Acenaphthylene in mg/kg				0.037			0.014						0.0093	0.023
Anthracene in mg/kg	24,000	1,100,000		0.28			0.037						0.019	0.06
Benzo(g,h,i)perylene in mg/kg				0.099			0.046						0.03	0.051
Fluoranthene in mg/kg	3,200	140,000		1.4			0.22						0.1	0.35
Fluorene in mg/kg	3,200	140,000		0.56			0.026						0.041	0.061
Phenanthrene in mg/kg				1.6			0.18						0.15	0.34
Pyrene in mg/kg	2,400	110,000		0.94			0.18						0.091	0.27
2-Methylnaphthalene in mg/kg	320	14,000		0.13			0.03						0.17	0.11
Naphthalene in mg/kg	5.3	11		0.28			0.21						0.23	0.14
Total Naphthalenes in mg/kg	5.3	11		0.41			0.24						0.4	0.25
Benz(a)anthracene in mg/kg				0.2			0.034						0.029	0.083
Benzo(a)pyrene in mg/kg	0.14	0.6		0.12			0.037						0.03	0.079
Benzo(b)fluoranthene in mg/kg				0.16			0.045						0.035	0.084
Benzo(k)fluoranthene in mg/kg				0.04			0.015						0.012	0.031
Chrysene in mg/kg				0.26			0.047						0.034	0.11
Dibenzo(a,h)anthracene in mg/kg				0.032			0.0036						0.0035	0.0093
Indeno(1,2,3-cd)pyrene in mg/kg				0.051			0.031						0.022	0.045
Total cPAHs TEF in mg/kg	0.14	0.6		0.171			0.0503						0.0405	0.105
Other Semivolatiles														
Dibenzofuran in mg/kg	160	7,000		0.45			0.029						0.037	0.067
Conventional Chemistry Parameters (including other metals)														
pH in pH units														

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Leve

Concentrations within bold border indicate value exceeds Industrial Soil Screening Lev

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 7 - Soil Chemistry Data, Million Gallon Tanks Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	MG-SB15 (3-4 ft) 12/20/2010 RI	MG-SB15 (5-6 ft) 12/20/2010 RI	MG-SB15 (7-8 ft) 12/20/2010 RI	MG-SB15 (9-10 ft) 12/20/2010 RI	MG-SB15 (12-13 ft) 12/20/2010 RI	MG-SB16 (2-3 ft) 12/20/2010 RI	MG-SB16 (5-6 ft) 12/20/2010 RI	MG-SB16 (7-8 ft) 12/20/2010 RI	MG-SB16 (9-10 ft) 12/20/2010 RI	MG-SB16 (12-13 ft) 12/20/2010 RI	SS-01 (2 ft.) 11/03/2006 Pre-RI	SS-02 (1.5 ft.) 11/03/2006 Pre-RI	SS-03 (1.5 ft.) 11/03/2006 Pre-RI	SS-04 (1.5 ft.) 11/03/2006 Pre-RI	SS-05 (3 ft.) 11/03/2006 Pre-RI
Total Petroleum Hydrocarbons																	
Gasoline Range Hydrocarbons in mg/kg	100	100															
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	44	290	4.5 UJ	14 UJ	110	85 UJ	160 UJ	20 UJ	97	3.9 UJ	335	615	994	451	1,590
Oil (C25-C36) in mg/kg	2,000	2,000	210	540	13 UJ	44 UJ	300	900	1,600	78 UJ	130	11 UJ	366	1,490	591	294	268 U
Bunker C in mg/kg	2,000	2,000															
Total TPHs in mg/kg	2,000	2,000	254 J	830 J	17.5 J	58.0 J	410 J	985 J	1,760 J	98.0 J	227 J	14.9 J	701	2,105	1,585	745	1,724
Mercury																	
Mercury in mg/kg	24	1,050															
Other Metals																	
Arsenic in mg/kg	20	20															
Cadmium in mg/kg	2	2															
Chromium in mg/kg	1,000,000	1,000,000															
Copper in mg/kg	3,000	130,000															
Lead in mg/kg																	
Nickel in mg/kg	1,600	70,000															
Zinc in mg/kg	24,000	1,100,000															
Polycyclic Aromatic Hydrocarbons (PAHs)																	
Acenaphthene in mg/kg	4,800	210,000		0.2	0.0032					0.0039	0.029						
Acenaphthylene in mg/kg				0.022 U	0.0028 U					0.0054	0.021						
Anthracene in mg/kg	24,000	1,100,000		0.15	0.0011 J					0.01	0.076						
Benzo(g,h,i)perylene in mg/kg				0.042	0.0028 U					0.03	0.096						
Fluoranthene in mg/kg	3,200	140,000		0.27	0.004					0.082	0.36						
Fluorene in mg/kg	3,200	140,000		0.22	0.0028 J					0.0056	0.061						
Phenanthrene in mg/kg				0.68	0.0089					0.058	0.25						
Pyrene in mg/kg	2,400	110,000		0.51	0.0045					0.069	0.25						
2-Methylnaphthalene in mg/kg	320	14,000		0.45	0.008					0.013	0.18						
Naphthalene in mg/kg	5.3	11		0.12	0.011					0.075	0.13						
Total Naphthalenes in mg/kg	5.3	11		0.57	0.019					0.088	0.31						
Benz(a)anthracene in mg/kg				0.19	0.0013 J					0.017	0.13						
Benzo(a)pyrene in mg/kg	0.14	0.6		0.076	0.0028 U					0.02	0.14						
Benzo(b)fluoranthene in mg/kg				0.063	0.0028 U					0.028	0.15						
Benzo(k)fluoranthene in mg/kg				0.016	0.0028 U					0.009	0.054						
Chrysene in mg/kg				0.26	0.0018 J					0.024	0.14						
Dibenzo(a,h)anthracene in mg/kg				0.017	0.0028 U					0.0023 J	0.015						
Indeno(1,2,3-cd)pyrene in mg/kg				0.021	0.0028 U					0.021	0.091						
Total cPAHs TEF in mg/kg	0.14	0.6		0.109	0.00211 J					0.028	0.185						
Other Semivolatiles																	
Dibenzofuran in mg/kg	160	7,000		0.081 U	0.0021 J					0.01	0.1						
Conventional Chemistry Parameters (including other metals)																	
pH in pH units																	

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Leve

Concentrations within bold border indicate value exceeds Industrial Soil Screening Lev

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 8 - Groundwater Chemistry Data, Million Gallon Tanks Subarea

GP West RI/FS 070188

Chemical Name	Preliminary Groundwater Screening Level for Unrestricted Land Use	Preliminary Groundwater Screening Level for Industrial Land Use	EMW-12S 07/09/93 Pre-RI	EMW-12S 12/10/93 Pre-RI	EMW-12S 07/26/04 Pre-RI	EMW-12S 09/30/09 RI	EMW-12S 03/30/10 RI	EMW-16S 12/16/93 Pre-RI	EMW-16S 07/26/04 Pre-RI	EMW-16S 09/30/09 RI	EMW-16S 03/30/10 RI	EMW-16S 12/16/10 RI	MG-MW01 07/27/04 Pre-RI	MG-MW01 09/28/09 RI	MG-MW01 03/29/10 RI	MG-MW01 12/16/10 RI	MG-MW02 03/29/10 RI	MG-MW03 03/29/10 RI	MG-MW03 12/16/10 RI	MG-MW04 12/21/10 RI	MG-MW05 12/20/10 RI	MG-MW05 12/20/10 Field Dup RI
Total Petroleum Hydrocarbons																						
Gasoline Range Hydrocarbons in ug/L					250 UJ				420 J				250 U									
Diesel Range Hydrocarbons in ug/L					250 U	540	29 U		500	1,800	450	26 UJ		1,100	46 U	260 UJ	26 U	200 U	26 J	110 UJ	180 UJ	120 UJ
Oil (C25-C36) in ug/L					500 U	560 U	49 J		500 U	720	58 J	520 UJ		520 U	520 U	24 J	510 U	630 U	520 UJ	190 UJ	56 UJ	81 UJ
Bunker C in ug/L													1,200									
Total TPHs in ug/L					ND	820	78 J		750	2,520	508	286 J	1,200	1,360	ND	154 J	ND	ND	286 J	300 J	236 J	201 J
Mercury																						
Dissolved Mercury in ug/L	0.94	0.94	0.2 U	0.2 U	1 U	0.00268 J	0.00286	0.2 U	1 U	0.0628	0.109		0.1 U									
Other Metals																						
Dissolved Arsenic in ug/L	5	5			79.6	7.53	4.1		42	15.7	0.17 U		7.9									
Dissolved Cadmium in ug/L	8.8	8.8			0.5 U	0.028	0.009 J		2 U	0.266	0.067 U		0.5 U									
Dissolved Chromium (III) in ug/L					1,480				4,530				1,310									
Dissolved Chromium (VI) in ug/L	50	50			224 U	50 U	5 J		224	50 U	50 U		112 U									
Dissolved Chromium in ug/L	240,000	240,000			1,480	329	98.4		4,750	2,690	3.9		1,310									
Dissolved Copper in ug/L	3.1	3.1			8	1.73	1.34		14	11.1	0.042 U		3									
Dissolved Lead in ug/L	8.1	8.1			2 U	0.227	0.211		2 U	0.462	0.1 U		2 U									
Dissolved Nickel in ug/L	8.2	8.2			9	2.35	2.63		27	23.9	1.67 U		6									
Dissolved Zinc in ug/L	81	81			10 U	1.17	1 J		20	11.1	1.67 U		10 U									
Polycyclic Aromatic Hydrocarbons (PAHs)																						
Acenaphthene in ug/L	640	640			1.0 U	0.12	0.096		49	55	37	23	18	30	13	17	0.82	20	26	3.7	42	41
Acenaphthylene in ug/L					1.0 U	0.022 U	0.02 U		0.15	0.17 U	0.15	0.097 U	0.22	0.082	0.047	0.08	0.02 U	0.07 U	0.091 U	0.096 U	0.25 U	0.26 U
Anthracene in ug/L	26,000	26,000			1.0 U	0.033	0.029		6.0	4	3.6	2.3	0.88	0.95	0.28	0.21	0.042	1.5	1.8	0.81	3.0	3.6
Benzo(g,h,i)perylene in ug/L					1.0 U	0.022 U	0.02 U		0.38	0.36	0.43	0.15	0.10 U	0.06	0.014 J	0.0066 J	0.0054 J	0.039	0.038	0.089	0.34	0.39
Fluoranthene in ug/L	90	90			1.0 U	0.027	0.018 J		43	33	24	16	4.5	4.9	1.2	0.64	0.14	4.2	5.9	3.1	19	20
Fluorene in ug/L	3,500	3,500			1.0 U	0.041	0.039		42	47	30	19	9.2	18	5.4	7.1	0.12	15	18	2.6	26	26
Phenanthrene in ug/L					1.0 U	0.0092 J	0.0051 J		91	55	43	27	8.9	2.3	0.056	0.063	0.26	19	24	5.8	44	46
Pyrene in ug/L	2,600	2,600			1.0 U	0.026	0.016 J		31	26	18	8.1	2.8	3.4	0.97	0.43	0.16	3	3.5	3.1	14	14
1-Methylnaphthalene in ug/L					1.0 U				21				6.0									
2-Methylnaphthalene in ug/L					1.0 U	0.022 U	0.02 U		34	15	12	8.4	5.7	0.31	0.0057 J	0.0072 J	0.12	5	8.2	7.7	61	60
Naphthalene in ug/L	170	360			1.0 U	0.022 U	0.057		210	64	59	42	27	5.4	0.072	0.31 U	1.1	87	160	15	450	440
Total Naphthalenes in ug/L	170	360			ND	ND	0.067		265	79.0	71.0	50.4	38.7	5.71	0.0777	0.3172 J	1.22	92	168.2	22.7	511	500
Benz(a)anthracene in ug/L	0.031	0.031			1.0 U	0.0045 J	0.02 U		8.7	4.5	4.2	2.1	0.42	0.55	0.14	0.06	0.018 J	0.51	0.67	0.53	2.1	2.3
Benzo(a)pyrene in ug/L	0.03	0.03			1.0 U	0.022 U	0.02 U		2.8	1.5	1.5	0.62	0.13	0.16	0.038	0.019 J	0.0088 J	0.13	0.16	0.33	1.2	1.3
Benzo(b)fluoranthene in ug/L	0.031	0.031			1.0 U	0.022 U	0.02 U		4.4	3.2	2.8	1.2	0.16	0.32	0.079	0.037	0.013 J	0.28	0.33	0.25	1.3	1.4
Benzo(k)fluoranthene in ug/L	0.031	0.031			1.0 U	0.022 U	0.02 U		2.4	0.76	0.77	0.33	0.10 U	0.083	0.022	0.0095 J	0.02 U	0.063	0.09	0.065	0.36	0.40
Chrysene in ug/L	0.031	0.031			1.0 U	0.022 U	0.02 U		4.7	1.7	1.8	0.76	0.37	0.41	0.083	0.044	0.011 J	0.39	0.69	0.88	2.8	3.1
Dibenzo(a,h)anthracene in ug/L	0.031	0.031			1.0 U	0.022 U	0.02 U		0.18	0.11	0.14	0.051	0.10 U	0.013 J	0.0044 J	0.0026 J	0.02 U	0.013 J	0.015 J	0.057	0.11	0.14
Indeno(1,2,3-cd)pyrene in ug/L	0.031	0.031			1.0 U	0.022 U	0.02 U		0.36	0.35	0.39	0.13	0.10 U	0.043	0.01 J	0.0095 J	0.02 U	0.022	0.026	0.054	0.23	0.25
Total cPAHs TEF in ug/L	0.03	0.03			ND	0.016	ND		4.45	2.41	2.35	1.01	0.207	0.265	0.0644	0.0313	0.015 J	0.223	0.28	0.434	1.64	1.78
Other Semivolatiles																						
1,2,4-Trichlorobenzene in ug/L	230	230			10 U				1.0 U				1.0 U									
1,2-Dichlorobenzene in ug/L	4,200	4,200			10 U				1.0 U				1.0 U									
1,3-Dichlorobenzene in ug/L	2,600	2,600			10 U				1.0 U				1.0 U									
1,4-Dichlorobenzene in ug/L	4.9	4.9			10 U				1.0 U				1.0 U									
2,4,5-Trichlorophenol in ug/L					50 U				5.0 U				5.0 U									
2,4,6-Trichlorophenol in ug/L	3.9	3.9			50 U				5.0 U				5.0 U									
2,4-Dichlorophenol in ug/L	190	190			30 U				3.0 U				3.0 U									
2,4-Dimethylphenol in ug/L	550	550			30 U				3.0 U				3.0 U									
2,4-Dinitrophenol in ug/L	3,500	3,500			250 U				25 U				25 U									
2-Chloronaphthalene in ug/L	1,000	1,000			10 U				1.0 U				1.0 U									
2-Chlorophenol in ug/L	97	97			10 U				1.0 U				1.0 U									
2-Methylphenol in ug/L					10 U				1.0 U				1.0 U									
2-Nitroaniline in ug/L					50 U				5.0 U				5.0 U									
2-Nitrophenol in ug/L					50 U				5.0 U				5.0 U									
3,3'-Dichlorobenzidine in ug/L	0.046	0.046			50 U				5.0 U				5.0 U									
3-Nitroaniline in ug/L					60 U				6.0 U				6.0 U									
4,6-Dinitro-2-methylphenol in ug/L					150 U				15 U				15 U									
4-Bromophenyl phenyl ether in ug/L					10 U				1.0 U				1.0 U									
4-Chloro-3-methylphenol in ug/L					20 U				2.0 U				2.0 U									
4-Chloroaniline in ug/L					30 U				3.0 U				3.0 U									
4-Chlorophenyl phenyl ether in ug/L					10 U				1.0 U				1.0 U									
4-Methylphenol in ug/L					10 U				1.0 U				13									
4-Nitroaniline in ug/L					50 U				5.0 U				5.0 U									
4-Nitrophenol in ug/L					50 U				5.0 U				5.0 U									
Benzoic acid in ug/L					100 U				10 U				15									
Benzyl alcohol in ug/L					50 U				5.0 U				5.0 U									

Table 8 - Groundwater Chemistry Data, Million Gallon Tanks Subarea

GP West RI/FS 070188

Chemical Name	Preliminary Groundwater Screening Level for Unrestricted Land Use	Preliminary Groundwater Screening Level for Industrial Land Use	EMW-12S 07/09/93 Pre-RI	EMW-12S 12/10/93 Pre-RI	EMW-12S 07/26/04 Pre-RI	EMW-12S 09/30/09 RI	EMW-12S 03/30/10 RI	EMW-16S 12/16/93 Pre-RI	EMW-16S 07/26/04 Pre-RI	EMW-16S 09/30/09 RI	EMW-16S 03/30/10 RI	EMW-16S 12/16/10 RI	MG-MW01 07/27/04 Pre-RI	MG-MW01 09/28/09 RI	MG-MW01 03/29/10 RI	MG-MW01 12/16/10 RI	MG-MW02 03/29/10 RI	MG-MW03 03/29/10 RI	MG-MW03 12/16/10 RI	MG-MW04 12/21/10 RI	MG-MW05 12/20/10 RI	MG-MW05 12/20/10 Field Dup RI
Benzyl butyl phthalate in ug/L	1,300	1,300			10 U				1.0 U				1.0 U									
Bis(2-chloro-1-methylethyl) ether in ug/L	37	37			10 U				1.0 U				1.0 U									
Bis(2-chloroethoxy)methane in ug/L					10 U				1.0 U				1.0 U									
Bis(2-chloroethyl) ether in ug/L	0.85	0.85			20 U				2.0 U				2.0 U									
Bis(2-ethylhexyl) phthalate in ug/L	3.6	3.6			12 U				1.0 U				1.0 U									
Carbazole in ug/L					10 U				16				2.5									
Dibenzofuran in ug/L					10 U	0.019 J	0.011 J		48	40	24	15	4.8	9.1	3.6	4.4	0.057	13	18	1.5	26	24
Diethyl phthalate in ug/L	28,000	28,000			10 U				1.0 U				1.0 U									
Dimethyl phthalate in ug/L	72,000	72,000			10 U				1.0 U				1.0 U									
Di-n-butyl phthalate in ug/L	2,900	2,900			10 U				1.0 U				1.0 U									
Di-n-octyl phthalate in ug/L					10 U				1.0 U				1.0 U									
Hexachlorobenzene in ug/L	0.00047	0.00047			10 U				1.0 U				1.0 U									
Hexachlorobutadiene in ug/L	30	30			20 U				2.0 U				2.0 U									
Hexachlorocyclopentadiene in ug/L	3,600	3,600			50 U				5.0 U				5.0 U									
Hexachloroethane in ug/L	5.3	5.3			20 U				2.0 U				2.0 U									
Isophorone in ug/L	600	600			10 U				1.0 U				1.0 U									
Nitrobenzene in ug/L	450	450			10 U				1.0 U				1.0 U									
N-Nitroso-di-n-propylamine in ug/L	0.82	0.82			20 U				2.0 U				2.0 U									
N-Nitrosodiphenylamine in ug/L	9.7	9.7			10 U				1.0 U				1.0 U									
Pentachlorophenol in ug/L	4.9	4.9			50 U				5.0 U				5.0 U									
Phenol in ug/L	1,100,000	1,100,000			20 U				2.0 U				18									
2,4-Dinitrotoluene in ug/L	9.1	9.1			50 U				5.0 U				5.0 U									
2,6-Dinitrotoluene in ug/L					50 U				5.0 U				5.0 U									
1-Methylnaphthalene in ug/L					1.0 U				21				6.0									
Total Naphthalenes in ug/L	170	360			ND				265				38.7									
Conventional Chemistry Parameters (including other metals)																						
Alkalinity (Bicarbonate) in mg/L as CaCO3				1,000				2,160														
Alkalinity (Carbonate) in mg/L as CaCO3				5 U				5 U														
Alkalinity (Hydroxide) in mg/L as CaCO3				5 U				5														
Alkalinity (Total) in mg/L as CaCO3				1,000				2,160														
Calcium in mg/L				280				960														
Chloride in mg/L				445				560														
Dissolved Iron in mg/L					44.2				11.8				5.99									
Dissolved Manganese in mg/L					5.8				6.57				1.93									
Formaldehyde in ug/L	1,600	1,600			18				17				10									
Magnesium in mg/L				47				200														
Manganese in mg/L				2.9				7.2														
Nitrate + Nitrite in mg/L					0.500 U				0.500 U				0.500 U									
Nitrate as Nitrogen in mg/L					0.500 U				0.500 U				0.500 U									
Nitrite as Nitrogen in mg/L					0.500 U				0.500 U				0.500 U									
Potassium in mg/L				18				57														
Sodium in mg/L				300				540														
Sulfate in mg/L				100 U	551			100 U	735				181									
Sulfide in mg/L				0.5 U				1.25 U														
Total Organic Carbon in ug/L				76,200				1,420,000														
Total Suspended Solids in mg/L					4.8	5 U	5 U		23	7.5	15.5	5 U	7	5 U	5.5	5 U	25	86	15	113	6.5	8.5
Field Parameters																						
Conductivity in us/cm			1,970	2,490	2,858	1,597	955	5,390	5,672	5,178	5,665	4,073	1,303	1,583	726	699	635	14,150	1,315	2,017	5,616	
Dissolved Oxygen in mg/L			0.8	1.2	0.8	0.6	0.3	1.4	0.7	0.4	0.2	0.5	0.6	0.4	0.3	0.1	0.2	0.1	0.2	0.5	0.4	
Eh (ORP) in mVolts			-87	-127	-190	-336	-207		-225	-402	-255	-102	-204	-28	-28	-152	3	-22	-136	-255	-237	
pH in pH units	6.0 - 8.5	6.0 - 8.5	7.1	6.8	6.6	6.7	6.8		6.6	6.7	6.7	6.6	6.5	6.6	7.5	7.0	8.4	7.3	6.5	6.7	6.8	
Salinity in g/L			0.5	0.8																		
Temperature in deg C			19.2	13.4	20.4	18.3	12.1	9.7	20.9	19.9	11.7	11.8	18.0	18.1	10.6	11.4	11.3	13.8	14.2	12.9	11.9	

Notes

Concentrations in shaded cells indicate value exceeds Preliminary Groundwater Screening Level for Unrestricted Land Use

Concentrations within bold border indicate value exceeds Preliminary Groundwater Screening Level for Industrial Land Use

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 9 - Soil Vapor Chemistry Data, Million Gallon Tanks Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Gas Screening Level	Industrial Soil Gas Screening Level	MG-VP01 02/03/2011 RI	MG-VP02 02/03/2011 RI	MG-VP03 02/03/2011 RI	MG-VP04 02/08/2011 RI
Extractable Petroleum Hydrocarbons						
Aliphatics C10-C12 in ug/m3	1,360	2,975	100 U	100 U	110 U	2,000 U
Aliphatics C5-C6 in ug/m3	27,200	59,500	47 U	48 U	50 U	9,300
Aliphatics C6-C8 in ug/m3	27,200	59,500	59 U	61 U	64 U	6,400
Aliphatics C8-C10 in ug/m3	1,360	2,975	84 U	87 U	90 U	3,000
Aromatics C10-C12 in ug/m3	85	85	79 U	82 U	85 U	1,600 U
Aromatics C8-C10 in ug/m3	1,820	3,990	71 U	74 U	76 U	1,400 U
Volatile Organic Compounds (VOCs)						
Naphthalene in ug/m3	16	30	15 U	16 U	16 U	300 U

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Gas Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Gas Screening Level

Unrestricted and industrial screening levels for Aromatics C10-C12 and unrestricted screening level for naphthalene are the respective analytical lab practical quantitation limits (PQL).

U - Analyte was not detected at or above the reported result.

Table 10 - Soil Chemistry Data, Bunker C Tank Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	BC-MW01 (5-6.5 ft) 07/14/2004 Pre-RI	BC-MW01 (10-11.5 ft) 07/14/2004 Pre-RI	BC-MW01 (15-16.5 ft) 07/14/2004 Pre-RI	BC-MW02 (2-4 ft) 09/22/2009 RI	BC-MW02 (8-10 ft) 09/22/2009 RI	BC-MW02 (12-14 ft) 09/22/2009 RI	BC-MW02 (17-19 ft) 09/22/2009 RI	BC-MW02 (21-22 ft) 09/22/2009 RI	BC-MW03 (4-5 ft) 09/22/2009 RI	BC-MW03 (7.5-9.5 ft) 09/22/2009 RI	BC-MW03 (13-15 ft) 09/22/2009 RI	BC-MW03 (18.5-19.5 ft) 09/22/2009 RI	BC-MW04 (3-4 ft) 12/17/2010 RI	BC-MW04 FD (6-7 ft) 12/17/2010 RI	BC-MW04 (6-7 ft) 12/17/2010 RI
Total Petroleum Hydrocarbons																	
Gasoline Range Hydrocarbons in mg/kg	100	100															
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	300	1,800	6.3	27 U	360	320	950	31 U	46	42	30 U	31 U	53	710	800
Oil (C25-C36) in mg/kg	2,000	2,000	300	1,300		110 U	840	450	2,000	130 U	140	140	120 U	130 U	360	4,600	5,300
Bunker C in mg/kg	2,000	2,000	1,600	8,600	36												
Total TPHs in mg/kg	2,000	2,000	1,600	8,600	36	ND	1,200	770	2,950	ND	186	182	ND	ND	413 J	5,310 J	6,100 J
Mercury																	
Mercury in mg/kg	24	1,050	0.05 J	0.05 U													
Other Metals																	
Arsenic in mg/kg	20	20	10 U	5 U													
Cadmium in mg/kg	2	2	0.6 U	0.2 U													
Chromium in mg/kg	1,000,000	1,000,000	48.0	27.4													
Copper in mg/kg	3,000	130,000	42.4 J	20.8 J													
Lead in mg/kg			7	8													
Nickel in mg/kg	1,600	70,000	47	26													
Zinc in mg/kg	24,000	1,100,000	75	41.9													
Polycyclic Aromatic Hydrocarbons (PAHs)																	
Acenaphthene in mg/kg	4,800	210,000		0.58		0.003 J	0.0086	0.22	0.8	0.25	0.036	0.023 J	0.062	0.008		0.06	0.061
Acenaphthylene in mg/kg				0.055 U		0.0039 J	0.0058	0.0061	0.038	0.0012 J	0.042	0.034 J	0.005 U	0.0048 U		0.061	0.059
Anthracene in mg/kg	24,000	1,100,000		0.47		0.0092	0.018	0.096	0.38	0.023	0.06	0.045 J	0.0082	0.00064 J		0.11	0.14
Benzo(g,h,i)perylene in mg/kg				0.055 U		0.035	0.061	0.11	0.79	0.0017 J	0.17	0.11	0.00098 J	0.0016 J		0.11	0.11
Fluoranthene in mg/kg	3,200	140,000		0.25		0.07	0.14	0.31	2.6	0.029	0.37	0.27 J	0.026	0.0015 J		0.29	0.34
Fluorene in mg/kg	3,200	140,000		0.93		0.0029 J	0.013	0.14	0.23	0.21	0.062	0.073 J	0.039	0.0018 J		0.11	0.13
Phenanthrene in mg/kg				0.32		0.061	0.096	0.3	0.78	0.23	0.41	0.39 J	0.021	0.0032 J		1	1.2
Pyrene in mg/kg	2,400	110,000		0.69		0.043 J	0.12 J	0.37 J	1.9 J	0.017 J	0.34	0.3 J	0.015 J	0.0015 J		0.36	0.42
1-Methylnaphthalene in mg/kg				3.2													
2-Methylnaphthalene in mg/kg	320	14,000		0.56		0.014	0.061	0.089	0.35	0.038	0.11	0.1 J	0.0022 J	0.0021 J		0.48	0.52
Naphthalene in mg/kg	5.3	11		0.13		0.017	0.029	0.12	0.96	0.089	0.41	0.2	0.0036 J	0.0048 U		0.54	0.51
Total Naphthalenes in mg/kg	5.3	11		3.89		0.031	0.09	0.209	1.31	0.127	0.52	0.3 J	0.0058 J	0.0045 J		1.02	1.03
Benz(a)anthracene in mg/kg				0.23		0.023	0.052	0.14	1.4	0.0016 J	0.12	0.092 J	0.0025 J	0.0048 U		0.074	0.091
Benzo(a)pyrene in mg/kg	0.14	0.6		0.15		0.023	0.049	0.14	1.4	0.00093 J	0.16	0.13 J	0.005 U	0.0048 U		0.067	0.066
Benzo(b)fluoranthene in mg/kg				0.055 U		0.044	0.084	0.18	1.7	0.0015 J	0.21	0.14 J	0.0014 J	0.0048 U		0.094	0.1
Benzo(k)fluoranthene in mg/kg				0.055 U		0.012	0.016	0.06	0.68	0.0048 U	0.065	0.042 J	0.005 U	0.0048 U		0.024 J	0.019 J
Chrysene in mg/kg				0.42		0.043	0.1	0.17	1.6	0.0018 J	0.2	0.15 J	0.0024 J	0.00092 J		0.15	0.16
Dibenzo(a,h)anthracene in mg/kg				0.055 U		0.0083	0.018	0.033	0.27	0.0048 U	0.021	0.017	0.005 U	0.0048 U		0.051	0.053
Indeno(1,2,3-cd)pyrene in mg/kg				0.055 U		0.028	0.041	0.11	0.98	0.001 J	0.13	0.096 J	0.005 U	0.0048 U		0.058	0.053
Total cPAHs TEF in mg/kg	0.14	0.6		0.188		0.035	0.0711	0.194	1.92	0.00184	0.217	0.17	0.00366	0.00361		0.0986	0.0992
Other Semivolatiles																	
Dibenzofuran in mg/kg	160	7,000		0.25		0.0098	0.012	0.075	0.1	0.043	0.06	0.038 J	0.007	0.00077 J		0.11	0.11
Conventional Chemistry Parameters (including other metals)																	
pH in pH units			9.68	10.05	8.61												

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Screening Level

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 10 - Soil Chemistry Data, Bunker C Tank Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	BC-MW04 (9-10 ft) 12/17/2010 RI	BC-MW04 (11-12 ft) 12/17/2010 RI	BC-MW04 (15-16 ft) 12/17/2010 RI	BC-MW04 (18-19 ft) 12/17/2010 RI	BC-MW05 (3-4 ft) 12/17/2010 RI	BC-MW05 (7-8 ft) 12/17/2010 RI	BC-MW05 (9-10 ft) 12/17/2010 RI	BC-MW05 (12-13 ft) 12/17/2010 RI	BC-MW05 (15-16 ft) 12/17/2010 RI	BC-MW05 (18-19 ft) 12/17/2010 RI	BC-SB01 (0-2 ft) 07/21/2004 Pre-RI	BC-SB01 (2-2.8 ft) 07/21/2004 Pre-RI	BC-SB02 (4-8 ft) 07/21/2004 Pre-RI	BC-SB02 (8-12 ft) 07/21/2004 Pre-RI	BC-SB02 (12-16 ft) 07/21/2004 Pre-RI
Total Petroleum Hydrocarbons																	
Gasoline Range Hydrocarbons in mg/kg	100	100															
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	380	420	38 UJ	7.0 UJ	66	5.4 UJ	6.5 UJ	24 UJ	340	6.5 UJ					
Oil (C25-C36) in mg/kg	2,000	2,000	5,200	1,900	85 UJ	24 UJ	340	14 UJ	25 UJ	81 UJ	720	19 UJ					
Bunker C in mg/kg	2,000	2,000											97,000	88,000	26,000	30,000	310
Total TPHs in mg/kg	2,000	2,000	5,580 J	2,320 J	123 J	31.0 J	406 J	19.4 J	31.5 J	105 J	1,060 J	25.5 J	97,000	88,000	26,000	30,000	310
Mercury																	
Mercury in mg/kg	24	1,050											0.05 U	0.07	0.10	0.06 U	
Other Metals																	
Arsenic in mg/kg	20	20											10 U	10 U	10 U	6 U	
Cadmium in mg/kg	2	2											0.6 U	0.6 U	0.6 U	0.2 U	
Chromium in mg/kg	1,000,000	1,000,000											21.0	41.0	43.0	35.1	
Copper in mg/kg	3,000	130,000											60.5	43.5	301	35.0	
Lead in mg/kg													76 J	33 J	62 J	5 J	
Nickel in mg/kg	1,600	70,000											30	43	43	36	
Zinc in mg/kg	24,000	1,100,000											113	157	160	51.6	
Polycyclic Aromatic Hydrocarbons (PAHs)																	
Acenaphthene in mg/kg	4,800	210,000			0.016			0.0035 U			0.04			0.24 U		1.3	
Acenaphthylene in mg/kg					0.0051			0.0035 U			0.0095			0.24 U		0.25 U	
Anthracene in mg/kg	24,000	1,100,000			0.018			0.0035 U			0.025			0.24 U		1.7	
Benzo(g,h,i)perylene in mg/kg					0.012			0.0035 U			0.081			0.24 U		0.25 U	
Fluoranthene in mg/kg	3,200	140,000			0.062			0.0035 U			0.19			0.24 U		0.52	
Fluorene in mg/kg	3,200	140,000			0.016			0.0035 U			0.025			0.3		1.9	
Phenanthrene in mg/kg					0.058			0.0035 U			0.1			0.5		6.9	
Pyrene in mg/kg	2,400	110,000			0.065			0.0035 U			0.2			0.24 U		3.9	
1-Methylnaphthalene in mg/kg														2.6		16	
2-Methylnaphthalene in mg/kg	320	14,000			0.014			0.00068 J			0.042			2.3		16	
Naphthalene in mg/kg	5.3	11			0.066			0.003 UJ			0.13			0.83		2.4	
Total Naphthalenes in mg/kg	5.3	11			0.08			0.00368 J			0.172			5.73		34.4	
Benz(a)anthracene in mg/kg					0.015			0.0035 U			0.06			0.24 U		1.1	
Benzo(a)pyrene in mg/kg	0.14	0.6			0.012			0.0035 U			0.086			0.24 U		0.41	
Benzo(b)fluoranthene in mg/kg					0.015			0.0035 U			0.081			0.24 U		0.25 U	
Benzo(k)fluoranthene in mg/kg					0.0069			0.0035 U			0.031			0.24 U		0.25 U	
Chrysene in mg/kg					0.015			0.0035 U			0.097			0.24 U		1.6	
Dibenzo(a,h)anthracene in mg/kg					0.0017 UJ			0.0035 U			0.02			0.24 U		0.25 U	
Indeno(1,2,3-cd)pyrene in mg/kg					0.0088			0.0035 U			0.053			0.24 U		0.25 U	
Total cPAHs TEF in mg/kg	0.14	0.6			0.0169			0.00264 U			0.111			ND		0.586	
Other Semivolatiles																	
Dibenzofuran in mg/kg	160	7,000			0.0097			0.001 J			0.019						
Conventional Chemistry Parameters (including other metals)																	
pH in pH units													7.94	8.45	8.28	8.84	8.66

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Screening Level

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 10 - Soil Chemistry Data, Bunker C Tank Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	BC-SB03 (4-5 ft) 09/22/2009 RI	BC-SB03 (8.5-9.5 ft) 09/22/2009 RI	BC-SB03 (11.5-12.5 ft) 09/22/2009 RI	BC-SB03 (14-15 ft) 09/22/2009 RI	BC-SB04 (1-2 ft) 09/22/2009 RI	BC-SB04 (7.5-8.5 ft) 09/22/2009 RI	BC-SB04 (10.5-11.5 ft) 09/22/2009 RI	BC-SB04 (14-15 ft) 09/22/2009 RI	BC-SB05 (7.5-8.5 ft) 09/22/2009 RI	BC-SB05 (10.5-11.5 ft) 09/22/2009 RI	BC-SB05 (14-15 ft) 09/22/2009 RI	BC-SB06 (4-5 ft) 09/22/2009 RI	BC-SB06 (9-10 ft) 09/22/2009 RI	BC-SB06 (12-14 ft) 09/22/2009 RI	BC-SB06 (17.5-18.5 ft) 09/22/2009 RI
Total Petroleum Hydrocarbons																	
Gasoline Range Hydrocarbons in mg/kg	100	100															
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	210	64	32 U	35 U	26 U	32 U	30 U	33 U	32 U	33 U	35 U	29 U	42 U	37 U	580
Oil (C25-C36) in mg/kg	2,000	2,000	2,100	220	11 J	47 J	6.3 J	14 J	5.3 J	39 J	87 J	9.1 J	41 J	120 U	170 U	150 U	1,100
Bunker C in mg/kg	2,000	2,000															
Total TPHs in mg/kg	2,000	2,000	2,310	284	27 J	64.5 J	19.3 J	30 J	20.3 J	55.5 J	103 J	25.6 J	58.5 J	ND	ND	ND	1,680
Mercury																	
Mercury in mg/kg	24	1,050															
Other Metals																	
Arsenic in mg/kg	20	20															
Cadmium in mg/kg	2	2															
Chromium in mg/kg	1,000,000	1,000,000															
Copper in mg/kg	3,000	130,000															
Lead in mg/kg																	
Nickel in mg/kg	1,600	70,000															
Zinc in mg/kg	24,000	1,100,000															
Polycyclic Aromatic Hydrocarbons (PAHs)																	
Acenaphthene in mg/kg	4,800	210,000	0.02	0.036	0.0029 J	0.017	0.00075 J	0.0032 J	0.11	0.0048 J	0.015	0.0045 J	0.0069	0.00061 J	0.005 U	0.0047 U	0.16
Acenaphthylene in mg/kg			0.016	0.019	0.003 J	0.016	0.005 U	0.0025 J	0.00083 J	0.0077	0.072	0.0049 U	0.012	0.0008 J	0.005 U	0.0047 U	0.047
Anthracene in mg/kg	24,000	1,100,000	0.029	0.022	0.0038 J	0.027	0.005 U	0.0024 J	0.00057 J	0.0091	0.056	0.0049 U	0.017	0.0026 J	0.005 U	0.0047 U	0.11
Benzo(g,h,i)perylene in mg/kg			0.14	0.027	0.0048 J	0.028	0.005 U	0.022	0.0016 J	0.012	0.52	0.0029 J	0.029	0.0071	0.0024 J	0.011	0.12
Fluoranthene in mg/kg	3,200	140,000	0.14	0.14	0.026	0.084	0.0011 J	0.039	0.0035 J	0.033	0.93	0.0029 J	0.089	0.0042 J	0.0018 J	0.0024 J	0.21
Fluorene in mg/kg	3,200	140,000	0.028	0.032	0.0049 J	0.026	0.005 U	0.0018 J	0.0025 J	0.008	0.048	0.0022 J	0.015	0.0048 U	0.005 U	0.0047 U	0.094
Phenanthrene in mg/kg			0.18	0.16	0.017	0.1	5 U	0.028	5 U	0.038	0.57	6.6 U	0.078	0.014	0.0014 J	0.0033 J	0.55
Pyrene in mg/kg	2,400	110,000	0.14 J	0.13	0.025	0.085	5 U	0.03	5 U	0.032	0.91	4.9 U	0.075	0.0058 J	0.0014 J	0.0028 J	0.4 J
1-Methylnaphthalene in mg/kg																	
2-Methylnaphthalene in mg/kg	320	14,000	0.13	0.035	0.0079	0.043	5 U	5 U	5 U	0.012	0.032	5 U	0.016	0.014	0.00082 J	0.0026 J	0.08
Naphthalene in mg/kg	5.3	11	0.08	0.15	0.022	0.12	5 U	0.0082 U	0.014	0.045	0.053	0.0093	0.081	0.0042 J	0.00086 J	0.0031 J	0.31
Total Naphthalenes in mg/kg	5.3	11	0.21	0.185	0.0299	0.163	ND	ND	2.51	0.057	0.085	2.5093	0.097	0.0182	0.00168 J	0.0057 J	0.39
Benz(a)anthracene in mg/kg			0.15	0.022	0.0074	0.026	0.005 U	0.011	0.0017 J	0.0087	0.39	0.0011 J	0.03	0.0031 J	0.0013 J	0.0015 J	0.18
Benzo(a)pyrene in mg/kg	0.14	0.6	0.16	0.022	0.0041 J	0.03	0.005 U	0.017	0.0013 J	0.0096	0.63	0.001 J	0.032	0.0023 J	0.0014 J	0.0012 J	0.18
Benzo(b)fluoranthene in mg/kg			0.19 J	0.033	0.0058	0.034	0.005 U	0.027	0.0017 J	0.013	0.77	0.0019 J	0.038	0.0023 J	0.0018 J	0.0017 J	0.14
Benzo(k)fluoranthene in mg/kg			0.0048 UJ	0.012	0.0021 J	0.014	0.005 U	0.0093	0.005 U	0.0044 J	0.27	0.0049 U	0.014	0.0048 U	0.005 U	0.0047 U	0.045
Chrysene in mg/kg			0.38	0.035	0.0072	0.029	0.005 U	0.021	0.0017 J	0.012	0.59	0.0027 J	0.031	0.0045 J	0.0015 J	0.0027 J	0.29
Dibenzo(a,h)anthracene in mg/kg			0.065	0.0021 J	0.005 U	0.0036 J	0.005 U	0.0024 J	0.005 U	0.0012 J	0.089	0.0049 U	0.0043 J	0.0013 J	0.005 U	0.0012 J	0.039
Indeno(1,2,3-cd)pyrene in mg/kg			0.07	0.017	0.0027 J	0.022	0.005 U	0.018	0.0011 J	0.0088	0.51	0.001 J	0.023	0.0018 J	0.0013 J	0.0013 J	0.088
Total cPAHs TEF in mg/kg	0.14	0.6	0.212	0.031	0.00622	0.0403	ND	0.024	0.00227	0.0133	0.839	0.00192	0.0432	0.00344	0.00236	0.00203	0.232
Other Semivolatiles																	
Dibenzofuran in mg/kg	160	7,000	0.015	0.039	5 U	0.034	5 U	5 U	0.005 U	5.9 U	0.019	4.9 U	0.013	0.001 J	0.005 U	0.00093 J	0.046
Conventional Chemistry Parameters (including other metals)																	
pH in pH units																	

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Screening Level

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 10 - Soil Chemistry Data, Bunker C Tank Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	BC-SB06 (19-20 ft) 09/22/2009 RI	BC-SB07 (4-5 ft) 09/22/2009 RI	BC-SB07 (7.5-9.5 ft) 09/22/2009 RI	BC-SB07 (13-14 ft) 09/22/2009 RI	BC-SB07 (16-17 ft) 09/22/2009 RI	BC-SB08 (4-5 ft) 09/22/2009 RI	BC-SB08 (9-10 ft) 09/22/2009 RI	BC-SB08 (13-14 ft) 09/22/2009 RI	BC-SB08 (15.5-16.5 ft) 09/22/2009 RI	BC-SB08 (18-19 ft) 09/22/2009 RI	BC-SB09 (1-2 ft) 03/25/2010 RI	BC-SB09 (3-4 ft) 03/25/2010 RI	BC-SB09 (5-6 ft) 03/25/2010 RI	BC-SB09 (7-8 ft) 03/25/2010 RI	BC-SB09 (9-10 ft) 03/25/2010 RI
Total Petroleum Hydrocarbons																	
Gasoline Range Hydrocarbons in mg/kg	100	100															
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	31 U	350	71	33	41	27 U	32 U	31 U	2,600	30 U	240	5.5 U	11 U	5 U	3.6 U
Oil (C25-C36) in mg/kg	2,000	2,000	130 U	4,300	190	130 U	130 U	110 U	130 U	130 U	3,000	120 U	4,000	16 J	70 J	6.6 J	5 J
Bunker C in mg/kg	2,000	2,000															
Total TPHs in mg/kg	2,000	2,000	ND	4,650	261	98	106	ND	ND	ND	5,600	ND	4,240	21.5 J	81 J	11.6 J	8.6 J
Mercury																	
Mercury in mg/kg	24	1,050															
Other Metals																	
Arsenic in mg/kg	20	20															
Cadmium in mg/kg	2	2															
Chromium in mg/kg	1,000,000	1,000,000															
Copper in mg/kg	3,000	130,000															
Lead in mg/kg																	
Nickel in mg/kg	1,600	70,000															
Zinc in mg/kg	24,000	1,100,000															
Polycyclic Aromatic Hydrocarbons (PAHs)																	
Acenaphthene in mg/kg	4,800	210,000	0.0068	0.097	0.25	1.2	0.39	0.00077 J	0.005 U	0.0048 U	0.054	0.0011 J	0.0044 J		0.005 U		
Acenaphthylene in mg/kg			0.005 U	0.012	0.029	0.0097	0.0089	0.0048 U	0.00085 J	0.0048 U	0.032	0.005 U	0.0048 U		0.0022 J		
Anthracene in mg/kg	24,000	1,100,000	0.00063 J	0.083	0.29	0.14	0.11	0.00084 J	0.00068 J	0.0048 U	0.1	0.00097 J	0.004 J		0.0031 J		
Benzo(g,h,i)perylene in mg/kg			0.005 U	0.17	0.062 J	0.034	0.03	0.0011 J	0.022	0.0014 J	0.04	0.005 U	0.12		0.026		
Fluoranthene in mg/kg	3,200	140,000	0.0013 J	0.5	0.99	0.4	0.36	0.0094	0.0085	0.0023 J	0.12	0.0022 J	0.034		0.017		
Fluorene in mg/kg	3,200	140,000	0.005 U	0.12	0.24	0.87	0.27	0.0048 U	0.005 U	0.0048 U	0.027	0.0012 J	0.0034 J		0.005 U		
Phenanthrene in mg/kg			0.0026 J	0.58	1.1	0.87	0.33	0.0073	0.0051	0.0029 J	0.089	0.0031 J	0.11		0.02		
Pyrene in mg/kg	2,400	110,000	0.0016 J	0.39 J	0.7 J	0.26 J	0.23 J	0.0041 J	0.0071	0.0015 J	0.26	0.0022 J	0.12		0.016		
1-Methylnaphthalene in mg/kg																	
2-Methylnaphthalene in mg/kg	320	14,000	0.0011 J	0.14	0.21	0.78	0.12	0.0017 J	0.0021 J	0.0013 J	0.058	0.0018 J	0.063		0.0065		
Naphthalene in mg/kg	5.3	11	0.0013 J	0.098	0.38	0.92	0.37	0.0033 J	0.0032 J	0.0033 J	0.037	0.0025 J	0.02		0.0058		
Total Naphthalenes in mg/kg	5.3	11	0.0024 J	0.238	0.59	1.7	0.49	0.005 J	0.0053 J	0.0046 J	0.095	0.0043 J	0.083		0.0123		
Benz(a)anthracene in mg/kg			0.00086 J	0.19	0.2	0.15	0.063	0.0019 J	0.005 J	0.00072 J	0.087	0.001 J	0.038		0.0076		
Benzo(a)pyrene in mg/kg	0.14	0.6	0.005 U	0.21	0.1 J	0.062	0.033	0.00083 J	0.012	0.0048 U	0.045	0.005 U	0.067		0.016		
Benzo(b)fluoranthene in mg/kg			0.005 U	0.25	0.17	0.11	0.057	0.0026 J	0.017	0.0012 J	0.064	0.005 U	0.1		0.021		
Benzo(k)fluoranthene in mg/kg			0.005 U	0.097	0.056 J	0.047	0.017	0.0048 U	0.0048 J	0.0048 U	0.015	0.005 U	0.011		0.0061		
Chrysene in mg/kg			0.005 U	0.4	0.23	0.2	0.08	0.0036 J	0.01	0.0013 J	0.22	0.00091 J	0.28		0.015		
Dibenzo(a,h)anthracene in mg/kg			0.005 U	0.069	0.019	0.01	0.0061	0.0048 U	0.0042 J	0.0048 U	0.025	0.005 U	0.048		0.0043 J		
Indeno(1,2,3-cd)pyrene in mg/kg			0.005 U	0.13	0.064 J	0.038	0.029	0.0048 U	0.015	0.0048 U	0.02	0.005 U	0.033		0.021		
Total cPAHs TEF in mg/kg	0.14	0.6	0.00361	0.288	0.153	0.0995	0.051	0.00204	0.0167	0.00333	0.0683	0.00361	0.0928		0.0222		
Other Semivolatiles																	
Dibenzofuran in mg/kg	160	7,000	0.00093 J	0.074	0.22	0.69	0.16	0.0013 J	0.0011 J	0.00067 J	0.016	0.0017 J	0.011		0.0062		
Conventional Chemistry Parameters (including other metals)																	
pH in pH units																	

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Screening Level

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 10 - Soil Chemistry Data, Bunker C Tank Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	BC-SB09 FD (13-15 ft) 03/25/2010 RI	BC-SB09 (13-15 ft) 03/25/2010 RI	BC-SB09 (18-20 ft) 03/25/2010 RI	BC-SB10 (5-6 ft) 03/25/2010 RI	BC-SB10 (9-10 ft) 03/25/2010 RI	BC-SB10 (13-14 ft) 03/25/2010 RI	BC-SB10 (15-16 ft) 03/25/2010 RI	BC-SB10 (16-17 ft) 03/25/2010 RI	BC-SB10 (18-19 ft) 03/25/2010 RI	BC-SB11 FD (3-4 ft) 12/22/2010 RI	BC-SB11 (3-4 ft) 12/22/2010 RI	BC-SB11 (6-7 ft) 12/22/2010 RI	BC-SB11 (9-10 ft) 12/22/2010 RI	BC-SB11 (12-13 ft) 12/22/2010 RI	BC-SB11 (15-16 ft) 12/22/2010 RI
Total Petroleum Hydrocarbons																	
Gasoline Range Hydrocarbons in mg/kg	100	100															
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	10 U	9.5 U	3.9 U	6 U	9.8 U	210	4.3 U	22 U	5 U	200	310	30 U	4.2 UJ	3.8 UJ	2.4 UJ
Oil (C25-C36) in mg/kg	2,000	2,000	120 J	83 J	12 J	21 J	7 J	310	7.8 J	56 J	10 J	1,000 J	1,600 J	120 U	8.6 UJ	6.6 UJ	6.0 UJ
Bunker C in mg/kg	2,000	2,000															
Total TPHs in mg/kg	2,000	2,000	130 J	92.5 J	15.9 J	27 J	16.8 J	520	12.1 J	78 J	15 J	1,200 J	1,910 J	ND	12.8 J	10.4 J	8.4 J
Mercury																	
Mercury in mg/kg	24	1,050															
Other Metals																	
Arsenic in mg/kg	20	20															
Cadmium in mg/kg	2	2															
Chromium in mg/kg	1,000,000	1,000,000															
Copper in mg/kg	3,000	130,000															
Lead in mg/kg																	
Nickel in mg/kg	1,600	70,000															
Zinc in mg/kg	24,000	1,100,000															
Polycyclic Aromatic Hydrocarbons (PAHs)																	
Acenaphthene in mg/kg	4,800	210,000		0.0039 J		0.0048 U		0.043					0.0029 U	0.003 U			
Acenaphthylene in mg/kg				0.0022 J		0.0048 U		0.011					0.0032	0.003 U			
Anthracene in mg/kg	24,000	1,100,000		0.0035 J		0.0013 J		0.024					0.0047	0.003 U			
Benzo(g,h,i)perylene in mg/kg				0.01		0.01		0.012					0.082	0.0027 J			
Fluoranthene in mg/kg	3,200	140,000		0.012		0.011		0.03					0.034	0.0013 J			
Fluorene in mg/kg	3,200	140,000		0.0043 J		0.0048 U		0.074					0.0018 J	0.003 U			
Phenanthrene in mg/kg				0.017		0.0072		0.16					0.026	0.0047			
Pyrene in mg/kg	2,400	110,000		0.017		0.0097		0.089					0.025	0.0027 J			
1-Methylnaphthalene in mg/kg																	
2-Methylnaphthalene in mg/kg	320	14,000		0.01		0.015		0.34					0.02	0.0092			
Naphthalene in mg/kg	5.3	11		0.021		0.0076		0.11					0.013	0.0059			
Total Naphthalenes in mg/kg	5.3	11		0.031		0.0226		0.45					0.033	0.0151			
Benz(a)anthracene in mg/kg				0.0043 J		0.0035 J		0.017					0.0059	0.003 U			
Benzo(a)pyrene in mg/kg	0.14	0.6		0.0054		0.0054		0.013					0.017	0.003 U			
Benzo(b)fluoranthene in mg/kg				0.0082		0.014		0.012					0.016	0.0013 J			
Benzo(k)fluoranthene in mg/kg				0.0018 J		0.0031 J		0.0031 J					0.0029 U	0.003 U			
Chrysene in mg/kg				0.0049		0.0096		0.044					0.0077	0.0018 J			
Dibenzo(a,h)anthracene in mg/kg				0.0017 J		0.0013 J		0.0034 J					0.0095	0.003 U			
Indeno(1,2,3-cd)pyrene in mg/kg				0.0053		0.0081		0.0069					0.023	0.003 U			
Total cPAHs TEF in mg/kg	0.14	0.6		0.00758		0.0085		0.0177					0.0227	0.00225 J			
Other Semivolatiles																	
Dibenzofuran in mg/kg	160	7,000		0.0035 J		0.0014 J		0.014					0.0034	0.003 U			
Conventional Chemistry Parameters (including other metals)																	
pH in pH units																	

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Screening Level

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 10 - Soil Chemistry Data, Bunker C Tank Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	BC-SB11 (18-19 ft) 12/22/2010 RI	BC-SB12 (3-4 ft) 12/21/2010 RI	BC-SB12 FD (6-7 ft) 12/21/2010 RI	BC-SB12 (6-7 ft) 12/21/2010 RI	BC-SB12 (9-10 ft) 12/21/2010 RI	BC-SB12 (12-13 ft) 12/21/2010 RI	BC-SB12 (14-15 ft) 12/21/2010 RI	BC-SB12 (16-17 ft) 12/21/2010 RI	BC-SB13 (3-4 ft) 12/21/2010 RI	BC-SB13 FD (6-7 ft) 12/21/2010 RI	BC-SB13 (6-7 ft) 12/21/2010 RI	BC-SB13 (9-10 ft) 12/21/2010 RI	BC-SB13 (12-13 ft) 12/21/2010 RI	BC-SB13 (14-15 ft) 12/21/2010 RI	BC-SB13 (16-17 ft) 12/21/2010 RI
Total Petroleum Hydrocarbons																	
Gasoline Range Hydrocarbons in mg/kg	100	100															
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	2.1 UJ	4.1 UJ	4.1 UJ	5.4 UJ	3,800	17 UJ	19 UJ	5.5 UJ	4.4 UJ	3.6 UJ	5.2 UJ	54	5.4 UJ	39	5.3 UJ
Oil (C25-C36) in mg/kg	2,000	2,000	120 U	22 UJ	13 UJ	15 UJ	1,500	39 UJ	49 UJ	17 UJ	12 UJ	18 UJ	23 UJ	120 UJ	11 UJ	88 UJ	16 UJ
Bunker C in mg/kg	2,000	2,000															
Total TPHs in mg/kg	2,000	2,000	62.1 J	26.1 J	17.1 J	20.4 J	5,300 J	56.0 J	68.0 J	22.5 J	16.4 J	21.6 J	28.2 J	174 J	16.4 J	127 J	21.3 J
Mercury																	
Mercury in mg/kg	24	1,050															
Other Metals																	
Arsenic in mg/kg	20	20															
Cadmium in mg/kg	2	2															
Chromium in mg/kg	1,000,000	1,000,000															
Copper in mg/kg	3,000	130,000															
Lead in mg/kg																	
Nickel in mg/kg	1,600	70,000															
Zinc in mg/kg	24,000	1,100,000															
Polycyclic Aromatic Hydrocarbons (PAHs)																	
Acenaphthene in mg/kg	4,800	210,000					0.17	0.019					0.0028 U	0.016			
Acenaphthylene in mg/kg							0.027 U	0.0031 U					0.0028 U	0.0023 J			
Anthracene in mg/kg	24,000	1,100,000					0.085	0.0047					0.0028 U	0.014			
Benzo(g,h,i)perylene in mg/kg							0.023	0.0049					0.0014 J	0.012			
Fluoranthene in mg/kg	3,200	140,000					0.25	0.017					0.0018 J	0.074			
Fluorene in mg/kg	3,200	140,000					0.12	0.012					0.0028 U	0.014			
Phenanthrene in mg/kg							0.17	0.018					0.0028 U	0.045			
Pyrene in mg/kg	2,400	110,000					0.23	0.015					0.0012 J	0.064			
1-Methylnaphthalene in mg/kg																	
2-Methylnaphthalene in mg/kg	320	14,000					0.022	0.027					0.00061 J	0.035			
Naphthalene in mg/kg	5.3	11					0.041	0.048					0.0014 UJ	0.03			
Total Naphthalenes in mg/kg	5.3	11					0.063	0.075					0.00201 J	0.065			
Benz(a)anthracene in mg/kg							0.045	0.0033					0.0028 U	0.03			
Benzo(a)pyrene in mg/kg	0.14	0.6					0.031	0.0024 J					0.0028 U	0.022			
Benzo(b)fluoranthene in mg/kg							0.044	0.0041					0.0028 U	0.023			
Benzo(k)fluoranthene in mg/kg							0.015	0.003 U					0.0028 U	0.0068			
Chrysene in mg/kg							0.067	0.0032					0.0028 U	0.051			
Dibenzo(a,h)anthracene in mg/kg							0.0065	0.003 U					0.0028 U	0.0037			
Indeno(1,2,3-cd)pyrene in mg/kg							0.016	0.0021 J					0.0028 U	0.0073			
Total cPAHs TEF in mg/kg	0.14	0.6					0.0443	0.00368					0.00211 U	0.0296			
Other Semivolatiles																	
Dibenzofuran in mg/kg	160	7,000					0.08 U	0.0043					0.0028 U	0.01			
Conventional Chemistry Parameters (including other metals)																	
pH in pH units																	

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Screening Level

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 10 - Soil Chemistry Data, Bunker C Tank Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	BC-SB14 (2-3 ft) 12/22/2010 RI	BC-SB14 (6.5-7.5 ft) 12/22/2010 RI	BC-SB14 (8-9 ft) 12/22/2010 RI	BC-SB14 (9-10 ft) 12/22/2010 RI	BC-SB14 FD (12-13 ft) 12/22/2010 RI	BC-SB14 (12-13 ft) 12/22/2010 RI	BC-SB14 (15-16 ft) 12/22/2010 RI	BC-SB14 (18-19 ft) 12/22/2010 RI	BC-SB15 (2-3 ft) 12/23/2010 RI	BC-SB15 FD (6.5-7.5 ft) 12/22/2010 RI	BC-SB15 (6.5-7.5 ft) 12/23/2010 RI	BC-SB15 (9-10 ft) 12/23/2010 RI	BC-SB15 (12-13 ft) 12/23/2010 RI	BC-SB15 (15-16 ft) 12/23/2010 RI	BC-SB15 (18-19 ft) 12/23/2010 RI
Total Petroleum Hydrocarbons																	
Gasoline Range Hydrocarbons in mg/kg	100	100															
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	870	5,500	3,600	28 UJ	23 UJ	29 UJ	5.2 UJ	2.2 UJ	9.4 UJ	7.5 UJ	7.6 UJ	3.3 UJ	6.1 UJ	12 UJ	3.2 UJ
Oil (C25-C36) in mg/kg	2,000	2,000	1,800	8,000	3,900	14 UJ	33 UJ	39 UJ	6.0 UJ	120 U	36 UJ	26 UJ	30 UJ	130 U	24 UJ	28 UJ	5.3 UJ
Bunker C in mg/kg	2,000	2,000															
Total TPHs in mg/kg	2,000	2,000	2,670 J	13,500 J	7,500 J	42.0 J	56.0 J	68.0 J	11.2 J	62.2 J	45.4 J	33.5 J	37.6 J	68.3 J	30.1 J	40.0 J	8.5 J
Mercury																	
Mercury in mg/kg	24	1,050															
Other Metals																	
Arsenic in mg/kg	20	20															
Cadmium in mg/kg	2	2															
Chromium in mg/kg	1,000,000	1,000,000															
Copper in mg/kg	3,000	130,000															
Lead in mg/kg																	
Nickel in mg/kg	1,600	70,000															
Zinc in mg/kg	24,000	1,100,000															
Polycyclic Aromatic Hydrocarbons (PAHs)																	
Acenaphthene in mg/kg	4,800	210,000				0.082		0.01					0.0031 U	0.0019 J			
Acenaphthylene in mg/kg						0.015 U		0.0037 U					0.0037	0.0032 U			
Anthracene in mg/kg	24,000	1,100,000				0.064		0.014					0.0069	0.0032 U			
Benzo(g,h,i)perylene in mg/kg						0.0078		0.0041					0.037	0.0025 J			
Fluoranthene in mg/kg	3,200	140,000				0.016		0.012					0.049	0.00099 J			
Fluorene in mg/kg	3,200	140,000				0.094		0.017					0.0012 J	0.0011 J			
Phenanthrene in mg/kg						0.12		0.058					0.029	0.0059			
Pyrene in mg/kg	2,400	110,000				0.081		0.037					0.043	0.0025 J			
1-Methylnaphthalene in mg/kg																	
2-Methylnaphthalene in mg/kg	320	14,000				0.68		0.16					0.011	0.008			
Naphthalene in mg/kg	5.3	11				0.095		0.031					0.031	0.0058			
Total Naphthalenes in mg/kg	5.3	11				0.775		0.191					0.042	0.0138			
Benz(a)anthracene in mg/kg						0.014		0.01					0.021	0.0032 U			
Benzo(a)pyrene in mg/kg	0.14	0.6				0.005		0.0045					0.031	0.0032 U			
Benzo(b)fluoranthene in mg/kg						0.0057		0.0039					0.04	0.0013 J			
Benzo(k)fluoranthene in mg/kg						0.0031 U		0.0011 J					0.013	0.0032 U			
Chrysene in mg/kg						0.024		0.016					0.032	0.0013 J			
Dibenzo(a,h)anthracene in mg/kg						0.0018 J		0.0011 J					0.004	0.0032 U			
Indeno(1,2,3-cd)pyrene in mg/kg						0.0015 J		0.0016 J					0.031	0.0032 U			
Total cPAHs TEF in mg/kg	0.14	0.6				0.0077		0.00643					0.0422	0.00238 J			
Other Semivolatiles																	
Dibenzofuran in mg/kg	160	7,000				0.039		0.0066					0.0049	0.00081 J			
Conventional Chemistry Parameters (including other metals)																	
pH in pH units																	

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Screening Level

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 10 - Soil Chemistry Data, Bunker C Tank Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	BC-SB16 (3-4 ft) 12/22/2010 RI	BC-SB16 FD (6-7 ft) 12/22/2010 RI	BC-SB16 (6-7 ft) 12/22/2010 RI	BC-SB16 (9-10 ft) 12/22/2010 RI	BC-SB16 (10-11 ft) 12/22/2010 RI	BC-SB16 (12-13 ft) 12/22/2010 RI	BC-SB16 (14-15 ft) 12/22/2010 RI	BC-SB17 (3-4 ft) 12/22/2010 RI	BC-SB17 (4-5 ft) 12/22/2010 RI	BC-SB17 (6-7 ft) 12/22/2010 RI	BC-SB17 FD (8-9 ft) 12/22/2010 RI	BC-SB17 (8-9 ft) 12/22/2010 RI	BC-SB17 (9-10 ft) 12/22/2010 RI	BC-SB18 (3-4 ft) 12/22/2010 RI	BC-SB18 (6-7 ft) 12/22/2010 RI
Total Petroleum Hydrocarbons																	
Gasoline Range Hydrocarbons in mg/kg	100	100															
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	200 J	96	87	5.6 UJ	41 UJ	4.7 UJ	3.4 UJ	630	11 UJ	22 UJ	15,000	16,000	21,000	6.0 UJ	12 UJ
Oil (C25-C36) in mg/kg	2,000	2,000	2,200	270	250	9.9 UJ	380	9.4 UJ	5.6 UJ	3,200	46 UJ	86 UJ	15,000	15,000	16,000	6.7 UJ	44 UJ
Bunker C in mg/kg	2,000	2,000															
Total TPHs in mg/kg	2,000	2,000	2,400 J	366 J	337 J	15.5 J	421 J	14.1 J	9.00 J	3,830 J	57.0 J	108 J	30,000 J	31,000 J	37,000 J	12.7 J	56.0 J
Mercury																	
Mercury in mg/kg	24	1,050															
Other Metals																	
Arsenic in mg/kg	20	20															
Cadmium in mg/kg	2	2															
Chromium in mg/kg	1,000,000	1,000,000															
Copper in mg/kg	3,000	130,000															
Lead in mg/kg																	
Nickel in mg/kg	1,600	70,000															
Zinc in mg/kg	24,000	1,100,000															
Polycyclic Aromatic Hydrocarbons (PAHs)																	
Acenaphthene in mg/kg	4,800	210,000			0.0035	0.0015 J								5.8	4.2		
Acenaphthylene in mg/kg					0.0036	0.0068								1.4 U	1.1 U		
Anthracene in mg/kg	24,000	1,100,000			0.0047	0.021								10	4.6		
Benzo(g,h,i)perylene in mg/kg					0.03	0.019								2.3	1		
Fluoranthene in mg/kg	3,200	140,000			0.019	0.083								5.2	3.1		
Fluorene in mg/kg	3,200	140,000			0.0039	0.0073								8.4	7.2		
Phenanthrene in mg/kg					0.03	0.062								58	35		
Pyrene in mg/kg	2,400	110,000			0.021	0.059								29	12		
1-Methylnaphthalene in mg/kg																	
2-Methylnaphthalene in mg/kg	320	14,000			0.018	0.019								120	110		
Naphthalene in mg/kg	5.3	11			0.021	0.008								14	13		
Total Naphthalenes in mg/kg	5.3	11			0.039	0.027								134	123		
Benz(a)anthracene in mg/kg					0.0067	0.037								10	3.7		
Benzo(a)pyrene in mg/kg	0.14	0.6			0.0084	0.029								4.5	2		
Benzo(b)fluoranthene in mg/kg					0.013	0.037								2.1	1		
Benzo(k)fluoranthene in mg/kg					0.0032	0.016								0.35	0.22		
Chrysene in mg/kg					0.014	0.046								16	5.8		
Dibenzo(a,h)anthracene in mg/kg					0.0027 J	0.0043								0.77	0.39		
Indeno(1,2,3-cd)pyrene in mg/kg					0.011	0.017								1.2	0.35		
Total cPAHs TEF in mg/kg	0.14	0.6			0.0122	0.0406								6.1	2.62		
Other Semivolatiles																	
Dibenzofuran in mg/kg	160	7,000			0.0071	0.0029 J								2.6 U	1.9 U		
Conventional Chemistry Parameters (including other metals)																	
pH in pH units																	

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Screening Level

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 10 - Soil Chemistry Data, Bunker C Tank Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	BC-SB18 FD (9-10 ft) 12/22/2010 RI	BC-SB18 (9-10 ft) 12/22/2010 RI	BC-SB18 (12-13 ft) 12/22/2010 RI	BC-SB18 (14-15 ft) 12/22/2010 RI	BC-SB18 (18-19 ft) 12/22/2010 RI	BC-SB19 (3-4 ft) 12/22/2010 RI	BC-SB19 (6-7 ft) 12/22/2010 RI	BC-SB19 FD (9-10 ft) 12/22/2010 RI	BC-SB19 (9-10 ft) 12/22/2010 RI	BC-SB19 (12-13 ft) 12/22/2010 RI	BC-SB19 (17-18 ft) 12/22/2010 RI	BC-SB19 (18-19 ft) 12/22/2010 RI	BC-SB20 (7-8 ft) 12/22/2010 RI	BC-SB20 (14.5-15 ft) 12/22/2010 RI	BC-SB20 (19-20 ft) 12/22/2010 RI
Total Petroleum Hydrocarbons																	
Gasoline Range Hydrocarbons in mg/kg	100	100															
Diesel Range Hydrocarbons in mg/kg	2,000	2,000	15,000	16,000	10,000	6.9 UJ	3.6 UJ	210	530	190	130	130	430	390	2.7 UJ	34	63
Oil (C25-C36) in mg/kg	2,000	2,000	15,000	17,000	14,000	5.2 UJ	7.1 UJ	2,000	3,600	970 J	440 J	370	1,900 J	1,200	6.2 UJ	110 UJ	320
Bunker C in mg/kg	2,000	2,000															
Total TPHs in mg/kg	2,000	2,000	30,000 J	33,000 J	24,000 J	12.1 J	10.7 J	2,210 J	4,130 J	1,160 J	570 J	500 J	2,330 J	1,590 J	8.9 J	144 J	383 J
Mercury																	
Mercury in mg/kg	24	1,050															
Other Metals																	
Arsenic in mg/kg	20	20															
Cadmium in mg/kg	2	2															
Chromium in mg/kg	1,000,000	1,000,000															
Copper in mg/kg	3,000	130,000															
Lead in mg/kg																	
Nickel in mg/kg	1,600	70,000															
Zinc in mg/kg	24,000	1,100,000															
Polycyclic Aromatic Hydrocarbons (PAHs)																	
Acenaphthene in mg/kg	4,800	210,000		4		0.053			0.14			0.018			0.0011 J		0.018
Acenaphthylene in mg/kg				0.99 U		0.0031 U			0.019 J			0.0075			0.003 U		0.0029 J
Anthracene in mg/kg	24,000	1,100,000		2.2		0.0043			0.12			0.018			0.00087 J		0.017
Benzo(g,h,i)perylene in mg/kg				4.2		0.0063			0.11			0.05			0.0011 J		0.021
Fluoranthene in mg/kg	3,200	140,000		4		0.012			0.85			0.084			0.002 J		0.1
Fluorene in mg/kg	3,200	140,000		5.5		0.018			0.17			0.02			0.0009 J		0.018
Phenanthrene in mg/kg				28		0.03			0.68			0.11			0.0023 J		0.057 J
Pyrene in mg/kg	2,400	110,000		11		0.015			0.7			0.089			0.0019 J		0.14
1-Methylnaphthalene in mg/kg																	
2-Methylnaphthalene in mg/kg	320	14,000		3.1		0.091			0.19			0.11			0.039		0.025
Naphthalene in mg/kg	5.3	11		1.5		0.38			2.1			0.058			0.011		0.057
Total Naphthalenes in mg/kg	5.3	11		4.6		0.471			2.29			0.168			0.05		0.082
Benz(a)anthracene in mg/kg				5.6		0.0031 J			0.21			0.038			0.001 J		0.031
Benzo(a)pyrene in mg/kg	0.14	0.6		5.4		0.002 J			0.14			0.042			0.00094 J		0.029
Benzo(b)fluoranthene in mg/kg				3.1		0.0038			0.2			0.052			0.0021 J		0.049
Benzo(k)fluoranthene in mg/kg				0.5		0.0031 U			0.055			0.017			0.003 U		0.013
Chrysene in mg/kg				9.1		0.0054			0.23			0.054			0.0012 J		0.031
Dibenzo(a,h)anthracene in mg/kg				1.4		0.0031 U			0.04			0.0086			0.003 U		0.0071
Indeno(1,2,3-cd)pyrene in mg/kg				1.5		0.0014 J			0.077			0.039			0.003 U		0.015
Total cPAHs TEF in mg/kg	0.14	0.6		6.7		0.00319			0.201			0.058			0.00171 J		0.0408
Other Semivolatiles																	
Dibenzofuran in mg/kg	160	7,000		1.3 U		0.0076			0.12			0.016			0.003 U		0.018
Conventional Chemistry Parameters (including other metals)																	
pH in pH units																	

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Screening Level

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 10 - Soil Chemistry Data, Bunker C Tank Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Screening Level	Industrial Soil Screening Level	BH-SB02 (0-4 ft) 07/21/2004 Pre-RI	BH-SB02 FD (4-8 ft) 07/21/2004 Pre-RI	BH-SB02 (4-8 ft) 07/21/2004 Pre-RI	BH-SB02 (8-12 ft) 07/21/2004 Pre-RI	BH-SB02 (12-16 ft) 07/21/2004 Pre-RI	GF-SB20 (0-4 ft) 07/22/2004 Pre-RI	GF-SB20 (4-8 ft) 07/22/2004 Pre-RI	GF-SB20 (12-16 ft) 07/22/2004 Pre-RI	TS-MW01 (2.5-4 ft) 07/14/2004 Pre-RI	TS-MW01 (5-6.5 ft) 07/14/2004 Pre-RI	TS-SB01 (0-4 ft) 07/21/2004 Pre-RI	TS-SB01 (4-8 ft) 07/21/2004 Pre-RI	TS-SB02 (0-4 ft) 07/21/2004 Pre-RI	TS-SB02 (4-8 ft) 07/21/2004 Pre-RI
Total Petroleum Hydrocarbons																
Gasoline Range Hydrocarbons in mg/kg	100	100				42	36			6.1 U						
Diesel Range Hydrocarbons in mg/kg	2,000	2,000		320	290	5,400	1,000	67		35	21	5.1	79	8.2	37	11
Oil (C25-C36) in mg/kg	2,000	2,000		1,800	1,600	1,500	430	110		98	130	21	980	80	220	68
Bunker C in mg/kg	2,000	2,000							3,100							
Total TPHs in mg/kg	2,000	2,000		2,120	1,890	6,900	1,430	177	3,100	133	151	26.1	1,059	88.2	257	79
Mercury																
Mercury in mg/kg	24	1,050	0.08	0.53	0.45			0.21	0.70		0.05 U	0.05 U	0.04 J	0.05 J	0.10 J	0.06 J
Other Metals																
Arsenic in mg/kg	20	20	5 U	7 U	6 U			6 U	6 U		5 U	6 U	5 U	6 U	5 U	6 U
Cadmium in mg/kg	2	2	0.3	0.7	0.7			0.3	0.3		0.2 U	0.2 U	0.2 U	0.2 U	0.4	0.2 U
Chromium in mg/kg	1,000,000	1,000,000	21.6	33.9	30.7			37.5	41.6		21.1	28.1	18.1	26.5	33.2	31.9
Copper in mg/kg	3,000	130,000	31.4	52.0	53.0			53.5	65.2		12.8 J	20.2 J	12.1	19.0	47.8	27.8
Lead in mg/kg			31 J	54 J	46 J			55	42		4	4	4	4	168	5
Nickel in mg/kg	1,600	70,000	24	30	31			28	38		21	29	13	27	31	33
Zinc in mg/kg	24,000	1,100,000	67.6	147	123			72.9	71.7		30.5	39.5	24.0 J	40.1 J	85.2 J	55.4 J
Polycyclic Aromatic Hydrocarbons (PAHs)																
Acenaphthene in mg/kg	4,800	210,000					57					0.0079 U	0.017 U		0.0075 U	
Acenaphthylene in mg/kg							1					0.0079 U	0.017 U		0.0075 U	
Anthracene in mg/kg	24,000	1,100,000					15					0.0079 U	0.017 U		0.0075 U	
Benzo(g,h,i)perylene in mg/kg							0.37 U					0.0079 U	0.017 U		0.0085	
Fluoranthene in mg/kg	3,200	140,000					90					0.011	0.026		0.028	
Fluorene in mg/kg	3,200	140,000					48					0.0079 U	0.017 U		0.0075 U	
Phenanthrene in mg/kg							160					0.017	0.021		0.022	
Pyrene in mg/kg	2,400	110,000					52					0.0079 U	0.034		0.028	
1-Methylnaphthalene in mg/kg							14						0.017 U		0.0073 J	
2-Methylnaphthalene in mg/kg	320	14,000					26					0.0079 U	0.017 U		0.011	
Naphthalene in mg/kg	5.3	11					68					0.0079 U	0.017 U		0.046	
Total Naphthalenes in mg/kg	5.3	11					108					ND	ND		0.0643	
Benz(a)anthracene in mg/kg							12					0.0079 U	0.017 U		0.0079	
Benzo(a)pyrene in mg/kg	0.14	0.6					3					0.0079 U	0.017 U		0.014	
Benzo(b)fluoranthene in mg/kg							4.6					0.0079 U	0.037		0.017	
Benzo(k)fluoranthene in mg/kg							6.2					0.0079 U	0.024		0.017	
Chrysene in mg/kg							10					0.01	0.036		0.016	
Dibenzo(a,h)anthracene in mg/kg							0.37 U					0.0079 U	0.017 U		0.0075 U	
Indeno(1,2,3-cd)pyrene in mg/kg							0.37 U					0.0079 U	0.017 U		0.0075 U	
Total cPAHs TEF in mg/kg	0.14	0.6					5.42					0.00603	0.0175		0.0191	
Other Semivolatiles																
Dibenzofuran in mg/kg	160	7,000										0.0079 U				
Conventional Chemistry Parameters (including other metals)																
pH in pH units			8.26	8.29	8.35	9.02	8.68	7.58	7.72	7.35	6.16	8.10	8.07	8.05	7.93	8.14

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Screening Level

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 11 - Groundwater Chemistry Data, Bunker C Tank Subarea

GP West RI/FS 070188

Chemical Name	Preliminary Groundwater Screening Level for Unrestricted Land Use	Preliminary Groundwater Screening Level for Industrial Land Use	BC-MW01 07/27/04 Pre-RI	BC-MW01 04/01/10 RI	BC-MW01 12/15/10 RI	BC-MW02 10/01/09 RI	BC-MW02 10/01/09 Field Dup RI	BC-MW02 04/01/10 RI	BC-MW02 04/01/10 Field Dup RI	BC-MW02 12/15/10 RI	BC-MW03 09/28/09 RI	BC-MW03 04/01/10 RI	BC-MW03 12/16/10 RI	BC-MW04 12/21/10 RI	BC-MW05 12/19/10 RI	GF-SB20 07/22/04 Pre-RI	TS-MW01 07/25/04 Pre-RI	TS-MW01 10/01/09 RI	TS-MW01 04/01/10 RI
Total Petroleum Hydrocarbons																			
Gasoline Range Hydrocarbons in ug/L			260														250 U		
Diesel Range Hydrocarbons in ug/L				1,200	35 J	280 U	280 U	28 J	30 J	14 J	270 U	26 J	260 UJ	77 UJ	35 UJ		320 J		
Oil (C25-C36) in ug/L				1,300	47 J	560 U	560 U	21 J	32 J	530 UJ	530 U	28 J	520 UJ	84 UJ	53 UJ		500 U		
Bunker C in ug/L			6,700																
Total TPHs in ug/L			6,700	2,500	82.0 J	ND	ND	49 J	62 J	279 J	ND	54 J	ND	161 J	88.0 J		570 J		
Mercury																			
Dissolved Mercury in ug/L	0.94	0.94	0.1 U	0.00175		0.001 U!	0.00044 J!	0.00058 J	0.00036 J			0.00021 J				0.1 U	0.1 U	0.00108	0.0009 J
Other Metals																			
Dissolved Arsenic in ug/L	5	5	2.7	1.5 J		10 U!	5.2 J!	0.66 U	0.61 U			0.15 U				2	0.5	0.69	0.5 U
Dissolved Cadmium in ug/L	8.8	8.8	0.5 U	0.04		1.5 !	1.4 !	0.012 U	0.016 U			0.014 U				0.5 U	0.2 U	0.005 J	0.02 U
Dissolved Chromium (VI) in ug/L	50	50	112 U	50 U		50 U!	50 U!	50 U	50 U			50 U					11 U	50 U	50 U
Dissolved Chromium in ug/L	240,000	240,000	5	1.29		1.1 J!	0.6 J!	3.03	2.3			1.66				7	1 U	1.98	0.78
Dissolved Copper in ug/L	3.1	3.1	1 U	2.4		12.7 J!	11 J!	0.232 J	0.121 J			0.14 J				1 U	0.5	0.42	0.57
Dissolved Lead in ug/L	8.1	8.1	2 U	0.123		412 !	334 !	0.045 U	0.1 U			0.1 U				2 U	1 U	0.02 U	0.028
Dissolved Nickel in ug/L	8.2	8.2	2	3.72		32.4 J!	30.1 J!	0.1 J	0.47 J			1.67 U				3	0.6	0.5	2.37
Dissolved Zinc in ug/L	81	81	10 U	0.9 J		208 !	195 !	1.18 U	0.69 U			0.47 U				10 U	4 U	0.25 J	0.3 U
Polycyclic Aromatic Hydrocarbons (PAHs)																			
Acenaphthene in ug/L	640	640	1.6 J	0.31	0.013 J	0.045	0.037	10	11	4.5	0.29	0.044	0.017 J	0.040	0.33		0.10 U		
Acenaphthylene in ug/L			0.39 J	0.14 U	0.014 J	0.022 U	0.023 U	0.029 U	0.033 U	0.025 U	0.012 J	0.0055 J	0.0041 J	0.0037 J	0.020 U		0.10 U		
Anthracene in ug/L	26,000	26,000	0.90 J	1.5 U	0.047	0.0058 J	0.0053 J	0.05 U	0.043 U	0.04 U	0.042	0.02 J	0.018 J	0.0060 J	0.20 U		0.10 U		
Benzo(g,h,i)perylene in ug/L			0.10 UJ	0.61	0.035	0.022 U	0.023 U	0.02 U	0.0075 J	0.016 J	0.02 U	0.0066 J	0.02 U	0.020 U	0.020 U		0.10 U		
Fluoranthene in ug/L	90	90	0.40 J	0.96	0.049	0.028	0.027	0.068	0.077	0.074	0.31	0.32	0.22	0.0086 J	0.044 J		0.10 U		
Fluorene in ug/L	3,500	3,500	1.7 J	0.02 U	0.02 J	0.018 J	0.018 J	0.035 U	0.033 U	0.03	0.085	0.016 J	0.0086 J	0.020 U	0.030		0.10 U		
Phenanthrene in ug/L			1.2 J	1.2 U	0.04	0.022 U	0.023 U	0.021 U	0.022 U	0.027 U	0.12	0.04	0.019 J	0.012 J	0.20 U		0.10 U		
Pyrene in ug/L	2,600	2,600	1.2 J	3.6 J	0.092	0.021 J	0.025	0.1	0.11	0.13	0.21	0.28	0.2	0.0070 J	0.045		0.10 U		
1-Methylnaphthalene in ug/L			12 J														0.10 U		
2-Methylnaphthalene in ug/L			7.0 J	0.24	0.0088 J	0.022 U	0.023 J	0.02 U	0.019 U	0.027 U	0.02 J	0.0045 J	0.007 J	0.010 J	0.0089 J		0.10 U		
Naphthalene in ug/L	170	360	4.1 J	0.28	0.027 U	0.017 J	0.014 J	0.032	0.028	0.29	0.014 J	0.093	0.026 U	0.072	0.044		0.10 U		
Total Naphthalenes in ug/L	170	360	23.1 J	0.52	0.0358 J	0.028 J	0.037 J	0.042	0.0375	0.3035	0.034 J	0.0975	0.033 J	0.082 J	0.0529 J		ND		
Benz(a)anthracene in ug/L	0.031	0.031	0.31 J	0.86	0.042	0.022 U	0.0061 J	0.011 J	0.013 J	0.021	0.011 J	0.017 J	0.011 J	0.0037 J	0.0058 J		0.10 U		
Benzo(a)pyrene in ug/L	0.03	0.03	0.10 J	0.71	0.031	0.022 U	0.023 U	0.02 U	0.019 U	0.013 J	0.02 U	0.02 U	0.02 U	0.020 U	0.020 U		0.10 U		
Benzo(b)fluoranthene in ug/L	0.031	0.031	0.10 UJ	0.56	0.035	0.022 U	0.023 U	0.02 U	0.014 J	0.017 J	0.0037 J	0.0068 J	0.02 U	0.020 U	0.020 U		0.10 U		
Benzo(k)fluoranthene in ug/L	0.031	0.031	0.10 UJ	0.02 U	0.028	0.022 U	0.023 U	0.02 U	0.019 U	0.016 J	0.02 U	0.02 U	0.02 U	0.020 U	0.020 U		0.10 U		
Chrysene in ug/L	0.031	0.031	0.49 J	1.6	0.048	0.022 U	0.023 U	0.0065 J	0.0069 J	0.021	0.011 J	0.012 J	0.013 J	0.020 U	0.020 U		0.10 U		
Dibenzo(a,h)anthracene in ug/L	0.031	0.031	0.10 UJ	0.15	0.025	0.022 U	0.023 U	0.02 U	0.019 U	0.01 J	0.02 U	0.02 U	0.02 U	0.020 U	0.020 U		0.10 U		
Indeno(1,2,3-cd)pyrene in ug/L	0.031	0.031	0.10 UJ	0.21	0.029	0.022 U	0.023 U	0.02 U	0.006 J	0.013 J	0.02 U	0.0055 J	0.02 U	0.020 U	0.020 U		0.10 U		
Total cPAHs TEF in ug/L	0.03	0.03	0.156 J	0.905	0.0474	ND	0.0168	0.0152 J	0.0148 J	0.0209	0.0146	0.0151 J	0.0152 J	0.0145 J	0.0147 J		ND		
Other Semivolatiles																			
1,2,4-Trichlorobenzene in ug/L	230	230	1.0 U														1.0 U		
1,2-Dichlorobenzene in ug/L	4,200	4,200	1.0 U														1.0 U		
1,3-Dichlorobenzene in ug/L	2,600	2,600	1.0 U														1.0 U		
1,4-Dichlorobenzene in ug/L	4.9	4.9	1.0 U														1.0 U		
2,4,5-Trichlorophenol in ug/L			5.0 U														5.0 U		
2,4,6-Trichlorophenol in ug/L	3.9	3.9	5.0 U														5.0 U		
2,4-Dichlorophenol in ug/L	190	190	3.0 U														3.0 U		
2,4-Dimethylphenol in ug/L	550	550	3.0 U														3.0 U		
2,4-Dinitrophenol in ug/L	3,500	3,500	25 U														25 U		
2-Chloronaphthalene in ug/L	1,000	1,000	1.0 U														1.0 U		
2-Chlorophenol in ug/L	97	97	1.0 U														1.0 U		
2-Methylphenol in ug/L			1.0 U														1.0 U		
2-Nitroaniline in ug/L			5.0 U														5.0 U		
2-Nitrophenol in ug/L			5.0 U														5.0 U		
3,3'-Dichlorobenzidine in ug/L	0.046	0.046	5.0 U														5.0 U		
3-Nitroaniline in ug/L			6.0 U														6.0 U		
4,6-Dinitro-2-methylphenol in ug/L			15 U														10 U		
4-Bromophenyl phenyl ether in ug/L			1.0 U														1.0 U		
4-Chloro-3-methylphenol in ug/L			2.0 U														2.0 U		
4-Chloroaniline in ug/L			3.0 U														3.0 U		

Table 11 - Groundwater Chemistry Data, Bunker C Tank Subarea

GP West RI/FS 070188

Chemical Name	Preliminary Groundwater Screening Level for Unrestricted Land Use	Preliminary Groundwater Screening Level for Industrial Land Use	BC-MW01 07/27/04 Pre-RI	BC-MW01 04/01/10 RI	BC-MW01 12/15/10 RI	BC-MW02 10/01/09 RI	BC-MW02 10/01/09 Field Dup RI	BC-MW02 04/01/10 RI	BC-MW02 04/01/10 Field Dup RI	BC-MW02 12/15/10 RI	BC-MW03 09/28/09 RI	BC-MW03 04/01/10 RI	BC-MW03 12/16/10 RI	BC-MW04 12/21/10 RI	BC-MW05 12/19/10 RI	GF-SB20 07/22/04 Pre-RI	TS-MW01 07/25/04 Pre-RI	TS-MW01 10/01/09 RI	TS-MW01 04/01/10 RI
4-Chlorophenyl phenyl ether in ug/L			1.0 U														1.0 U		
4-Methylphenol in ug/L			1.0 U														1.0 U		
4-Nitroaniline in ug/L			5.0 U														5.0 U		
4-Nitrophenol in ug/L			5.0 U														5.0 U		
Benzoic acid in ug/L			10 U														10 U		
Benzyl alcohol in ug/L			5.0 U														5.0 U		
Benzyl butyl phthalate in ug/L	1,300	1,300	1.0 U														1.0 U		
Bis(2-chloro-1-methylethyl) ether in ug/L	37	37	1.0 U														1.0 U		
Bis(2-chloroethoxy)methane in ug/L			1.0 U														1.0 U		
Bis(2-chloroethyl) ether in ug/L	0.85	0.85	2.0 U														2.0 U		
Bis(2-ethylhexyl) phthalate in ug/L	3.6	3.6	1.0 U														1.0 U		
Carbazole in ug/L			1.0 U														1.0 U		
Dibenzofuran in ug/L			1.0 U	0.14	0.016 J	0.0068 J	0.0079 J	0.017 J	0.019 J	0.017 J	0.01 J	0.0073 J	0.005 J	0.020 U	0.0056 J		1.0 U		
Diethyl phthalate in ug/L	28,000	28,000	1.0 U														1.0 U		
Dimethyl phthalate in ug/L	72,000	72,000	1.0 U														1.0 U		
Di-n-butyl phthalate in ug/L	2,900	2,900	1.0 U														1.0 U		
Di-n-octyl phthalate in ug/L			1.0 U														1.0 U		
Hexachlorobenzene in ug/L	0.00047	0.00047	1.0 U														1.0 U		
Hexachlorobutadiene in ug/L	30	30	2.0 U														2.0 U		
Hexachlorocyclopentadiene in ug/L	3,600	3,600	5.0 U														5.0 U		
Hexachloroethane in ug/L	5.3	5.3	2.0 U														2.0 U		
Isophorone in ug/L	600	600	1.0 U														1.0 U		
Nitrobenzene in ug/L	450	450	1.0 U														1.0 U		
N-Nitroso-di-n-propylamine in ug/L	0.82	0.82	2.0 U														2.0 U		
N-Nitrosodiphenylamine in ug/L	9.7	9.7	1.0 U														1.0 U		
Pentachlorophenol in ug/L	4.9	4.9	5.0 U														5.0 U		
Phenol in ug/L	1,100,000	1,100,000	2.0 U														2.0 U		
2,4-Dinitrotoluene in ug/L	9.1	9.1	5.0 U														5.0 U		
2,6-Dinitrotoluene in ug/L			5.0 U														5.0 U		
1-Methylnaphthalene in ug/L			12 J														0.10 U		
Total Naphthalenes in ug/L	170	360	23.1 J														ND		
Conventional Chemistry Parameters (including other metals)																			
Conductivity in umhos/cm					400					22,500			9,440	18,300	23,100				
Dissolved Calcium in mg/L						241 !	236 !											108	
Dissolved Iron in mg/L			0.19	0.188		0.554 !	0.566 !	0.099 J				0.116				3.36	2.24	1.35	2.14
Dissolved Magnesium in mg/L						999 !	995 !											17	
Dissolved Manganese in mg/L			0.229	0.316		0.204 !	0.201 !	0.884				0.49				2.24	0.392	0.362	0.498
Dissolved Potassium in mg/L						291 !	288 !											18.6	
Dissolved Sodium in mg/L						8,590 !	8,550 !											75.1	
Formaldehyde in ug/L	1,600	1,600	6 U														19 U		
Nitrate + Nitrite in mg/L			0.312														0.010 U		
Nitrate as Nitrogen in mg/L			0.134														0.010 U		
Nitrite as Nitrogen in mg/L			0.178														0.010 U		
Sulfate in mg/L			39.7														3.6		
Total Suspended Solids in mg/L			6,580	790	5 U	11.5	16.5	14	11.5	5 U	12.5	30	5 U	5.0	11.0		3.3		
Field Parameters																			
Conductivity in us/cm			1,168	444	409	40,700		26,660		23,420	1,224	1,246	11,170	19,400	25,250		533	1,038	1,058
Dissolved Oxygen in mg/L			0.8	1.1	1.6	4.3		0.5		0.9	0.3	1.0	0.4	1.3	0.2		1.2	0.8	0.5
Eh (ORP) in mVolts			-125	-199	-6	-265		-297		-284	-39	-280	-291	-178	-313		-118	-319	-189
pH in pH units	6.0 - 8.5	6.0 - 8.5	7.5	6.8	6.2	6.6		6.7		6.8	7.8	8.0	8.0	7.2	7.6		7.2	7.4	7.3
Temperature in deg C			22.3	10.8	10.8	15.9		9.9		10.5	17.1	10.9	11.8	12.8	10.8		19.6	18.9	10.9

Notes

Concentrations in shaded cells indicate value exceeds Preliminary Groundwater Screening Level for Unrestricted Land Use

Concentrations within bold border indicate value exceeds Preliminary Groundwater Screening Level for Industrial Land Use

! - Dissolved metals data not considered representative of groundwater quality due to salinity interferences in lab method.

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

UJ - Analyte was not detected at or above the reported estimate

Table 12 - Soil Vapor Chemistry Data, Bunker C Tank Subarea

GP West RI/FS 070188

Chemical Name	Unrestricted Soil Gas Screening Level	Industrial Soil Gas Screening Level	BC-VP01 02/03/2011 RI	BC-VP02 02/03/2011 RI	BC-VP03 02/08/2011 RI	BC-VP04 02/03/2011 RI
Extractable Petroleum Hydrocarbons						
Aliphatics C10-C12 in ug/m3	1,360	2,975	1,200	100 U	100 U	110 U
Aliphatics C5-C6 in ug/m3	27,200	59,500	190 U	47 U	47 U	50 U
Aliphatics C6-C8 in ug/m3	27,200	59,500	240 U	60 U	60 U	63 U
Aliphatics C8-C10 in ug/m3	1,360	2,975	19,000	85 U	160	89 U
Aromatics C10-C12 in ug/m3	85	85	320 U	80 U	80 U	84 U
Aromatics C8-C10 in ug/m3	1,820	3,990	2,100	72 U	72 U	75 U
Volatile Organic Compounds (VOCs)						
Naphthalene in ug/m3	16	30	60 U	15 U	15 U	16 U

Notes

Concentrations in shaded cells indicate value exceeds Unrestricted Soil Gas Screening Level

Concentrations within bold border indicate value exceeds Industrial Soil Gas Screening Level

Unrestricted and industrial screening levels for Aromatics C10-C12 and unrestricted screening level for naphthalene are the respective analytical lab practical quantitation limits (PQL).

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

Whatcom Waterway

Law-1 Area

Mercury Source Area of Caustic Plume Subarea

Million Gallon Tanks Subarea

Bunker C Tank Subarea

0 100 200 400 600 800 Feet

Investigation areas supporting potential interim actions

MILL NORTH

TRUE NORTH

45°

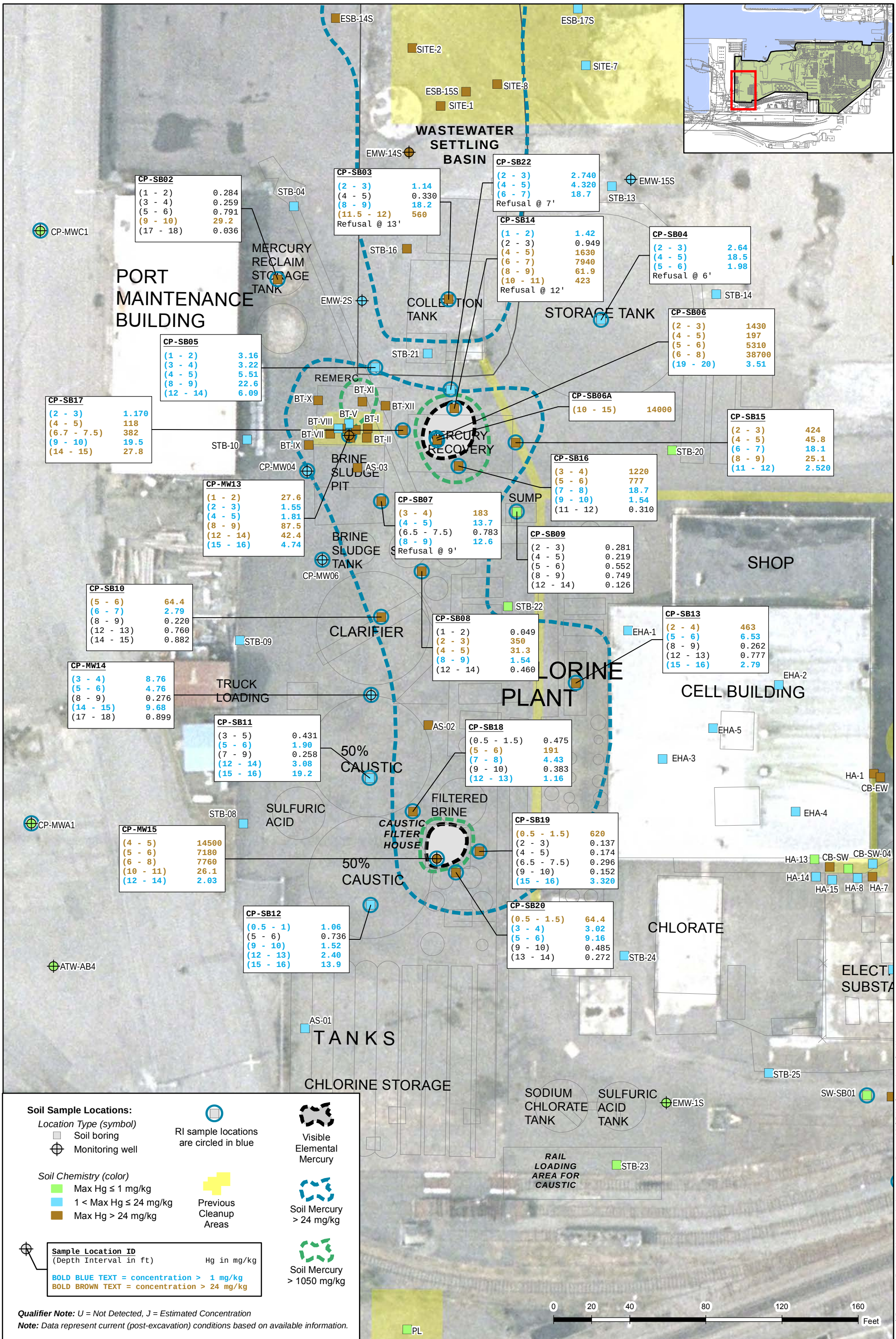
Aspect CONSULTING

Areas Considered for Early Interim Actions

Interim Action Investigation, GP West Site - Bellingham, WA

DATE: Mar 2011	PROJECT NO. 070188
DESIGNED BY: SJG	
DRAWN BY: PPW	FIGURE NO. 1
REVISED BY: - - -	

Path: T:\projects_8\Port_of_Bellingham\Delivered\InterimActionInvestigationReport\01 IRA Areas.mxd



MILL NORTH / TRUE NORTH 45°

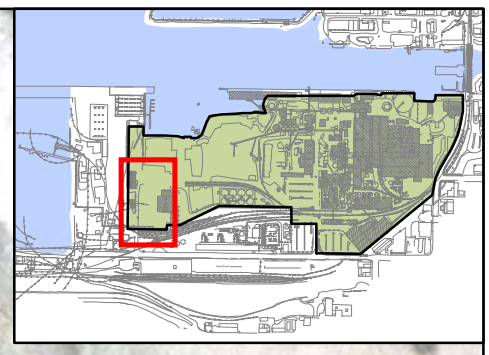
Aspect CONSULTING

Explorations and New Soil Mercury Data for Mercury Source Area of Caustic Plume Subarea

Interim Action Investigation, GP West Site - Bellingham, WA

DATE: Apr 2011	PROJECT NO. 070188
DESIGNED BY: SJG	
DRAWN BY: PPW	FIGURE NO. 2
REVISED BY: ---	

Path: T:\projects_8\Port_of_Bellingham\Delivered\InterimActionInvestigationReport\02 CP Hg Source Area Soil Hg.mxd



WASTEWATER SETTLING BASIN

EMW-14S
M: 2.53 / 5.03 / NS
P: 8.5 / 9.2 / NS
O: -332 / -224 / NS

CP-MWC1
M: 1.84 / 2.75 / NS
P: 9.6 / 9.8 / NS
O: -350 / -321 / NS

MERCURY RECLAIM STORAGE TANK

PORT MAINTENANCE BUILDING

EMW-2S
M: 2.39 / 1.63 / NS
P: 7.7 / 8.9 / NS
O: -357 / -255 / NS

COLLECTION TANK

SURGE STORAGE TANK

REMERC

CP-MW13
M: NS / NS / 0.406
P: NS / NS / 7.9
O: NS / NS / -41

MERCURY RECOVERY

BRINE SLUDGE PIT

CP-MW06
M: 4.9 / 8.65 / NS
P: 9.3 / 8.9 / NS
O: -598 / -273 / NS

BRINE SLUDGE TANK

SATURATORS

SHOP

CLARIFIER

AMW-02
M: 41.7 / 28.1 / NS
P: 10.0 / 9.8 / NS
O: -725 / -417 / NS

TRUCK LOADING

CHLORINE PLANT

CP-MW14
M: NS / NS / 1.26
P: NS / NS / 9.1
O: NS / NS / -339

CELL BUILDING

EMW-19S
M: 18.5 / 28.5 / NS
P: 10.9 / 11.1 / NS
O: -641 / -478 / NS

50% CAUSTIC

SULFURIC ACID

FILTERED BRINE

CAUSTIC FILTER HOUSE

CP-MWA1
M: 10.8 / 14.3J / NS
P: 11.0 / 11.1 / NS
O: -744 / -432 / NS

CP-MW15
M: NS / NS / 619
P: NS / NS / 11.2
O: NS / NS / -376

50% CAUSTIC

MOTOR CONTROL BUILDING

CHLORATE

ELECTR SUBSTA

TANKS

CHLORINE STORAGE

EMW-1S
M: 0.0167 / 0.0079 / NS
P: 7.0 / 7.0 / NS
O: -294 / -129 / NS

SODIUM CHLORATE TANK

SULFURIC ACID TANK

RAIL LOADING AREA FOR CAUSTIC

0 22.5 45 90 135 180 Feet

Fill Unit Monitoring Well

Dissolved Mercury in Groundwater

Mercury <= 0.94 µg/L

Mercury > 0.94 µg/L

Well ID → CP-MW06
Dissolved Mercury (in µg/L) → M: 4.9 / 8.65 / NS
pH → P: 9.3 / 8.9 / NS
ORP (mV) → O: -598 / -273 / NS
2009
Mar-Apr 2010
Dec 2010

("NS" = No Sample)

Qualifiers: *U = Not Detected, J = Estimated Concentration*

RI sample locations are circled in blue

MILL NORTH
TRUE NORTH
45°

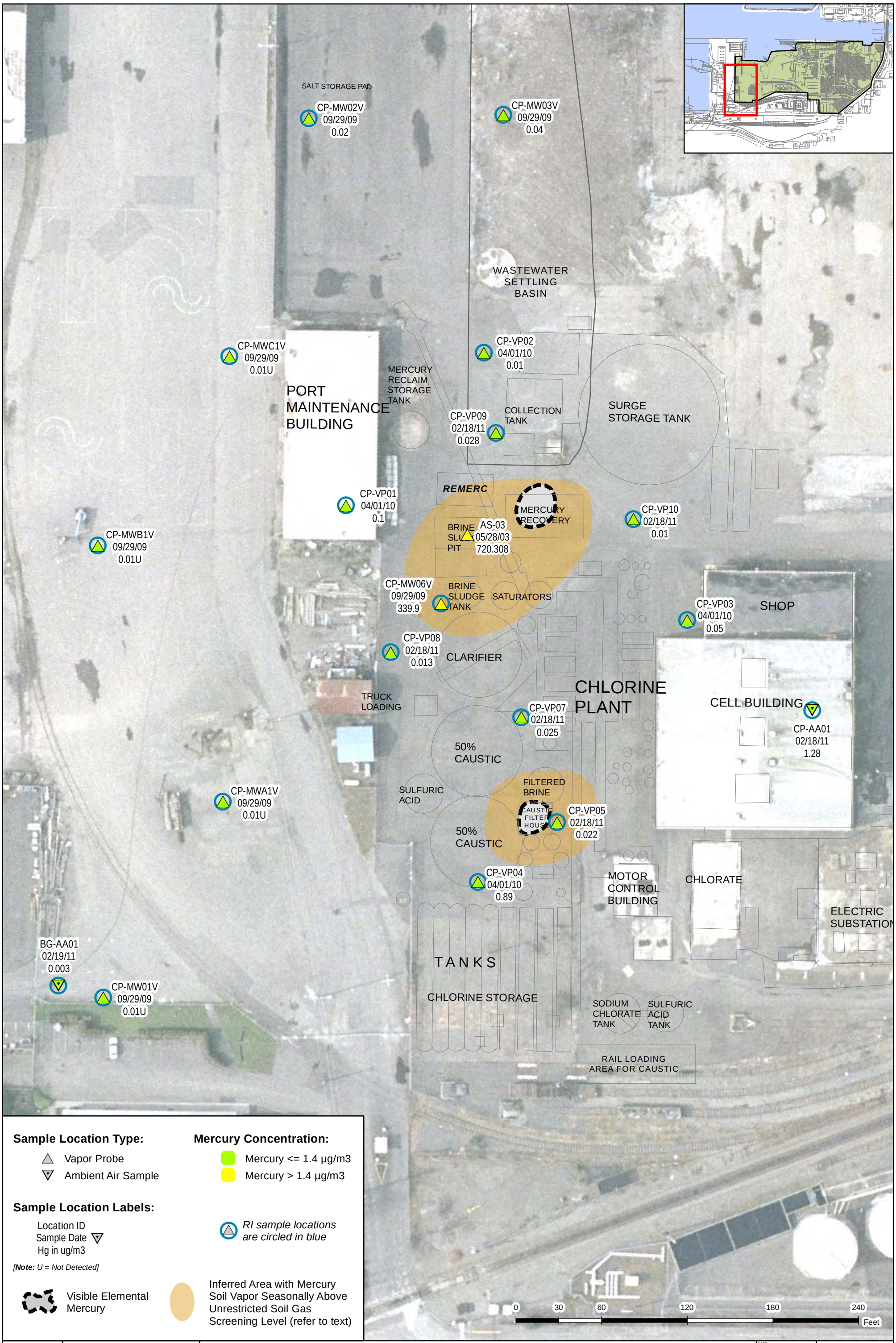
Aspect CONSULTING

2009-2010 Fill Unit Groundwater Mercury, pH, and ORP, Mercury Source Area of Caustic Plume Subarea

Interim Action Investigation, GP West Site - Bellingham, WA

DATE: Apr 2011	PROJECT NO. 070188
DESIGNED BY: SJG	
DRAWN BY: PPW	FIGURE NO. 3
REVISED BY: - - -	

Path: T:\projects_8\Port_of_Bellingham\Delivered\InterimActionInvestigationReport\03 CP Hg Source Area GW.mxd



Sample Location Type:

- Vapor Probe
- Ambient Air Sample

Mercury Concentration:

- Mercury <= 1.4 µg/m3
- Mercury > 1.4 µg/m3

Sample Location Labels:

Location ID
Sample Date
Hg in ug/m3

RI sample locations are circled in blue

*[**Note:** U = Not Detected]*

Visible Elemental Mercury

Inferred Area with Mercury Soil Vapor Seasonally Above Unrestricted Soil Gas Screening Level (refer to text)

MILL NORTH
TRUE NORTH
45°

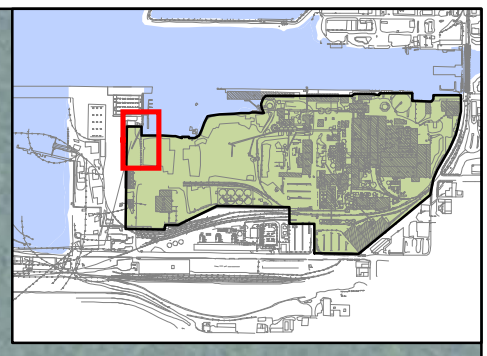
Aspect CONSULTING

Mercury Soil Vapor and Ambient Air Data, Mercury Source Area of Caustic Plume Subarea

Interim Action Investigation, GP West Site - Bellingham, WA

DATE: Apr 2011	PROJECT NO. 070188
DESIGNED BY: SJG	
DRAWN BY: PPW	FIGURE NO. 4
REVISED BY: - - -	

Path: T:\projects_8\Port_of_Bellingham\Delivered\InterimActionInvestigationReport\04 CP Hg Source Area Vapor.mxd



L1-MW06

(3 - 5)	0.031
(5 - 7)	0.276
(13 - 14)	0.065
(16 - 17)	0.856

L1-MW01

(3 - 4)	0.195
(7 - 9)	1.02
(11 - 13)	3.72
(14 - 15)	51.5

L1-MW02

(4 - 5)	0.219
(7 - 9)	6.49
(11 - 12)	3.37
(13 - 14)	0.075
(16 - 17)	0.143

L1-MW03

(4 - 5)	3.01
(7 - 9)	0.121
(11 - 12)	0.356
(13 - 14)	0.256
(15 - 16)	0.147

L1-MW05

(3 - 5)	22.5
(7 - 9)	108
(11 - 12)	5.26
(13 - 14)	7.08
(16 - 18)	1.27

L1-MW04

(3 - 4)	62.0
(5 - 7)	48.7
(8 - 10)	1760
(10 - 12)	5.65
(13 - 15)	3.31

EMW-3S
STB-01
ESB-18S
ESB-16S
WASTEWATER SETTLING BASIN
STB-12
SALT STORAGE PAD
SITE-6
CP-MW02
CP-MW03
CP-MW05
SITE-5
SITE-3
SITE-4
AS-04
STB-15
ESB-17S
ESB-14S
SITE-2
SITE-7
ESB-15S

0 15 30 60 90 120 Feet

Soil Sample Locations:

Location Type (symbol)

- Soil boring
- Monitoring well

RI sample locations are circled in blue

Soil Chemistry (color)

- Max Hg ≤ 1 mg/kg
- 1 < Max Hg ≤ 24 mg/kg
- Max Hg > 24 mg/kg

Sample Location ID
(Depth Interval in ft) Hg in mg/kg

BOLD BLUE TEXT = concentration > 1 mg/kg
BOLD BROWN TEXT = concentration > 24 mg/kg

Qualifier Note: *U = Not Detected, J = Estimated Concentration*

Note: *Data represent current (post-excavation) conditions based on available information.*

MILL NORTH
TRUE NORTH
45°

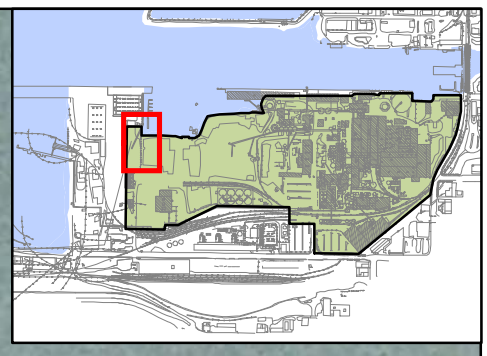
Aspect CONSULTING

Explorations and New Soil Mercury Data, Law-1 Area

Interim Action Investigation, GP West Site - Bellingham, WA

DATE: Apr 2011	PROJECT NO. 070188
DESIGNED BY: SJG	
DRAWN BY: PPW	FIGURE NO. 5
REVISED BY: ---	

Path: T:\projects_8\Port_of_Bellingham\Delivered\InterimActionInvestigationReport\05 LAW-1 Area Soil Hg.mxd



AMW-01
M: 0.00319 / NS
P: 6.5 / NS
O: -233 / NS
C: 13 / NS
S: 6.94 / NS

L1-WP1
M: 1.34 / 0.125 & 0.0739
P: 7.8 / 7.5 & 7.7
O: -62 / -96 & -113
C: 21 / 7.9 & 7.9
S: 2.75 / 0.0493 & 0.0056

L1-WP2
M: NS / 0.131 & 0.164
P: NS / 8.5 & 8.4
O: NS / -203 & -120
C: NS / 29.0 & 22.6
S: NS / 3.78 & 3.08

L1-WP3
M: NS / 0.0511 & 0.0533
P: NS / 8.0 & 8.2
O: NS / -176 & -115
C: NS / 17.9 & 18.6
S: NS / 0.0262 & 0.135

L1-MW06
M: NS / 0.432
P: NS / 7.8
O: NS / -351
C: NS / 689
S: NS / 85.3

L1-MW02
M: 35 / 2.09
P: 8.8 / 9.0
O: -128 / -208
C: 171 / 116
S: 3.13 / 1.39

L1-MW01
M: 0.46 / 14.6
P: 8.9 / 10.1
O: -160 / -275
C: 288 / 248
S: 7.04 / 5.68

L1-MW03
M: 0.025 / 0.0224
P: 6.9 / 9,6
O: -65 / -91
C: 94 / 89
S: 2.38 / 0.0511

LAW-1
M: 1.03 / 17.8
P: 8.6 / 10.2
O: -178 / -311
C: 226 / 176
S: 10.33 / 6.98

CP-MW10
M: 0.00979 / NS
P: 7.0 / NS
O: -70 / NS
C: 73 / NS
S: 2.18 / NS

L1-MW05
M: 4.06 / NS
P: 7.7 / NS
O: -51 / NS
C: 102 / NS
S: 1.98 / NS

L1-MW04
M: 0.317 / NS
P: 7.5 / NS
O: -591 / NS
C: 56.2 / NS
S: 0.124 / NS

CP-MW03
M: 0.48 / NS
P: 7.0 / NS
O: -74 / NS
C: 60 / NS
S: 0.03 / NS

6 7 8 9 10 11 12 13

WASTEWATER SETTLING BASIN

0 20 40 80 120 160 Feet

Fill Unit Monitoring Well

Intertidal Well Point

Dissolved Mercury in Groundwater

Mercury <= 0.94 µg/L

Mercury > 0.94 µg/L

Well ID → LAW-1
Dissolved Mercury (in µg/L) → M: 1.03 / 17.8
pH → P: 8.6 / 10.2
ORP (mV) → O: -178 / -311
Dissolved Organic Carbon (mg/L) → C: 226 / 176
Sulfide (mg/L) → S: 10.33 / 6.98
Dec 2010 / Jan-Feb 2011*

("NS" = No Sample)

**For well points, February sample results separated by "&" were collected 4 hours apart (refer to text).*

Qualifiers: *U = Not Detected, J = Estimated Concentration*

RI sample locations are circled in blue

Groundwater Elevation Contour from 2/3/2011 tide at approx. 5 feet, MLLW
(elevation in feet, MLLW vertical datum)

MILL NORTH / TRUE NORTH 45°

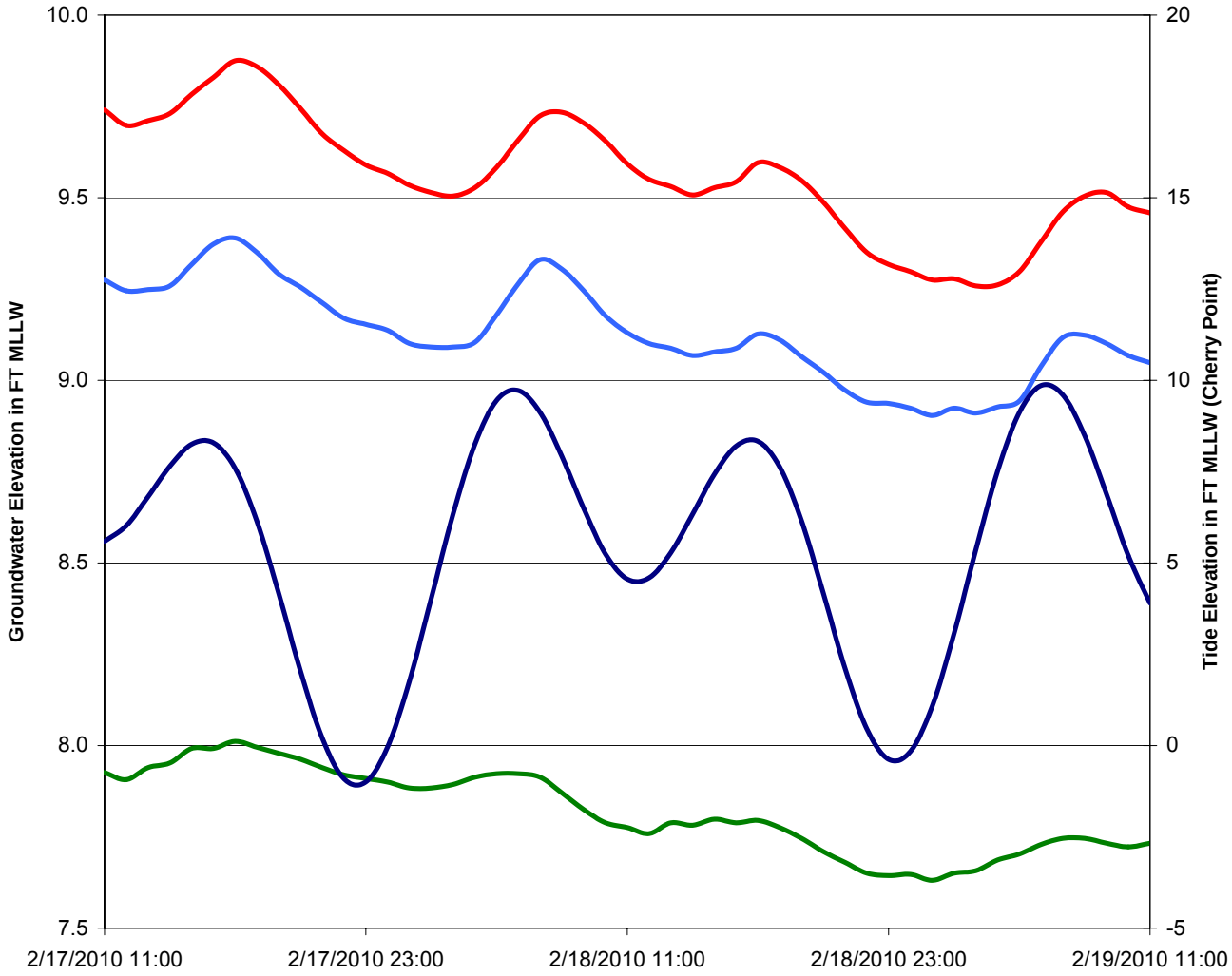
Aspect CONSULTING

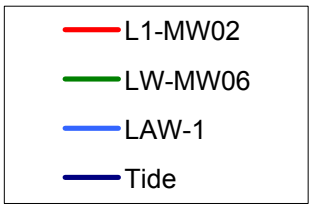
Explorations and New Fill Unit Groundwater Chemistry Data, Law-1 Area

Interim Action Investigation, GP West Site RI/FS - Bellingham, WA

DATE: Apr 2011	PROJECT NO. 070188
DESIGNED BY: SJG	
DRAWN BY: PPW	FIGURE NO. 6
REVISED BY: ---	

Path: T:\projects_8\Port_of_Bellingham\Delivered\InterimActionInvestigationReport\06 LAW-1 Area GW.mxd

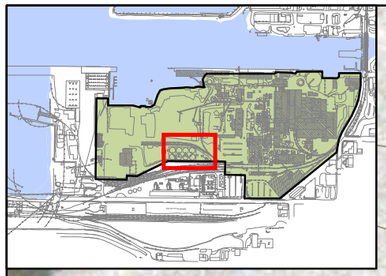




Well	Mean GW Elevation in FT (Serfies Method)	Groundwater Fluctuation in FT	Tidal Efficiency in %
L1-MW02	9.47	0.37	4.1%
L1-MW06	7.75	0.14	1.5%
LAW-1	9.06	0.31	3.4%

Aspect Consulting
4/28/11
S:\Port of Bellingham\GP West 070188\Data\Field Data\POB GP West Tidal\Feb2011\Serfies

Figure 7 - LAW-1 Area Tidal Study Data, February 2011
GP-West IA Investigation



MG-SB11	TPH	Naph	cPAHs
(2-3)	2520J		
(5-6)	1770J		
(7-8)	490J	1.37	1.3
(9-10)	99.0J	0.094	0.053
(12-13)	360J		

MG-MW04	TPH	Naph	cPAHs
(2-3)	524J		
(6-7)	91.0J		
(7-8)	1750J	1.27	0.059
(9-10)	590J		
(11-12)	1170J	3.3	4.22

MG-SB13	TPH	Naph	cPAHs
(2-3)	4700J		
(5-6)	2970J	0.41	0.171
(7-8)	2620J		
(9-10)	226J	0.24	0.0503
(12-13)	2840J		

MG-SB12	TPH	Naph	cPAHs
(2-3)	442J		
(6-7)	4580J	1.57	0.766
(8-9)	2030J		
(10-11)	570J	21.1	2.85
(12-13)	2250J		
(13-14)	3240J		

MG-SB14	TPH	Naph	cPAHs
(2-3)	201J		
(5-6)	1820J		
(7-8)	1700J		
(9-10)	36.6J	0.4	0.0405
(12-13)	272J	0.25	0.105

MG-MW05	TPH	Naph	cPAHs
(2-3)	366J	0.212	0.0847
(5-6)	146J		
(7-8)	1170J		
(9-10)	57.0J	0.84	0.0306
(11-12)	300J		

MG-SB15	TPH	Naph	cPAHs
(3-4)	254J		
(5-6)	830J	0.57	0.109
(7-8)	17.5J	0.019	0.00211J
(9-10)	58.0J		
(12-13)	410J		

MG-SB16	TPH	Naph	cPAHs
(2-3)	985J		
(5-6)	1760J		
(7-8)	98.0J	0.088	0.028
(9-10)	227J	0.31	0.185
(12-13)	14.9J		

MG-MW03
EMW-16S
AS-08
MG-MW01
MG-SB07
MG-SB04
MG-SB09
SS-4
SS-5
SS-3
SS-1
SS-2
MG-SB06
MG-SB10
MG-SB05
MG-SB08
MG-SB02
MG-SB01
MG-SB03
MG-MW02
Tank #1
Tank #2
Tank #3
Tank #4
Tank #5
Tank #6
Tank #7
Tank #8
TO STEAM PLANT

0 17.5 35 70 105 140 Feet

Soil Sample Locations:

Location Type (symbol)
- Soil boring
- Monitoring well

Soil Chemistry (color)
- Location *without* TPH or PAH exceedance in soil
- Location *with* TPH and/or PAH exceedance in soil

** Total TPH is the sum of detected diesel- and oil-range TPH.*

BROWN, BOLD TEXT indicates exceedance of unrestricted soil screening level

Qualifiers: *U = Not Detected*
J = Estimated Concentration

- RI sample locations are circled in blue
- Million Gallon Tanks Excavation Area (RETEC, 2007)
- Soil TPH > 2000 mg/kg
- Soil Naphthalenes > 5.3 mg/kg

Sample Location ID — *Total Naphthalenes (mg/kg)*

MG-SB16	TPH	Naph	cPAHs
(7-8)	98.0J	0.088	0.028
(9-10)	227J	0.31	0.185

Sample Depth Intervals (ft) — *Total TPHs* (mg/kg)* — *Total cPAHs (TEC) (mg/kg)*

Oil Pipelines:
- at or above ground surface
- below ground surface in concrete-lined trench
- below ground surface in unlined trench

MILL NORTH
TRUE NORTH
45°

Aspect CONSULTING

Explorations and New Soil TPH, Naphthalenes, and cPAH Data, Million Gallon Tanks Subarea

Interim Action Investigation, GP West Site - Bellingham, WA

DATE:	PROJECT NO.
Apr 2011	070188
DESIGNED BY: SJG	
DRAWN BY: PPW	FIGURE NO. 8
REVISED BY: ---	

Path: T:\projects_8\Port_of_Bellingham\Delivered\InterimActionInvestigationReport\08 MGT Soil.mxd

Well ID → MG-MW04
Dec, 2010 Total TPHs* (in ug/L) → TPH: 300 J
Dec, 2010 Total Naphthalenes (in ug/L) → Naph: 22.7
Dec, 2010 Total cPAH TEF (in ug/L) → cPAH: 0.434

Monitoring Wells

*Total TPH is either Bunker C or the sum of detected diesel- and oil-range TPH.
BOLD, BROWN TEXT indicates exceedance of RI groundwater screening level

"ND" = non-detect, "NS" = no sample

RI sample locations are circled in blue

Million Gallon Tanks Excavation Area (RETEC, 2007)

Oil Pipelines:

- at or above ground surface
- below ground surface in concrete-lined trench
- below ground surface in unlined trench

MILL NORTH
TRUE NORTH
45°

Aspect CONSULTING

Explorations and New Groundwater TPH, Naphthalenes, and cPAH Data, Million Gallon Tanks Subarea

Interim Action Investigation, GP West Site RI/FS - Bellingham, WA

DATE: Apr 2011	PROJECT NO. 070188
DESIGNED BY: SJG	
DRAWN BY: PPW	FIGURE NO. 9
REVISED BY: PPW	

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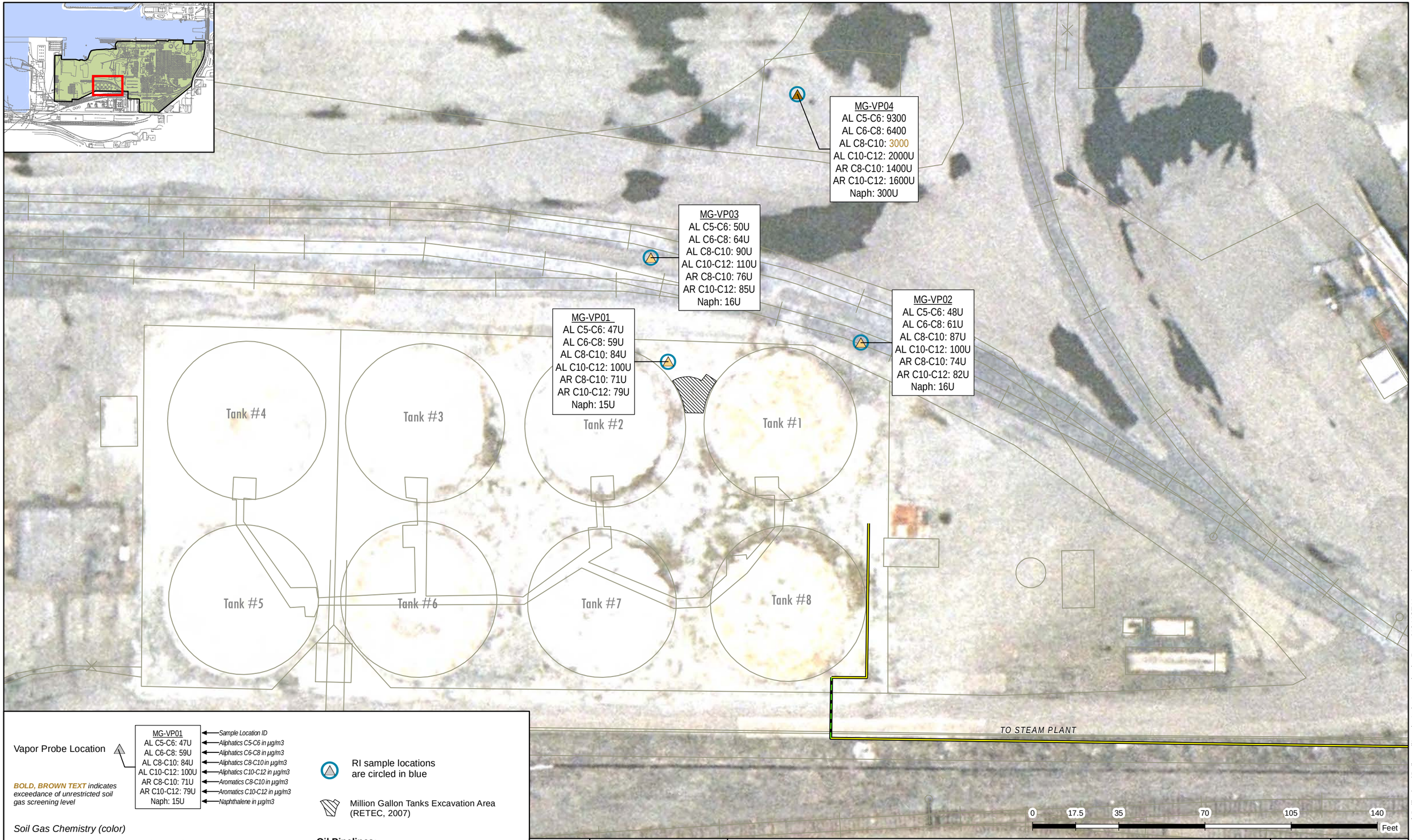


Vapor Probe Location

MG-VP01
AL C5-C6: 47U
AL C6-C8: 59U
AL C8-C10: 84U
AL C10-C12: 100U
AR C8-C10: 71U
AR C10-C12: 79U
Naph: 15U

- Sample Location ID
- Aliphatics C5-C6 in µg/m3
- Aliphatics C6-C8 in µg/m3
- Aliphatics C8-C10 in µg/m3
- Aliphatics C10-C12 in µg/m3
- Aromatics C8-C10 in µg/m3
- Aromatics C10-C12 in µg/m3
- Naphthalene in µg/m3

BOLD, BROWN TEXT *indicates exceedance of unrestricted soil gas screening level*

Soil Gas Chemistry (color)

- Location *without* exceedance of Unrestricted Soil Gas Screening Level
- Location *with* exceedance of Unrestricted Soil Gas Screening Level

RI sample locations are circled in blue

Million Gallon Tanks Excavation Area (RETEC, 2007)

Oil Pipelines:

- at or above ground surface
- below ground surface in concrete-lined trench
- below ground surface in unlined trench

MILL NORTH

TRUE NORTH

45°

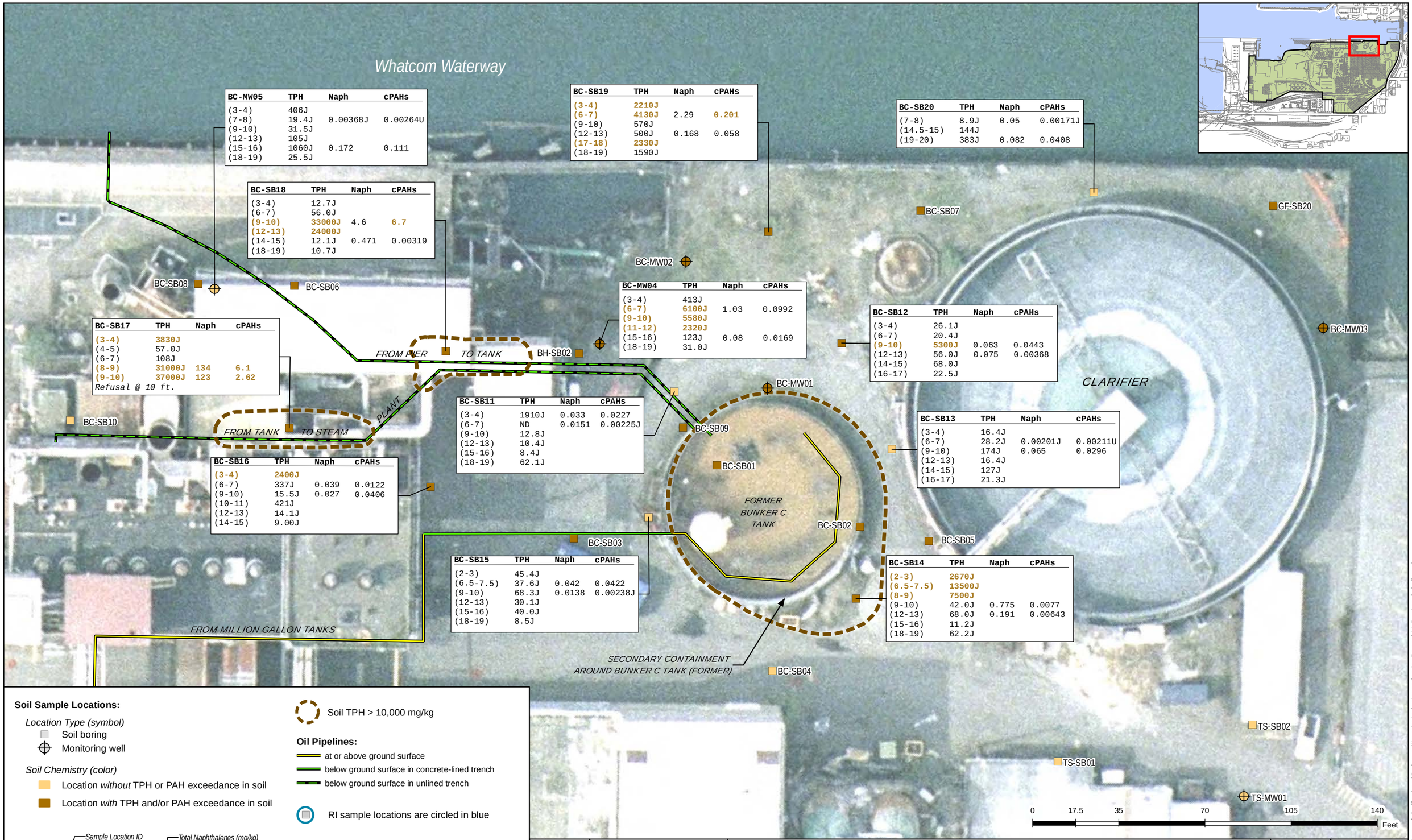
Aspect CONSULTING

Explorations and New Soil Vapor Petroleum Fraction and Naphthalene Data, Million Gallon Tanks Subarea

Interim Action Investigation, GP West Site RI/FS - Bellingham, WA

DATE: Apr 2011	PROJECT NO. 070188
DESIGNED BY: SJG	
DRAWN BY: PPW	FIGURE NO. 10
REVISED BY: - - -	

Path: T:\projects_8\Port_of_Bellingham\Delivered\InterimActionInvestigationReport\10 MGT Vapor.mxd



Soil Sample Locations:

Location Type (symbol)

- Soil boring
- Monitoring well

Soil Chemistry (color)

- Location *without* TPH or PAH exceedance in soil
- Location *with* TPH and/or PAH exceedance in soil

Soil TPH > 10,000 mg/kg

Oil Pipelines:

- at or above ground surface
- below ground surface in concrete-lined trench
- below ground surface in unlined trench

RI sample locations are circled in blue

Sample Location ID — Total Naphthalenes (mg/kg)

BC-SB12	TPH	Naph	cPAHs
(9-10)	5300J	0.063	0.0443
(12-13)	56.0J	0.075	0.00368

Sample Depth Intervals (ft) — Total TPHs* (mg/kg) — Total cPAHs (TEC) (mg/kg)

Qualifiers: *U = Not Detected, J = Estimated Concentration*

** Total TPH is the sum of detected diesel- and oil-range TPH.*

BROWN, BOLD TEXT indicates exceedance of unrestricted soil screening level

MILL NORTH — TRUE NORTH 45°

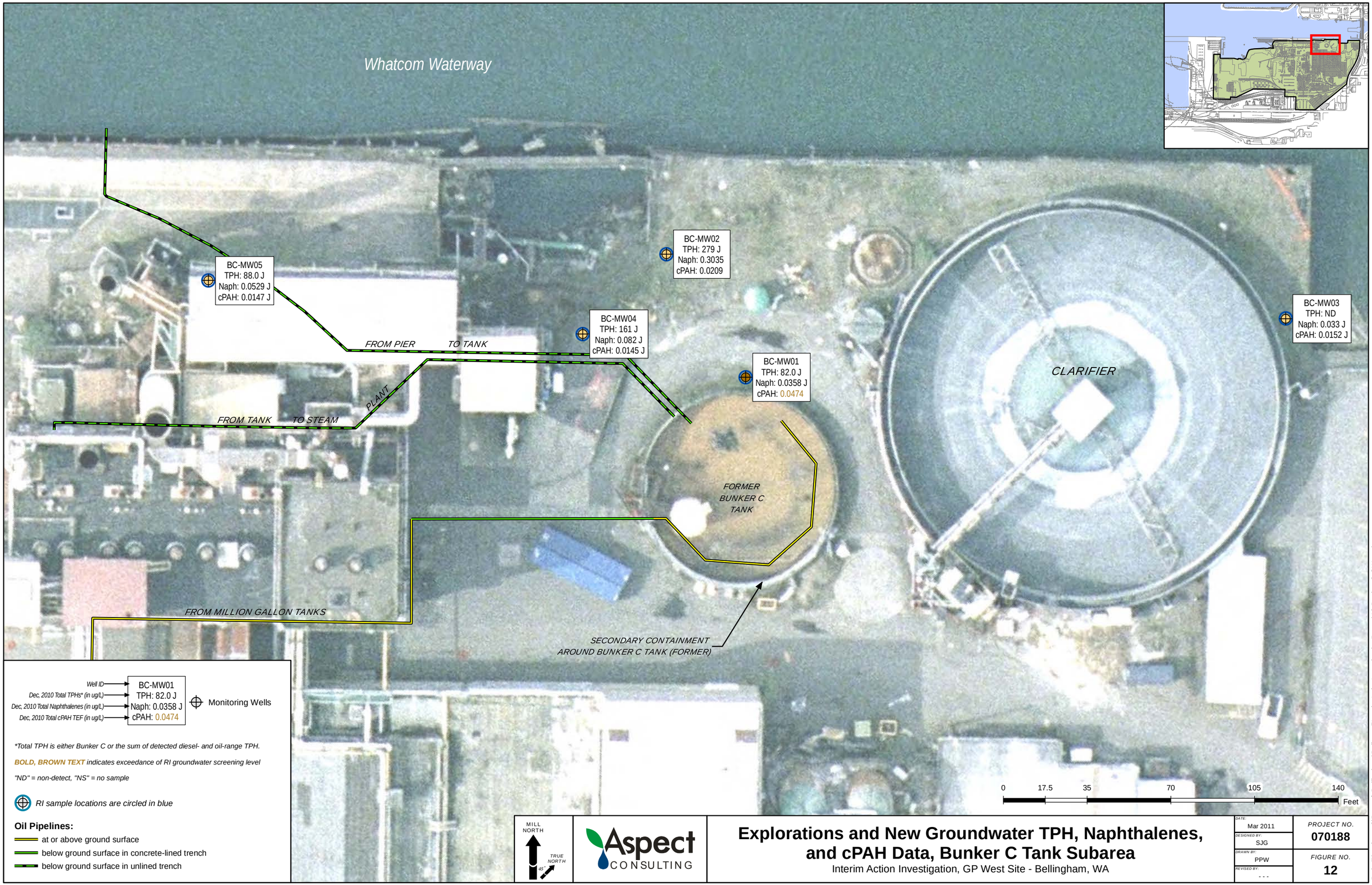
Aspect CONSULTING

Explorations and New Soil TPH, Naphthalenes, and cPAH Data, Bunker C Tank Subarea

Interim Action Investigation, GP West Site - Bellingham, WA

DATE:	PROJECT NO.
Apr 2011	070188
DESIGNED BY: SJG	
DRAWN BY: PPW	FIGURE NO. 11
REVISED BY: - - -	

Path: T:\projects_8\Port_of_Bellingham\Delivered\InterimActionInvestigationReport\11 Bunker-C Soil.mxd



Well ID → BC-MW01
Dec, 2010 Total TPHs* (in ug/L) → TPH: 82.0 J
Dec, 2010 Total Naphthalenes (in ug/L) → Naph: 0.0358 J
Dec, 2010 Total cPAH TEF (in ug/L) → cPAH: 0.0474

Monitoring Wells

*Total TPH is either Bunker C or the sum of detected diesel- and oil-range TPH.

BOLD, BROWN TEXT indicates exceedance of RI groundwater screening level

"ND" = non-detect, "NS" = no sample

RI sample locations are circled in blue

Oil Pipelines:

- at or above ground surface
- below ground surface in concrete-lined trench
- below ground surface in unlined trench

MILL NORTH
TRUE NORTH
45°

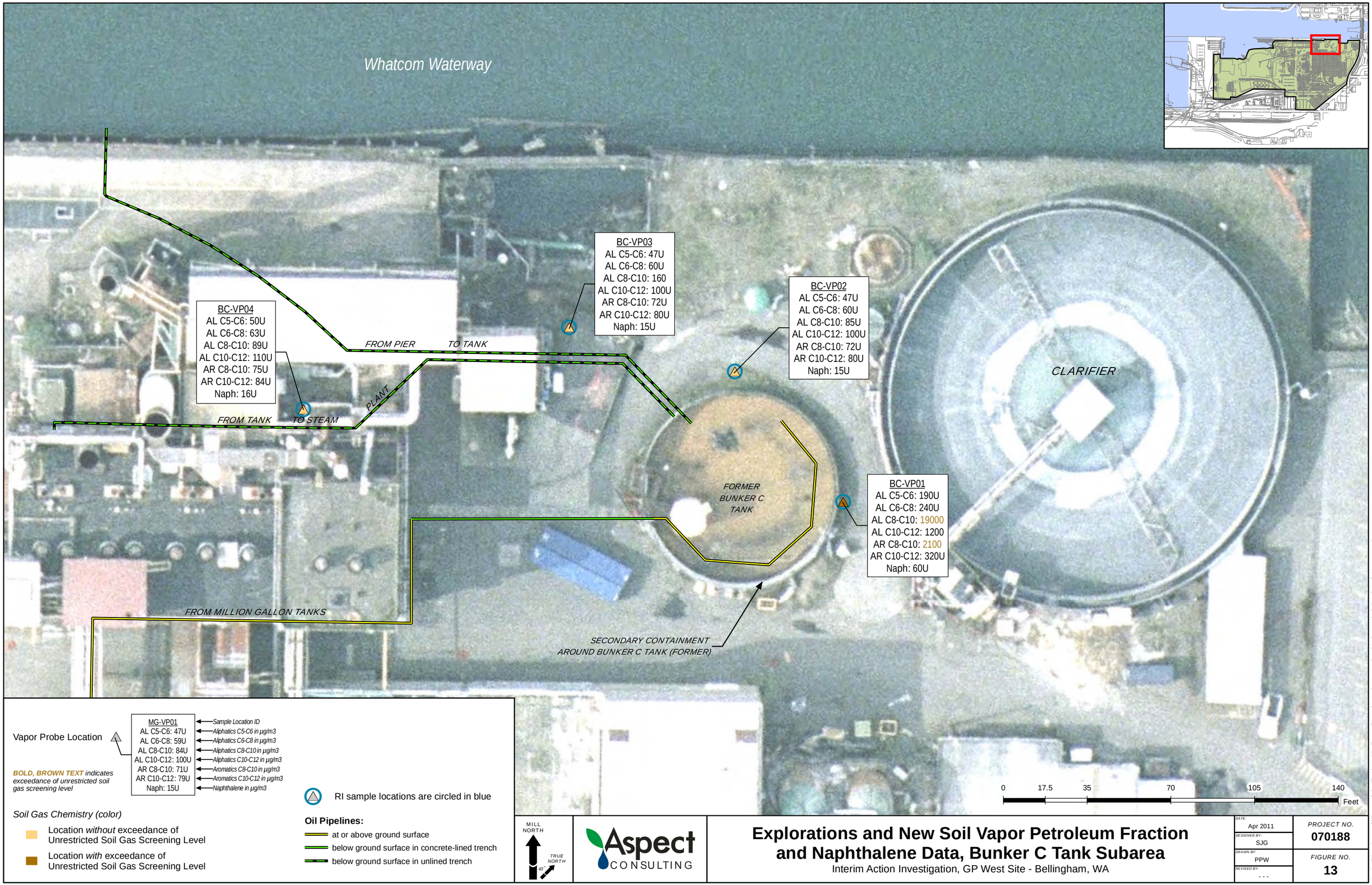
Aspect CONSULTING

Explorations and New Groundwater TPH, Naphthalenes, and cPAH Data, Bunker C Tank Subarea

Interim Action Investigation, GP West Site - Bellingham, WA

DATE: Mar 2011	PROJECT NO. 070188
DESIGNED BY: SJG	
DRAWN BY: PPW	FIGURE NO. 12
REVISED BY: - - -	

Path: T:\projects_8\Port_of_Bellingham\Delivered\InterimActionInvestigationReport\12 Bunker-C GW.mxd



Vapor Probe Location

MG-VP01
AL C5-C6: 47U
AL C6-C8: 59U
AL C8-C10: 84U
AL C10-C12: 100U
AR C8-C10: 71U
AR C10-C12: 79U
Naph: 15U

- *Sample Location ID*
- *Aliphatics C5-C6 in µg/m3*
- *Aliphatics C6-C8 in µg/m3*
- *Aliphatics C8-C10 in µg/m3*
- *Aliphatics C10-C12 in µg/m3*
- *Aromatics C8-C10 in µg/m3*
- *Aromatics C10-C12 in µg/m3*
- *Naphthalene in µg/m3*

***BOLD, BROWN TEXT** indicates exceedance of unrestricted soil gas screening level*

Soil Gas Chemistry (color)

- Location *without* exceedance of Unrestricted Soil Gas Screening Level
- Location *with* exceedance of Unrestricted Soil Gas Screening Level

RI sample locations are circled in blue

Oil Pipelines:

- at or above ground surface
- below ground surface in concrete-lined trench
- below ground surface in unlined trench

MILL NORTH
TRUE NORTH
45°

Aspect CONSULTING

Explorations and New Soil Vapor Petroleum Fraction and Naphthalene Data, Bunker C Tank Subarea

Interim Action Investigation, GP West Site - Bellingham, WA

DATE: Apr 2011	PROJECT NO. 070188
DESIGNED BY: SJG	
DRAWN BY: PPW	FIGURE NO. 13
REVISED BY: - - -	

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APPENDIX A

Exploration Logs from Interim Action Pre-Design Investigation

Coarse-Grained Soils - More than 50% [1] Retained on No. 200 Sieve	Gravels - More than 50% [1] of Coarse Fraction Retained on No. 4 Sieve	≦5% Fines [5]	GW	Well-graded gravel and gravel with sand, little to no fines
			GP	Poorly-graded gravel and gravel with sand, little to no fines
		≧15% Fines [5]	GM	Silty gravel and silty gravel with sand
			GC	Clayey gravel and clayey gravel with sand
	Sands - 50% [1] or More of Coarse Fraction Passes No. 4 Sieve	≦5% Fines [5]	SW	Well-graded sand and sand with gravel, little to no fines
			SP	Poorly-graded sand and sand with gravel, little to no fines
		≧15% Fines [5]	SM	Silty sand and silty sand with gravel
			SC	Clayey sand and clayey sand with gravel
Fine-Grained Soils - 50% [1] or More Passes No. 200 Sieve	Silts and Clays Liquid Limit Less than 50		ML	Silt, sandy silt, gravelly silt, silt with sand or gravel
			CL	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay
			OL	Organic clay or silt of low plasticity
	Silts and Clays Liquid Limit 50 or More		MH	Elastic silt, clayey silt, silt with micaceous or diato-maceous fine sand or silt
			CH	Clay of high plasticity, sandy or gravelly clay, fat clay with sand or gravel
			OH	Organic clay or silt of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

Terms Describing Relative Density and Consistency

	Density	SPT [2] blows/foot
Coarse-Grained Soils	Very Loose	0 to 4
	Loose	4 to 10
	Medium Dense	10 to 30
	Dense	30 to 50
	Very Dense	>50
	Consistency	**SPT [2] blows/foot**
Fine-Grained Soils	Very Soft	0 to 2
	Soft	2 to 4
	Medium Stiff	4 to 8
	Stiff	8 to 15
	Very Stiff	15 to 30
	Hard	>30

Test Symbols

FC = Fines Content
G = Grain Size
M = Moisture Content
A = Atterberg Limits
C = Consolidation
DD = Dry Density
K = Permeability
Str = Shear Strength
Env = Environmental
PiD = Photoionization Detector

Component Definitions

Descriptive Term	Size Range and Sieve Number
Boulders	Larger than 12"
Cobbles	3" to 12"
Gravel	3" to No. 4 (4.75 mm)
Coarse Gravel	3" to 3/4"
Fine Gravel	3/4" to No. 4 (4.75 mm)
Sand	No. 4 (4.75 mm) to No. 200 (0.075 mm)
Coarse Sand	No. 4 (4.75 mm) to No. 10 (2.00 mm)
Medium Sand	No. 10 (2.00 mm) to No. 40 (0.425 mm)
Fine Sand	No. 40 (0.425 mm) to No. 200 (0.075 mm)
Silt and Clay	Smaller than No. 200 (0.075 mm)

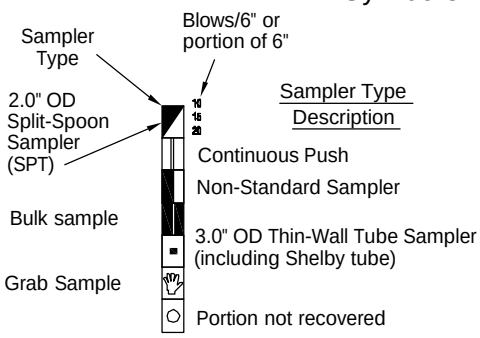
[3] Estimated Percentage

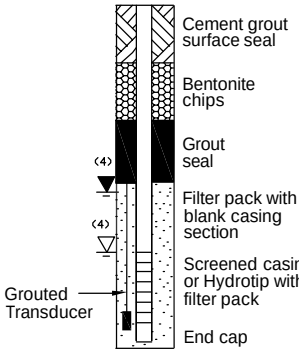
Percentage by Weight	Modifier
<5	Trace
5 to 15	Slightly (sandy, silty, clayey, gravelly)
15 to 30	Sandy, silty, clayey, gravelly)
30 to 49	Very (sandy, silty, clayey, gravelly)

Moisture Content

Dry - Absence of moisture, dusty, dry to the touch
Slightly Moist - Perceptible moisture
Moist - Damp but no visible water
Very Moist - Water visible but not free draining
Wet - Visible free water, usually from below water table

Symbols





(1) Percentage by dry weight
(2) (SPT) Standard Penetration Test (ASTM D-1586)
(3) In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)
(4) Depth of groundwater — ATD = At time of drilling; Static water level (date); BGS = below ground surface
(5) Combined USCS symbols used for fines between 5% and 15% as estimated in General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)

Classifications of soils in this report are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.

Aspect CONSULTING

Exploration Log Key

DATE:
DESIGNED BY:
DRAWN BY:
REVISED BY:

PROJECT NO.

FIGURE NO.
A-1

Q:_ACAD Standards\Standard Details\Exploration Log Key A1.dwg

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	CP-MW13	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Top of Casing Elev.: 14.32
Depth to Water (ft BGS): 3.0 ATD
Start/Finish Date: 12/16/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
	8" flush mount monument set in concrete						Asphalt	
1							Slightly moist, gray silty, sandy GRAVEL (GW/GM); fill	1
2		CP-MW13-1-2	Total Hg				Slightly moist, brown, slightly gravelly SAND (SW); fine to coarse subrounded sand, fine to coarse subrounded gravel, trace silt, trace organics (wood fragments) 1'-2'	2
3	▽	CP-MW13-2-3	Total Hg				3" bed brown silt Becomes wet	3
4	3/4" Sch 40 PVC riser							4
5		CP-MW13-4-5	Total Hg		8.5			5
6	3/8" bentonite chips							6
7							Wet, gray, GRAVEL (GP); fine to coarse subrounded gravel trace slightly subangular gravel, trace sand	7
8		CP-MW13-8-9	Total Hg		8.5			8
9								9
10	10-20 silica sand							10
11					8.5		Wet, gray, slightly gravelly SAND (SW); fine to coarse subrounded sand, trace silt, pred. fine to medium subrounded gravel	11
12								12
13	Prepacked screen, 0.020" slot	CP-MW13-12-14	Total Hg					13
14								14
15		CP-MW13-15-16	Total Hg					15
16	Threaded cap				9.1		Wet, gray SILT (ML); trace fine, black organics, woodchips/sawdust	16
17					8.4			17
18	Slough				8.7 8.3			18
19					8.4		Wet, gray fine SAND (SP); trace organics and shell fragments, grades to medium sand	19
20							Bottom of boring at 20'	20
21								21
22								22
23								23
24								24

Sampler Type:
- No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: JWC/MAR

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	CP-MW14	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Caustic Plume Area / Bellingham, Washington	Top of Casing Elev.	16.14
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	5 ATD
Sampling Method:	1.5" core	Start/Finish Date	12/21/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0	8" flush mount monument set in concrete						Asphalt	0
1							Concrete and debris	1
2								2
3		CP-MW14-3-4	Total Hg				Moist, gray, silty, sandy GRAVEL (GM)	3
4								4
5	▽	CP-MW14-5-6	Total Hg		10.2			5
6					10.3			6
7	3/8" bentonite chips				8		Wet, dark gray, SILT (ML) with organics	7
8		CP-MW14-8-9	Total Hg		8			8
9	3/4" Sch 40 PVC riser				7.8			9
10							Woody debris	10
11							Wet, brown-gray sandy SILT (ML); with organics	11
12	10-20 silica sand				8.4			12
13					8.6		Woody debris	13
14		CP-MW14-14-15	Total Hg		8.5		Wet, gray SAND (SP); fine sand	14
15	Prepacked screen, 0.020" slot				9.5			15
16					9.2 9.3 9.4		grades to sandy SILT (ML)	16
17					9.2			17
18	Threaded cap Slough	CP-MW14-17-18	Total Hg		9.2 9.1 9.1		SAND (SP); fine sand gray SILT (ML) Bottom of boring at 18'	18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: JWC

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	CP-MW15	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Caustic Plume Area / Bellingham, Washington	Top of Casing Elev.	15.62
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	5 ATD
Sampling Method:	1.5" core	Start/Finish Date	12/20/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1	8" flush mount monument set in concrete						Concrete	1
2								2
3	3/8" bentonite chips							3
4		CP-MW15-4-5	Total Hg				Slightly moist, gray to brown, gravelly SAND (SW); trace silt, well-graded fine to coarse sand, visible elemental Hg	4
5	▽				11.8		Visible elemental Hg 5'-8'.	5
6		CP-MW15-6-7	Total Hg		11.8		Discoloration, sand becomes siltier	6
7	3/4" Sch 40 PVC riser				12.3		Slightly moist, dark gray, SILT (ML); trace fine sand, trace clay, scattered woody debris, thin beds siltly, fine sand	7
8		CP-MW15-8-9	Total Hg		12.2			8
9					11.6		Woody debris	9
10					10.4		Wet, gray SAND (SW); trace silt, trace gravel, scattered woody debris	10
11	10-20 silica sand	CP-MW15-10-11	Total Hg		11.2			11
12					10.8		Very moist, dark gray, sandy SILT (ML); scattered woody debris	12
13		CP-MW-12-14	Total Hg		11.9		Moist, gray, gravelly SAND (SP); trace silt, fine to medium sand	13
14	Prepacked screen, 0.020" slot				11.5			14
15					11.4			15
16	Threaded cap				10.5		Becomes siltier with depth	16
17					11.6		Wet, gray, SILT (ML); scattered woody debris	17
18	Slough				11.3			18
19					9.9			19
20					9.9		Bottom of boring at 20'.	20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MAR/Mv

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB02	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 5.0 ATD
Start/Finish Date: 12/21/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0							Concrete	0
1		CP-SB02-1-2	Total Hg				Moist, brown-gray, slightly silty, slightly gravelly SAND (SP); fine to medium sand	1
2								2
3		CP-SB02-3-4	Total Hg					3
4							Crushed concrete	4
5	▽							5
6		CP-SB02-5-6	Total Hg				Wet, gray-brown, silty, slightly gravelly SAND (SM); fine to coarse sand Sheen, hydrocarbon-like odor	6
7	Hole backfilled with 3/8" bentonite chips				9.5 9.3		Wet, gray, slightly silty, slightly sandy GRAVEL (GP); fine gravel	7
8								8
9		CP-SB02-9-10	Total Hg				Woody debris, hydrocarbon-like odor	9
10					9.1 9.4		Wet, dark brown, silty GRAVEL (GM); scattered woody debris	10
11								11
12					8.9			12
13							Wet, gray, silty SAND (SM); fine to coarse sand, seashell fragments common, scattered woody debris, scattered fine gravel	13
14					8.6			14
15								15
16					8.8			16
17		CP-SB02-17-18	Total Hg					17
18					8.8 9.3		Bottom of boring at 18'	18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MAR/Mv

Approved by: SJG

Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB03	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 4.0 ATD
Start/Finish Date: 12/22/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0						Asphalt	Asphalt	0
1							Moist, brown to black, silty, gravelly SAND (SM); well-graded fine to coarse sand, fine angular gravel (crushed rock)	1
2		CP-SB03-2-3	Total Hg					2
3								3
4	▽						Becomes wet	4
5		CP-SB03-4-5	Total Hg					5
6	Hole backfilled with 3/8" bentonite chips							6
7								7
8		CP-SB03-8-9	Total Hg					8
9							Wet, white, silty GRAVEL (GM); fine to coarse gravel, crushed marble rock and crushed concrete	9
10							Moist, brown to black, silty, gravelly SAND (SM); well-graded fine to coarse sand, fine angular gravel (crushed rock)	10
11								11
12		CP-SB03-11.5-12	Total Hg				Refusal on concrete at 12' Bottom of boring at 12'.	12
13								13
14								14
15								15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB04	1 of 1

Project Name: Georgia Pacific West Site
Ground Surface Elev:
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Depth to Water (ft BGS): 3.5 ATD
Sampling Method: 1.5" core
Start/Finish Date: 12/22/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0						Asphalt	Asphalt	0
1							Moist, brown-gray, silty, gravelly SAND (SM)	1
2	Hole backfilled with 3/8" bentonite chips	CP-SB04-2-3	Total Hg					2
3								3
4							Perched water at 3.5'	4
5		CP-SB04-4-5	Total Hg				Moist, brown and gray, sandy SILT (ML)	5
6		CP-SB04-5-6	Total Hg				Refusal at 6' on concrete or boulder Bottom of boring at 6'. No saturation at depth.	6
7								7
8								8
9								9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: MAR/SJG
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB05	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 4.0 ATD
Start/Finish Date: 12/21/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
							Asphalt	
1		CP-SB05-1-2	Total Hg				Slightly moist, gray and brown, silty GRAVEL (GM); trace coarse sand	1
2								2
3							Crushed concrete	3
		CP-SB05-3-4	Total Hg		9.1		Moist, dark olive gray, slightly gravelly SILT (ML); fine, rounded gravel	
4	▽							4
		CP-SB05-4-5	Total Hg		8		Set, gray-brown, slightly silty SAND (SM); increasingly silty with depth	
5					8.5			5
6					9.4			6
7	Hole backfilled with 3/8" bentonite chips							7
					9.5			
8		CP-SB05-8-9	Total Hg		9.2			8
9								9
					8.8			
10					9.9			10
11					9.5		Wet, dark gray, slightly silty GRAVEL	11
					10.2			
12								12
13		CP-SB05-12-14	Total Hg		10.2			13
					10.4			
14					9.2		Wet, gray, silty SAND (SM)	14
					8.6			
15							Wet, gray SILT (ML)	15
					7.9			
16					8		Woody debris	16
					9.1			
17					7.8			17
18					8		Bottom of boring at 18'	18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

- ▼ Static Water Level
- ▽ Water Level (ATD)

Logged by: MAR/Mv
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB06	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 4.0 ATD
Start/Finish Date: 12/20/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
							Asphalt	
1							Moist, silty SAND (SM)	1
							Crushed concrete	
2		CP-SB06-2-3	Total Hg		9.2		Moist to wet, slightly silty, slightly gravelly SAND (SM); well-graded fine to coarse sand, fine angular gravel, seashell fragments common	2
3					8.9			3
4	▽							4
		CP-SB06-4-5	Total Hg		9.4			
5	Hole backfilled with 3/8" bentonite chips							5
		CP-SB06-5-6	Total Hg		9.8			
6								6
7		CP-SB06-6-8	Total Hg		10.5		Visible elemental Hg 4'-8'	7
					9.4			
8								8
9					7.9		Moist, black, gravelly SILT (ML); crushed concrete	9
10							Wet, brown-gray, slightly silty SAND (SW); well-graded fine to coarse sand, scattered fine gravel. Low recovery, probably slough.	10
11					8.5			11
12								12
					8.5			
13					8.2			13
14					8			14
15								15
16					7.1			16
17					7.4			17
18								18
19							Wet, black SAND (SP); poorly graded fine to medium sand. Low recovery, probaby slough	19
		CP-SB06-19-20	Total Hg		8.2			
20							Bottom of boring at 20'	20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB06A	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 4.0' ATD
Start/Finish Date: 2/2/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0						Asphalt		0
1						Moist, silty SAND		1
						Crushed concrete		
2							Moist to wet, slightly silty, slightly gravelly SAND (SM); well-graded fine to coarse sand, fine angular gravel, seashell fragments abundant	2
3								3
4	▽						Visible elemental Hg present to 2' - 10'	4
5							Hg vapor >50 ug/m3 in borehole open to 5'	5
6								6
7								7
8	Hole backfilled with 3/8" bentonite chips							8
9							Moist, black, gravelly silt (ML); scattered crushed concrete	9
10							Wet, gray, gravelly SAND (SW)	10
11								11
12		CP-SB06A-10-15	Total Hg				Visible elemental Hg in sample. Due to poor recovery, depth of sample uncertain.	12
13								13
14								14
15							Bottom of boring at 15' BGS	15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB07	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 3.0 ATD
Start/Finish Date: 12/22/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0						Asphalt	Asphalt	0
1						Concrete	Concrete	1
2							Wet, brown SAND (SW); well-graded fine to coarse sand, trace fine to coarse gravel, trace silt	2
3	▽							3
4		CP-SB07-3-4	Total Hg					4
5	Hole backfilled with 3/8" bentonite chips	CP-SB07-4-5	Total Hg				Wet, brown-gray, gravelly SAND (SW); well-graded fine to coarse subangular sand, trace silt	5
6								6
7		CP-SB07-6.5-7.5	Total Hg					7
8								8
9							Refusal on concrete at 9'. Bottom of boring 9'.	9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MAR
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB08	1 of 1

Project Name: Georgia Pacific West Site
Ground Surface Elev:
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Depth to Water (ft BGS): 3.5 ATD
Sampling Method: 1.5" core
Start/Finish Date: 12/23/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0						Asphalt	Asphalt	0
1		CP-SB08-1-2	Total Hg			Gravel	Moist, gray/brown, silty, sandy GRAVEL (GM); fine to coarse angular gravel (crushed rock)	1
2		CP-SB08-2-3	Total Hg			Gravel		2
3						Gravel	Moist, very sandy GRAVEL (GP); gravel subrounded	3
4		CP-SB08-4-5	Total Hg			Gravel	Becomes wet	4
5	Hole backfilled with 3/8" bentonite chips					Sand	Wet, gray, slightly silty SAND (SW); well-graded, fine to coarse, subrounded sand, trace gravel	5
6						Sand		6
7						Sand	Wet, gray, very silty SAND (SM); fine, subrounded sand, scattered seashell fragments	7
8		CP-SB08-8-9	Total Hg			Sand		8
9						Organic silt	Organic silt (OL)	9
10						Sawdust	Sawdust	10
11						Silt	Wet, gray SILT (ML); abundant brown organics (sawdust)	11
12						Silt		12
13		CP-SB08-12-14	Total Hg			Silt		13
14						Silt	Becomes dark gray to black	14
15							Bottom of boring at 15'	15
16							This boring was moved 15' to the SW from original location. Original location had 6" asphalt, 18" gravel, 34" concrete.	16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: JWC
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

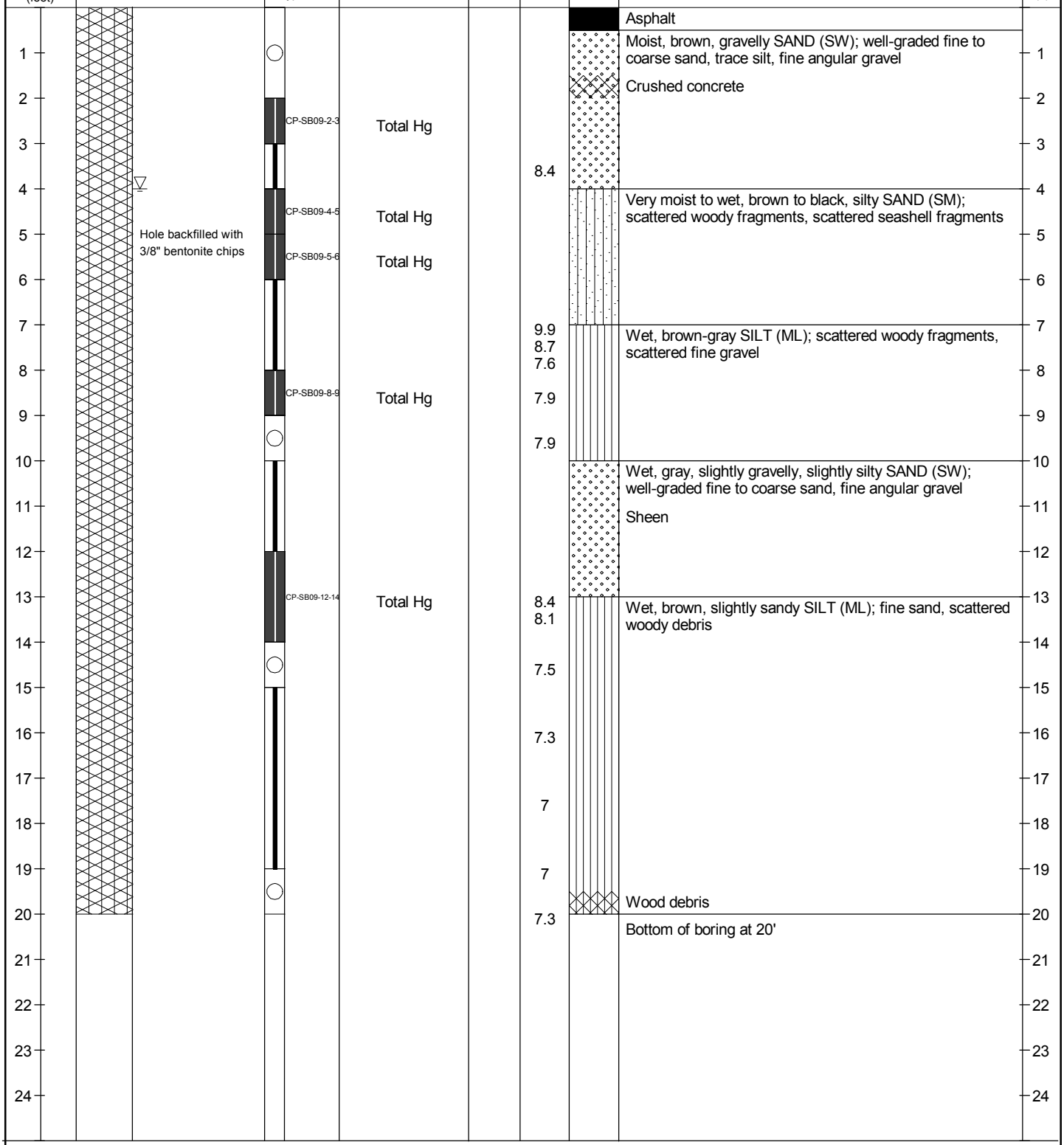
Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB09	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 4.0 ATD
Start/Finish Date: 12/21/2010



Sampler Type:
- No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

Static Water Level

Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB10	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 5.0 ATD
Start/Finish Date: 12/22/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0							Asphalt	0
0.5							GRAVEL	0.5
1							Concrete (cored and vac'd)	1
2					50			2
3								3
4							No recovery	4
5	▽							5
6		CP-SB10-5-6	Total Hg		511		Wet, dark gray SAND (SW); well-graded fine to coarse sand, trace gravel (probably slough)	6
7	Hole backfilled with 3/8" bentonite chips	CP-SB10-6-7	Total Hg		611		Wet, dark gray, sandy SILT (ML); scattered woody debris	7
8					710			8
9		CP-SB10-8-9	Total Hg		811			9
10					910			10
11					1022			11
12		CP-SB10-12-13	Total Hg					12
13								13
14		CP-SB10-14-15	Total Hg				Sand and woody debris	14
15							Bottom of boring at 15'	15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MAR
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB11	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 6.0 ATD
Start/Finish Date: 12/22/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0							Asphalt	0
1							Concrete	1
2								2
3							Wet, gray SAND (SP); poorly graded fine to medium sand, trace silt, trace gravel	3
4		CP-SB11-3-5	Total Hg Soil pH 10.8				Sheen	4
5	Hole backfilled with 3/8" bentonite chips	CP-SB11-5-6	Soil pH 8.7 Total Hg				Petroleum-like odor, sheen.	5
6	▽		Soil pH 8.8					6
7			Soil pH 7.6				Wet, gray SILT (ML); scattered fine gravel	7
8		CP-SB11-7-9	Total Hg Soil pH 7.6				Sand with scattered woody debris	8
9			Soil pH 7.8					9
10								10
11			Soil pH 10.3 Soil pH 8.9				Moist, dark gray SAND (SP); poorly graded medium to coarse sand, trace silt, scattered gravel	11
12								12
13		CP-SB11-12-14	Total Hg Soil pH 8.8				Petroleum-like odor	13
14			Soil pH 9.2				Moist, dark gray SILT (ML); scatted woody debris	14
15		CP-SB11-15-16	Soil pH 9.2 Total Hg					15
16								16
17			Soil pH 10.5 Soil pH 7.6					17
18			Soil pH 9.5				Bottom of boring at 18'	18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MAR
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB12	1 of 1

Project Name: Georgia Pacific West Site
Ground Surface Elev:
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Depth to Water (ft BGS): 4.0 ATD
Sampling Method: 1.5" core
Start/Finish Date: 12/23/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0						Asphalt	Asphalt	0
1		CP-SB12-0.5-1	Total Hg			Concrete	Slightly moist, gray GRAVEL (GW); angular to subangular fine to coarse gravel (crushed rock), trace silt, trace sand	1
2							Concrete	2
3								3
4	▽						Becomes wet	4
5	Hole backfilled with 3/8" bentonite chips	CP-SB12-5-6	Total Hg				Wet, gray SAND (SW); well graded fine to coarse subrounded sand	5
6							Wet, gray, silty SAND (SP-SM); fine sand	6
7							Wet, gray SILT (ML)	7
8								8
9		CP-SB12-9-10	Total Hg				Wet, gray/black silty, sandy GRAVEL (GM); angular gravel, frequent wood fragments, creosote-like odor (pile?)	9
10								10
11							Wet gray SAND (SW); well-graded fine to coarse sand, interfingered with silty SAND (SM); fine sand, scattered seashell fragments	11
12		CP-SB12-12-13	Total Hg					12
13								13
14								14
15		CP-SB12-15-16	Total Hg					15
16							Moist, gray SILT (ML); trace fine brown organics	16
17							2" bed of sand	17
18							Bottom of boring at 18'	18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: JWC

Approved by: SJG

Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB13	1 of 1

Project Name: Georgia Pacific West Site
Ground Surface Elev:
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Depth to Water (ft BGS): 1.0 ATD
Sampling Method: 1.5" core
Start/Finish Date: 12/21/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
							Asphalt	
1							Wet, black, slightly silty SAND (SM); scattered woody debris, scattered sheashell fragments	1
2								2
3		CP-SB13-2-4	Total Hg		8.2			3
4	▽							4
5	Hole backfilled with 3/8" bentonite chips							5
6		CP-SB13-5-6	Total Hg				Becomes brown	6
7					7.8			7
8					8.2		Charcoal	8
9		CP-SB13-8-9	Total Hg					9
10					7.7		Wet, gray, slightly sandy SILT (ML); fine sand	10
11					7.5			11
12							Petroleum-like odor	12
13		CP-SB13-12-13	Total Hg		7.2			13
14					8.2			14
15					6.6		Petroleum-like odor	15
16		CP-SB13-15-16	Total Hg		8			16
17					7.5		Woody debris.	17
					7.8		Bottom of boring at 17'.	
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv/MAR

Approved by: SJG

Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB14	1 of 1

Project Name: Georgia Pacific West Site
Ground Surface Elev:
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Depth to Water (ft BGS): 4.0 ATD
Sampling Method: 1.5" core
Start/Finish Date: 1/31/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Drive/ Recovery (inches)	Material Type	Description	Depth (ft)
0							Asphalt	0
1							Slightly moist to moist, brown, slightly silty, gravelly SAND (SW); fine to coarse sand, fine, angular gravel	1
2								2
3								3
4	▽							4
5							Building material debris, becomes black	5
6	Hole backfilled with bentonite chips						Woody debris, visible elemental mercury	6
7								7
8							Wet, black, slightly gravelly, silty SAND (SM/SP); fine to medium sand	8
9								9
10							Abundant woody debris at 10'	10
11								11
12							Seashell fragments Bottom of boring at 12' BGS; hit refusal on concrete	12
13								13
14								14
15								15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- ▯ Continuous Core
- ▮ Soil sample

PID - Photoionization Detector (Headspace Measurement)
- ▼ Static Water Level
- ▽ Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

ENV PROBE LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ April 28, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB15	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 3.5 ATD
Start/Finish Date: 1/31/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Drive/ Recovery (inches)	Material Type	Description	Depth (ft)
0						Asphalt	Asphalt	0
2						Slightly moist, brown and gray, gravelly SAND (SW); fine to coarse sand, fine, angular gravel, trace silt	2
4						Wet, sandy GRAVEL (GP); fine gravel, coarse to medium sand	4
6	Hole backfilled with 3/8" bentonite chips							6
8								8
9						Wet, brown, silty GRAVEL (GM); trace coarse sand	9
11						Wet, gray SILT (ML); abundant woody debris	11
13						Bottom of boring at 13' BGS	13
24								24

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

ENV PROBE LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ April 28, 2011

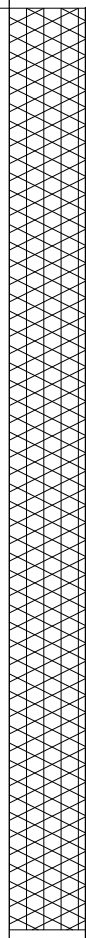
Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB16	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 4.0 ATD
Start/Finish Date: 2/1/2011



Depth / Elevation (feet)	Material Type	Description	Depth (ft)
0		Asphalt	
1		Moist, gravelly SAND (SW); fine to coarse sand, fine gravel, trace silt	1
2			2
3		Hg vapor=24 ug/m3	3
4			4
5		Color becomes brown, Hg vapor=5.4 ug/m3	5
6		Hg vapor=3.9 ug/m3	6
7		SILT (ML); Hg vapor=720 ng/m3	7
8		Brick fragments-FILL	8
9		Silt (ML); Hg vapor=1907 ng/m3	9
10		Wet, gray SAND (SP); fine to medium sand, trace silt, trace gravel	10
11		Hg vapor=655 ng/m3	11
12		Wet, gray, slightly gravelly, silty SAND (SM) Hg vapor=595 ng/m3	12
13		Hg vapor=510 ng/m3	13
14		Woody fragments at 14'	14
15		Hg vapor=417 ng/m3	15
		Hg vapor = 463 ng/m3; bottom of boring at 15' BGS	

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)
- Static Water Level
- Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

ENV PROBE LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ April 28, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB17	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 3.5 ATD
Start/Finish Date: 1/31/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1							Slightly moist, brown and gray, silty, sandy GRAVEL (GM)	1
2		CP-SB17-2-3	Total Hg				Hg vapor=0.3 ug/m3	2
3	▽						Hg vapor=208 ng/m3	3
4		CP-SB17-4-5	Total Hg					4
5							Hg vapor=250 ng/m3	5
6					8.6			6
7		CP-SB17-6.5-7.5	Total Hg		8.5 9.7		Hg vapor=156 ng/m3	7
8					9.5		Wet, gray SAND (SP); coarse sand, trace silt, trace gravel	8
9	Hole backfilled with 3/8" bentonite chips						Hg vapor=50 ng/m3 from 9' to 18'	9
10		CP-SB17-9-10	Total Hg		9			10
11					9.1			11
12					8.7			12
13								13
14							Becomes wet, black, slightly silty, gravelly SAND (SP); fine to medium sand	14
15		CP-SB17-14-15	Total Hg		9.6 9.7			15
16					8.3 7.6		Becomes brown Presence of woody debris	16
17					8.7		Wet, gray SILT (ML); trace gravel	17
18					9.7		Bottom of boring at 18' BGS	18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB18	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 3.0 atd
Start/Finish Date: 2/1/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0							Asphalt	0
1		CP-SB18-0.5-1.5	Total Hg				Moist, black and brown, gravelly SAND (SW); trace silt	1
2							Concrete	2
3	▽							3
4								4
5							Wet, gray SAND (SW), fine to coarse sand, trace silt	5
6		CP-SB18-5-6	Total Hg		8.4		Wet, brown, slightly sandy SILT (ML); adundant woody debris	6
7	Hole backfilled with 3/8" bentonite chips							7
8		CP-SB18-7-8	Total Hg		8.9			8
9					10.8			9
10		CP-SB18-9-10	Total Hg		9.8 9.3		Wet, black SAND (SW); fine to coarse sand, trace gravel, trace silt	10
11					11		Color becomes gray	11
12					9		Wet, black, silty SAND (SM); trace gravel	12
13		CP-SB18-12-13	Total Hg		11.5		Scattered woody debris	13
14					9.4 10.7		Becomes very silty	14
15							SILT (ML) Bottom of boring at 15' BGS	15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB19	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 4' ATD
Start/Finish Date: 1/31/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0					7.9	Asphalt	Asphalt	0
1		CP-SB19-0.5-1.5	Total Hg		9.6	Moist, gray, silty, sandy GRAVEL (GM)	Moist, gray, silty, sandy GRAVEL (GM) Hg Vapor=43,520 ng/m3	1
2					8.7			2
3		CP-SB19-2-3	Total Hg				Hg vapor=317 ng/m3	3
4	▽				8.6	Wet, brown and gray, slightly gravelly, silty, SAND (SM)	Wet, brown and gray, slightly gravelly, silty, SAND (SM) Very gravelly from 4' to 6'	4
5		CP-SB19-4-5	Total Hg		8.8		Hg vapor=227 ng/m3 Hg vapor=418 ng/m3	5
6							Abundant woody debris from 6' to 9'	6
7		CP-SB19-6.5-7.5	Total Hg		7.2		Hg vapor=357 ng/m3	7
8					7.9		Hg vapor=475 ng/m3	8
9	Hole backfilled with 3/8" bentonite chips					SILT (ML)	SILT (ML)	9
10		CP-SB19-9-10	Total Hg		7.5			10
11					7.8	Wet, brown and gray gravelly, silty SAND (SM)	Wet, brown and gray gravelly, silty SAND (SM) Hg vapor=167 ng/m3	11
12								12
13								13
14						Wet, black, slightly silty gravel	Wet, black, slightly silty gravel Hg vapor=403 ng/m3	14
15		CP-SB19-15-16	Total Hg			Wet, dark gray, silty SAND (SM); fine to coarse sand	Wet, dark gray, silty SAND (SM); fine to coarse sand	15
16					9.8 9.9		Hg vapor=436 ng/m3	16
17					9.8	Wet, dark gray SILT (ML)	Wet, dark gray SILT (ML) Hg vapor=241 ng/m3	17
18					9.3		Hg vapor=1200 ng/m3 Bottom of boring at 18' BGS	18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv

Approved by: SJG

Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB20	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 6.5 ATD
Start/Finish Date: 1/31/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1		CP-SB20-0.5-1.5	Total Hg				Slightly moist, brown and gray, silty GRAVEL (GM)	1
							Hg vapor >50 ug/m3	
2								2
3		CP-SB20-3-4	Total Hg					3
4							Hg vapor=0.4 ug/m3	4
							Moist, gray, silty, gravelly SAND (SM); fine to medium sand	
5		CP-SB20-5-6	Total Hg				Hg vapor=0.2 ug/m3	5
6	▽				9.3		Hg vapor=0.8 ug/m3	6
							Wet, dark gray SILT (ML); woody debris at 6.5' and 8'	
7							Hg vapor=0.2 ug/m3	7
8					7.7		Hg vapor=0.08 ug/m3	8
9	Hole backfilled with 3/8" bentonite chips	CP-SB20-9-10	Total Hg				Wet, gray, silty SAND (SM)	9
10					8			10
					8.6		Hg vapor=0.08 ug/m3	
11					10.6		Seashell fragments	11
12					11.5		Hg vapor=0.08 ug/m3	12
13							Hg vapor=0.2 ug/m3	13
		CP-SB20-13-14	Total Hg		11.4		Color becomes blacks, becomes very silty with woody debris	
14							Hg vapor=0.1 ug/m3	14
15					11.9			15
					10.8		Hg vapor=0.1 ug/m3	
16					10.9			16
17					10.4		SILT (ML)	17
18					9.8		Bottom of boring at 18' BGS	18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	CP-SB22	1 of 1

Project Name: Georgia Pacific West Site
Location: Caustic Plume Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 4.5 ATD
Start/Finish Date: 1/31/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0						Asphalt	Asphalt	0
1						Moist to wet, slightly silty, gravelly SAND (SM); fine to coarse sand, fine angular gravel	Moist to wet, slightly silty, gravelly SAND (SM); fine to coarse sand, fine angular gravel	1
2		CP-SB19-2-3	Total Hg					2
3	Hole backfilled with 3/8" bentonite chips							3
4	▽							4
5		CP-SB19-4-5	Total Hg					5
6							Very silty from 6' to 7'	6
7		CP-SB19-6-7	Total Hg				Bottom of boring at 7' BGS; hit refusal in concrete	7
8								8
9								9
10								10
11								11
12								12
13								13
14								14
15								15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	CP-VP05	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Caustic Plume Area / Bellingham, Washington	Top of Casing Elev.	
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	not encountered
Sampling Method:	1.5" core	Start/Finish Date	2/1/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0	Hydrated bentonite chips						Asphalt	0
1	3.4" diam Sch 40 PVC riser						Slightly moist, gray, silty GRAVEL (GM)	1
2	3/4" diam 0.010" slot Sch 40 PVC screen; 10-20 sand							2
3	Slip cap						moist, black, silty SAND	3
4							Bottom of boring at 3.5'	4

Sampler Type:
- No Recovery
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: Mv

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	CP-VP06	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Caustic Plume Area / Bellingham, Washington	Top of Casing Elev.	
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	2' ATD
Sampling Method:	1.5" core	Start/Finish Date	2/1/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0	Hydrated bentonite chips						Asphalt	0
	3.4" diam Sch 40 PVC riser						Concrete	
1								1
	3/4" diam 0.010" slot Sch 40 PVC screen							
	Slip cap							
2	▽ 10-20 sand						Wet GRAVEL (GP)	2
							Bottom of boring at 2.5'	
3								3
4								4

Sampler Type:
○ No Recovery
Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	CP-VP07	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Caustic Plume Area / Bellingham, Washington	Top of Casing Elev.	
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	not encountered
Sampling Method:	1.5" core	Start/Finish Date	2/1/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0							Asphalt	0
	Hydrated bentonite chips						Moist, slightly silty, sandy GRAVEL (GP)	
1	3.4" diam Sch 40 PVC riser							1
							Hg vapor = 3600 ng/m3 in borehole	
2	3/4" diam 0.010" slot Sch 40 PVC screen							2
3	10-20 sand						Moist, silty SAND (SM); fine to medium sand	3
	Slip cap						Bottom of boring	
4								4

Sampler Type:
- No Recovery
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: Mv

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	CP-VP08	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Caustic Plume Area / Bellingham, Washington	Top of Casing Elev.	
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	not encountered
Sampling Method:	1.5" core	Start/Finish Date	2/1/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0							Asphalt	0
1	Hydrated bentonite chips						Moist, silty, sandy GRAVEL (GM)	1
2	3.4" diam Sch 40 PVC riser							2
3	3/4" diam 0.010" slot Sch 40 PVC screen Slip cap 10-20 sand						Gravelly SAND (SP)	3
4							Bottom of boring at 3.5'	4

Sampler Type:
- No Recovery
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: Mv

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	CP-VP09	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Caustic Plume Area / Bellingham, Washington	Top of Casing Elev.	
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	3' ATD
Sampling Method:	1.5" core	Start/Finish Date	2/1/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0							Asphalt	0
1	Hydrated bentonite chips; 3/4" diam Sch 40 PVC riser; 10-20 sand						Brown, silty, sandy GRAVEL (GM)	1
2							Hg vapor= 4000 ng/m3 in borehole	2
3	3/4" diam 0.010" slot Sch 40 PVC screen; ▽; Slip cap							3
4							Bottom of boring at 3.6'	4

Sampler Type:
- ○ No Recovery
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

- ▼ Static Water Level
- ▽ Water Level (ATD)

Logged by: Mv

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	CP-VP10	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Caustic Plume Area / Bellingham, Washington	Top of Casing Elev.	
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	3' ATD
Sampling Method:	1.5" core	Start/Finish Date	2/1/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0							Silty, sandy GRAVEL (GM)	0
1	Hydrated bentonite chips							1
	3.4" diam Sch 40 PVC riser						Hg vapor = 0.15 ug/m3 in borehole	
2	3/4" diam 0.010" slot Sch 40 PVC screen							2
3	Slip cap						Crushed concrete	3
	10-20 sand							
							Bottom of boring at 3.5'	
4								4

Sampler Type:
- No Recovery
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: Mv

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Aspect CONSULTING

Monitoring Well Construction Log

Project Number	Well Number	Sheet
070188	L1-MW01	1 of 1

Project Name: Georgia Pacific West Site
Location: Law 1 Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Top of Casing Elev.: 13.2
Depth to Water (ft BGS): 5 ATD
Start/Finish Date: 12/16/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0	5" flush mount monument set in concrete						Slightly moist, brown, sandy, gravelly SILT (ML)	0
1							Becomes olive gray	1
2	3/4" Sch 40 PVC riser							2
3								3
4	3/8" bentonite chips	L1-MW01-3-4	Total Hg					4
5	▽				8		Becomes wet	5
6					8.8			6
7					8.9			7
8	10-20 silica sand	L1-MW01-7-9	Total Hg		8.8			8
9					9.4		Becomes brownish-olive-green	9
10					10			10
11	Prepacked screen, 0.020" slot				9.6		Wet, gray to black, very silty, very sandy GRAVEL (GW); fine to coarse gravel, abundant woody debris	11
12		L1-MW01-11-13	Total Hg		8.9			12
13					8.6			13
14	Threaded cap Slough	L1-MW01-14-15	Total Hg		8.2		Slightly moist, dark gray SILT (ML); scattered woody debris	14
15					8.6		Becomes sandy Bottom of boring at 15'	15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MAR

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	L1-MW02	1 of 1

Project Name: Georgia Pacific West Site
Location: Law 1 Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Top of Casing Elev.: 13.6
Depth to Water (ft BGS): 6 ATD
Start/Finish Date: 12/17/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
	5" flush mount monument set in concrete						Asphalt	
1							Moist, gray, gravelly, SAND (SW); fine to coarse sand, trace silt	1
2								2
3								3
4	3/4" Sch 40 PVC riser						Becomes trace gravel	4
5		L1-MW02-4-5	Total Hg		7.9			5
6	▽				8.2			6
7					7.8			7
8	3/8" bentonite chips	L1-MW02-7-9	Total Hg					8
9					7.7			9
10	10-20 silica sand				8.7		Wet, gray, silty GRAVEL (GM); trace sand	10
11					8.5 9.2		Wet, gray, silty SAND (SM); trace gravel, scattered seashell fragments	11
12	Prepacked screen, 0.020" slot	L1-MW02-11-12	Total Hg		9.4			12
13					9.4 9.1 9.2		Wet, gray SAND (SP); fine to medium sand, trace silt, trace gravel, scattered seashell fragments	13
14		L1-MW02-13-14	Total Hg		9			14
15	Threaded cap				8.8 9			15
16					8.7			16
17		L1-MW02-16-17	Total Hg		8.4		Wood chips, sawdust	17
18	Slough				8		Moist, gray SILT (ML); trace fine sand	18
19					9			19
20					7.7		Bottom of boring at 20'	20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	L1-MW03	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Law 1 Area / Bellingham, Washington	Top of Casing Elev.	13.3
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	13.5 ATD
Sampling Method:	1.5" core	Start/Finish Date	12/15/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1	5" flush mount monument set in concrete						Slightly moist, dark brown to olive gray, slightly sandy, very silty GRAVEL (GM); fine to coarse gravel	1
2							Abundant woody debris	2
3							Scattered woody debris	3
4	3/4" Sch 40 PVC riser						Becomes olive gray Crushed rock	4
5		L1-MW03-4-5	Total Hg				Moist, dark olive gray, trace to slightly sandy, slightly gravelly SILT (ML)	5
6							Olive green 5' to 7'	6
7					8.7		Becomes very moist	7
8	3/8" bentonite chips	L1-MW03-7-9	Total Hg		8.9		Trace gravel 7'-10'	8
9					8.4		Scattered wood 7'-20'	9
10					8.4			10
11		L1-MW03-11-12	Total Hg		8.5		Slightly gravelly 10'-12'	11
12					8.6			12
13	▽	L1-MW03-13-14	Total Hg		8.4		Gravelly 12'-14'	13
14	10-20 silica sand				8.7		Driller indicates water level at 13'	14
15		L1-MW03-15-16	Total Hg		8.5		Becomes sandy, very gravelly 14'-19'	15
16					8.4		Dark reddish brick-like coarse gravel	16
17	Prepacked screen, 0.020" slot				8.8			17
18					8.4			18
19	Threaded cap Slough				8.6		Trace gravel	19
20					8.6		Bottom of boring at 20'	20
21								21
22								22
23								23
24								24

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MAR

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	L1-MW04	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Law 1 Area / Bellingham, Washington	Top of Casing Elev.	14.32
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	4 ATD
Sampling Method:	1.5" core	Start/Finish Date	12/16/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0	5" flush mount monument set in concrete						Moist, brown, very sandy, very silty GRAVEL (GM)	0
1								1
2								2
3							Thin bed olive-gray silt	3
4		L1-MW04-3-4	Total Hg		7.9		Becomes wet	4
5					7.7		Woody debris Wet, gray, very sandy GRAVEL (GP); mostly fine gravel, fine to coarse sand, trace silt	5
6	3/4" Sch 40 PVC riser	L1-MW04-5-7	Total Hg		7.7			6
7					7.7			7
8	3/8" bentonite chips				7.8			8
9		L1-MW04-8-10	Total Hg		7.6			9
10					7.5			10
11	10-20 silica sand	L1-MW04-10-12	Total Hg		7.6		Becomes brown	11
12					7.5			12
13					7.5			13
14	Prepacked screen, 0.020" slot	L1-MW04-13-15	Total Hg		7.5			14
15					7.5		Becomes slightly sandy	15
16	Threaded cap							16
17								17
18	Slough				7.6			18
19								19
20							Bottom of boring at 20'	20
21								21
22								22
23								23
24								24

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

Static Water Level

Water Level (ATD)

Logged by: MAR

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	L1-MW05	1 of 1

Project Name: Georgia Pacific West Site
Location: Law 1 Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev
Top of Casing Elev. 14.36
Depth to Water (ft BGS) 3 ATD
Start/Finish Date 12/15/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1	5" flush mount monument set in concrete						Slightly moist to moist, dark brown, silty, very sandy GRAVEL (GM); fine to coarse gravel	1
2	3/8" bentonite chips				9.2			2
3	▽				7.7		Driller indicates water at 3'	3
4	3/4" Sch 40 PVC riser	L1-MW05-3-5	Total Hg		9.3		Gray crushed rock	4
5	10-20 silica sand				8.8		Becomes wet, olive gray	5
6					9.7			6
7					9.6			7
8	Prepacked screen, 0.020" slot	L1-MW05-7-9	Total Hg		10.8		Coarse gravel	8
9					10.9			9
10	Threaded cap				11			10
11		L1-MW05-11-12	Total Hg		8.9		Wet, gray, gravelly SAND (SP); trace silt	11
12					9.3			12
13		L1-MW05-13-14	Total Hg		9.2			13
14					9.1			14
15	Slough				9.6			15
16					9.6		Wet, olive gray, slightly sandy SILT (ML); scattered seashell fragments, scattered woody debris	16
17		L1-MW05-16-18	Total Hg		9.3			17
18					9.3		Coarse gravel	18
19					8.7		Becomes slightly moist, dark gray	19
20					8.3		Bottom of boring at 20'	20
21								21
22								22
23								23
24								24

Sampler Type:
○ No Recovery
Soil sample
Continuous Core

PID - Photoionization Detector (Headspace Measurement)
▼ Static Water Level
▽ Water Level (ATD)

Logged by: JTL
Approved by: SJG
Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	L1-MW06	1 of 1

Project Name: Georgia Pacific West Site
Location: Law 1 area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS) 8.5 ATD
Start/Finish Date 1/31/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
	5" flush mount monument set in concrete						Asphalt	
1							Slightly moist, silty, sandy GRAVEL (GW)	1
2								2
3	3/4" Sch 40 PVC riser						Slightly moist SAND (SW); fine to coarse grained sand, trace silt and trace gravel	3
4		L1-MW06-3-5	Total Hg		8.2			4
5							Slightly moist, very silty, very sandy GRAVEL (GW-GM)	5
6	3/8" bentonite chips	L1-MW06-5-7	Total Hg		8.1			6
7							Silt (ML)	7
8								8
9					7.8			9
10								10
11	10-20 silica sand				7.3			11
12					8			12
13	Prepacked screen, 0.020" slot	L1-MW06-13-14			8.5		Wet, gray, silty SAND (SM); shell fragments and scattered woody/organic debris	13
14								14
15					8.3			15
16	Threaded cap						Grades to soft, wet, gray SILT (ML); trace organics	16
17	Slough	L1-MW06-16-17			8.3 8 7.5		Bottom of boring at 17' BGS	17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

Static Water Level

Water Level (ATD)

Logged by: Mv

Approved by: SJG

Figure No. A1-

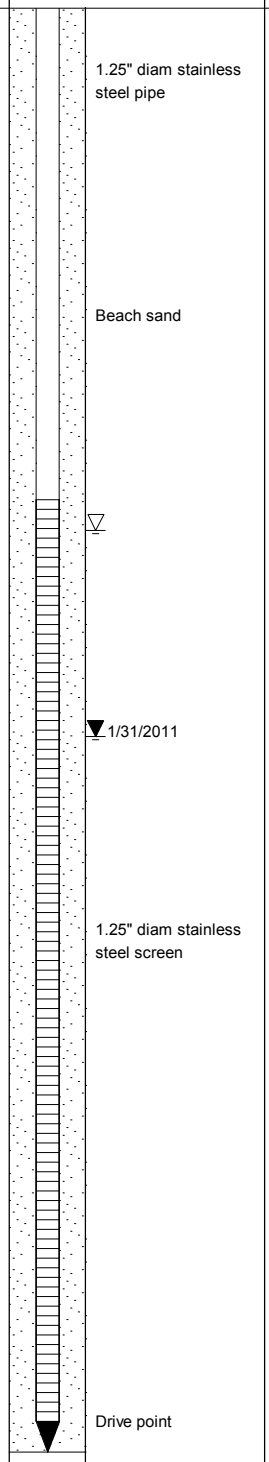
_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Aspect CONSULTING

Monitoring Well Construction Log

Project Number	Well Number	Sheet
070188	L1-WP1	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	6.45
Location:	Law 1 Area / Bellingham, Washington	Top of Casing Elev.	8.12
Driller/Method:	SJG / Sledge hammer, well point	Depth to Water (ft BGS)	1.7' ATD
Sampling Method:		Start/Finish Date	12/16/2010



Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
					Beach sand (SP)	
					Bottom of boring at 4.6'	

Sampler Type:
○ No Recovery

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: JWC

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Aspect CONSULTING

Monitoring Well Construction Log

Project Number	Well Number	Sheet
070188	L1-WP2	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	4.95
Location:	Law 1 Area / Bellingham, Washington	Top of Casing Elev.	6.41
Driller/Method:	JWC / Sledge hammer, well point	Depth to Water (ft BGS)	1.7' ATD
Sampling Method:		Start/Finish Date	1/31/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1 (4)	1.25" diam stainless steel pipe						Beach sand (SP)	1
	Beach sand							
	1/31/2011							
2 (3)								2
3 (2)	1.25" diam stainless steel screen							3
4 (1)								4
0	Drive point						Bottom of boring at 4.6'	

Sampler Type:
○ No Recovery

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: JWC

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Aspect CONSULTING

Monitoring Well Construction Log

Project Number	Well Number	Sheet
070188	L1-WP3	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	5.2
Location:	Law 1 Area / Bellingham, Washington	Top of Casing Elev.	6.74
Driller/Method:	JWC / Sledge hammer, well point	Depth to Water (ft BGS)	1.5' ATD
Sampling Method:		Start/Finish Date	1/31/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
5	1.25" diam stainless steel pipe						Beach sand (SP)	
1 4	Beach sand							1
	▽							
	▼ 1/31/2011							
2 3								2
3 2	1.25" diam stainless steel screen							3
4 1								4
	Drive point						Bottom of boring at 4.6'	

Sampler Type:
○ No Recovery

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: JWC

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	MG-MW04	1 of 1

Project Name: Georgia Pacific West Site
Location: Million Gallon Tank Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Top of Casing Elev.: 14.68
Depth to Water (ft BGS): 3 ATD
Start/Finish Date: 12/16/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1	5" flush mount monument set in concrete						Asphalt	1
2		MG-MW04-2-3	NWTPH-Dx	0			Moist, gray, silty, gravelly, SAND (SM)	2
3	▽ 3/4" Sch 40 PVC riser						Moist, black, sandy, GRAVEL (GP); trace silt	3
4							Moist, black SAND (SP); trace silt	4
5	3/8" bentonite chips			0			Blue-green sandy material	5
6							Wet, silty, GRAVEL (GM)	6
7	10-20 silica sand	MG-MW04-6-7	NWTPH-Dx, TOC	0				7
8		MG-MW04-7-8	NWTPH-Dx, PAH	0			Wet, dark brown to dark gray, silty, SAND (SM); abundant woody debris, scattered seashell fragments	8
9				0				9
10	Prepacked screen, 0.020" slot, 3/4" dia.	MG-MW04-9-10	NWTPH-Dx	0				10
11				0				11
12		MG-MW04-11-12	NWTPH-Dx, PAH					12
13	Threaded cap						Becomes very silty	13
14	Slough						Petroleum-like odor	14
15							Bottom of boring at 15'	15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	MG-MW05	1 of 1

Project Name: Georgia Pacific West Site
Location: Million Gallon Tank Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Top of Casing Elev.: 14.52
Depth to Water (ft BGS): 2.5 ATD
Start/Finish Date: 12/16/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0	5" flush mount monument set in concrete						Slightly moist, green, silty, sandy GRAVEL (GM)	0
2	▽	MG-MW05-2-3	NWTPH-Dx, PAH				Becomes black	2
3	3/4" Sch 40 PVC riser						Wet, slightly gravelly, SAND (SW); fine to medium, subrounded to subangular sand, trace silt, scattered black organics	3
5	3/8" bentonite chips	MG-MW05-5-6	NWTPH-Dx, TOC					5
6							Wet, silty SAND (SM); scattered fine to coarse woody fragments	6
7	10-20 silica sand	MG-MW05-7-8	NWTPH-Dx					7
9							Woody debris	9
9		MG-MW05-9-10	NWTPH-Dx, PAH				Wet, silty SAND and silty GRAVEL (SM-GM)	9
10	Prepacked screen, 0.020" slot, 3/4" dia.						Wet GRAVEL (GW); angular gravel	10
10							Gray, silty, gravelly, SAND (SP)	10
11		MG-MW05-11-12	NWTPH-Dx					11
13	Threaded cap						Woody debris	13
14	Slough						Wet SILT (ML); abundant woody debris	14
15							Bottom of boring at 15'	15
16–24								16–24

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: JWC
Approved by: SJG
Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	MG-SB11	1 of 1

Project Name: Georgia Pacific West Site
Location: Million Gallon Tank Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Top of Casing Elev.:
Depth to Water (ft BGS): 3 ATD
Start/Finish Date: 12/20/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1							Slightly moist, dark gray to dark brown, sandy GRAVEL (GP); angular to subangular gravel, trace silt	1
2		MG-SB11-2-3	NWTPH-Dx					2
3	▽						Becomes wet	3
4							Silty	4
5	Hole backfilled with 3/8" bentonite chips	MG-SB11-5-6	NWTPH-Dx				Sandy	5
6							Wet, dark gray SAND (SP); trace silt, trace gravel, scattered seashell fragments	6
7		MG-SB11-7-8	NWTPH-Dx, PAHs, TOC				Abundant woody debris	7
8								8
9		MG-SB11-9-10	NWTPH-Dx, PAH					9
10								10
11							Wet, dark gray, silty SAND (SM); fine to medium sand, scattered seashell fragments	11
12		MG-SB11-12-13	NWTPH-Dx					12
13								13
14								14
15								15
16							Woody debris	16
17							SILT (ML)	17
18							Silty SAND (SP); fine sand Bottom of boring at 18'	18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MAR
Approved by: SJG
Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	MG-SB12	1 of 1

Project Name: Georgia Pacific West Site
Location: Million Gallon Tank Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Top of Casing Elev.:
Depth to Water (ft BGS): 6 ATD
Start/Finish Date: 12/22/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1							Slightly moist, gray, sightly silty, sandy GRAVEL (GW); medium to coarse angular gravel	1
2		MG-SB12-2-3	NWTPH-Dx, TOC				Moist, very silty, sandy GRAVEL (GM)	2
3							Abundant organics	3
4	Hole backfilled with 3/8" bentonite chips						Woody debris	4
5								5
6	▽	MG-SB12-6-7	NWTPH-Dx, PAHs				Wet, gray, slightly silty to silty SAND (SP/SM); fine sand Petroleum-like odor and sheen 6'-7'	6
7								7
8		MG-SB12-8-9	NWTPH-Dx				Wet, gray-brown, SILT (OH); abundant woody debris	8
9							Wood	9
10		MG-SB12-10-11	NWTPH-Dx, PAHs				Wet, gray SAND (SW); fine to coarse (predominantly medium) angular to subrounded sand, trace fine organics, trace gravel	10
11								11
12		MG-SB12-12-13	NWTPH-Dx				Petroleum-like odor and sheen	12
13		MG-SB12-13-14	NWTPH-Dx				Wet, dark gray SILT (ML)	13
14							Bottom of boring at 14'	14
15								15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: JWC

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	MG-SB13	1 of 1

Project Name: Georgia Pacific West Site
Location: Million Gallon Tank Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Top of Casing Elev.:
Depth to Water (ft BGS): 8.5 ATD
Start/Finish Date: 12/20/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1							Slightly moist, brown and gray, sandy GRAVEL (GP); angular, fine gravel, medium to coarse sand, trace silt	1
2		MG-SB13-2-3	NWTPH-Dx, TOC					2
3								3
4							Moist to wet, light gray to dark gray, silty, GRAVEL (GM); trace coarse sand	4
5	Hole abandoned with 3/8" bentonite chips							5
6		MG-SB13-5-6	NWTPH-Dx, PAH				Moist, black, gravelly, SILT (ML); abundant woody debris	6
7								7
8	▽	MG-SB13-7-8	NWTPH-Dx	0.4			petroleum-like odor	8
9							Wet, gray, gravelly, silty, SAND (SM); woody fragments common	9
10		MG-SB13-9-10	NWTPH-Dx, PAH					10
11							Gravelly	11
12		MG-SB13-12-13	NWTPH-Dx	0.8			Strong petroleum-like odor	12
13							Wet, gray, sandy SILT; fine sand	13
14							Woody debris	14
15								15
16							Wet, gray, SILT (ML); trace fine gravel	16
17							Wet, gray, silty SAND (SM)	17
18							Bottom of boring at 18'	18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	MG-SB14	1 of 1

Project Name: Georgia Pacific West Site
Location: Million Gallon Tank Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Top of Casing Elev.:
Depth to Water (ft BGS): 5 ATD
Start/Finish Date: 12/20/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1							Slightly moist, dark gray, silty, sandy, GRAVEL (GM); subangular fine gravel, scattered woody debris	1
2		MG-SB14-2-3	NWTPH-Dx, TOC					2
3	Hole backfilled with 3/8" bentonite chips						Becomes gray	3
4							Becomes brown	4
5	▽							5
6		MG-SB14-5-6	NWTPH-Dx				Beomes wet, green, very silty	6
7							Moist, brown, silty SAND (SM); fine to medium sand, trace angular gravel, abundant woody debris	7
8		MG-SB14-7-8	NWTPH-Dx					8
9							SILT (ML)	9
10		MG-SB14-9-10	NWTPH-Dx, PAH	0.2			Moist, dark gray, SAND (SP); poorly-graded subrounded sand, trace gravel Becomes gravelly	10
11								11
12		MG-SB14-12-13	NWTPH-Dx, PAH, EPH	0.7			Petroleum-like odor	12
13								13
14							Woody debris	14
15								15
16								16
17							Wet, dark gray, SILT (ML)	17
18							Bottom of boring at 18'	18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MAR/Mv

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	MG-SB15	1 of 1

Project Name: Georgia Pacific West Site
Location: Million Gallon Tank Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Top of Casing Elev.:
Depth to Water (ft BGS): 6 ATD
Start/Finish Date: 12/20/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1						Asphalt	Asphalt	1
2				0		Slightly moist, brown, silty, gravelly SAND (SM); fine to coarse sand, scattered woody debris	Slightly moist, brown, silty, gravelly SAND (SM); fine to coarse sand, scattered woody debris Becomes yellow-gray, very silty	2
3								3
4	Hole abandoned with 3/8" bentonite chips	MG-SB15-3-4	NWTPH-Dx, TOC	0			Becomes dark gray	4
5						Moist, gray, slightly silty, sandy GRAVEL (GM); fine gravel, medium to coarse sand		5
6	▽	MG-SB15-5-6	NWTPH-Dx, PAH	0				6
7						Wet, gray, slightly silty SAND (SW); seashell fragments	Wet, gray, slightly silty SAND (SW); seashell fragments Petroleum-like odor from 7' to 12.5', oily sheen	7
8		MG-SB15-7-8	NWTPH-Dx, PAH	0				8
9								9
10		MG-SB15-9-10	NWTPH-Dx	0				10
11								11
12								12
13		MG-SB15-12-13	NWTPH-Dx	0				13
14				0		Wet, brown-gray SILT (ML)	Wet, brown-gray SILT (ML) Woody debris	14
15							Bottom of boring at 15'	15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MAR
Approved by: SJG
Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	MG-SB16	1 of 1

Project Name: Georgia Pacific West Site
Location: Million Gallon Tank Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS): 8 ATD
Start/Finish Date: 12/22/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1						Asphalt	Asphalt	1
2		MG-SB16-2-3	NWTPH-Dx			Slightly moist, brown and gray, gravelly SAND (SW); angular fine gravel, scattered woody debris, scattered concrete fragments		2
3								3
4	Hole abandoned with 3/8" bentonite chips					Moist, dark gray, silty, gravelly SAND (SM); fine to medium sand, woody debris		4
5		MG-SB16-5-6	NWTPH-Dx					5
6						Becomes dark gray to black, very silty		6
7		MG-SB16-7-8	NWTPH-Dx, PAH, TOC					7
8	▽					Woody debris	Woody debris	8
9						Wet, gray, slightly silty SAND (SP-SM); abundant seashell fragments, scattered fine gravel		9
10		MG-SB16-9-10	NWTPH-Dx, PAH					10
11								11
12		MG-SB16-12-13	NWTPH-Dx, TOC					12
13								13
14						Wet, gray SILT (ML)	Wet, gray SILT (ML)	14
15							Bottom of boring at 15'	15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MAR
Approved by: SJG
Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	MG-VP01	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Million Gallon Tank Area / Bellingham, Washington	Top of Casing Elev.	
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	1' ATD
Sampling Method:	1.5" core	Start/Finish Date	2/2/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0	Hydrated bentonite crumbles 3.4" diam Sch 40 PVC riser 10-20 sand						Silty, sandy GRAVEL (GM)	0
1	3/4" diam 0.010" slot Sch 40 PVC screen ▽ Slip cap						Becomes wet	1
2	Slough							2
3							Bottom of boring at 3' BGS.	3
4								4

Sampler Type:
○ No Recovery

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MvdA

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Aspect CONSULTING

Monitoring Well Construction Log

Project Number	Well Number	Sheet
070188	MG-VP02	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Million Gallon Tank Area / Bellingham, Washington	Top of Casing Elev.	
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	1.5' ATD
Sampling Method:	1.5" core	Start/Finish Date	2/2/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0	Hydrated bentonite crumbles						Moist, brown, slighly silty, gravelly SAND (SW); well-graded fine to coarse sand	0
	3/4" diam Sch 40 PVC riser							
	10-20 sand							
1	3/4" diam 0.010" slot Sch 40 PVC screen							1
	Slip cap							
	▽						Becomes wet, become black	
2								2
	Slough							
3							Bottom of boring at 3' BGS	3
4								4

Sampler Type:
○ No Recovery

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MvdA

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	MG-VP03	1 of 1

Project Name: Georgia Pacific West Site
Location: Million Gallon Tank Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS): 1' ATD
Start/Finish Date: 2/2/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0	Hydrated bentonite crumbles; 3.4" Sch 40 PVC riser; 10-20 sand						Asphalt	0
1	3/4" diam 0.010" slot Sch 40 PVC screen; Slip cap						Brown to black, silty, sandy GRAVEL (GM)	1
							Becomes wet, becomes black	
2	Slough						Bottom of boring at 2' BGS	2
3								3
4								4

Sampler Type:
○ No Recovery

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MvdA
Approved by: SJG
Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	MG-VP04	1 of 1

Project Name: Georgia Pacific West Site
Location: Million Gallon Tank Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS): not encountered
Start/Finish Date: 2/2/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0	Hydrated bentonite crumbles						Asphalt	0
1	3.4" diam Sch 40 PVC riser						Silty, sandy GRAVEL (GM)	1
2	10-20 sand; 3/4" diam 0.010" slot Sch 40 PVC screen						Gravelly, sandy SILT (ML)	2
3	Slip cap; Slough						Bottom of boring at 3.2' BGS	3
4								4

Sampler Type:
○ No Recovery

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MvdA
Approved by: SJG
Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	BC-MW04	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Bunker C Area / Bellingham, Washington	Top of Casing Elev.	17.22
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	9.5 ATD
Sampling Method:	1.5" core	Start/Finish Date	12/17/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1	5" flush mount monument set in concrete						Moist, gray, gravelly, silty SAND (SW); fine to coarse sand, gravel to 1.5" diameter, scattered concrete fragments	1
2								2
3								3
4	3/4" Sch 40 PVC riser	BC-MW04-3-4	NWTPH-Dx				Perched water 4'-7'	4
5								5
6		BC-MW04-6-7	NWTPH-Dx, PAH				6" bed crushed asphalt	6
7	3/8" bentonite chips							7
8								8
9								9
10		BC-MW04-9-10	NWTPH-Dx				Becomes wet	10
11	10-20 silica sand							11
12		BC-MW04-11-12	NWTPH-Dx, TOC					12
13							Wet, silty, GRAVEL (GM)	13
14	Prepacked screen, 0.020" slot, 3/4" dia.							14
15								15
16		BC-MW04-15-16	NWTPH-Dx, PAH				Woody debris	16
17	Threaded cap						Moist, gray to brown, silty, SAND (SM); abundant woody debris, trace fine gravel	17
18								18
19	Slough	BC-MW04-18-19	NWTPH-Dx					19
20							Bottom of boring at 20'	20
21								21
22								22
23								23
24								24

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

Static Water Level

Water Level (ATD)

Logged by: Mv

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	BC-MW05	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Bunker C Area / Bellingham, Washington	Top of Casing Elev.	15.98
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	13.5 ATD
Sampling Method:	1.5" core	Start/Finish Date	12/17/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1	5" flush mount monument set in concrete						Concrete	1
2							Moist, brown, slightly silty, gravelly SAND (SP); medium to coarse sand	2
3								3
4		BC-MW05-3-4	NWTPH-Dx				Becomes black; scattered red brick fragments	4
5	3/4" Sch 40 PVC riser							5
6								6
7							Whitish building material fragments	7
8		BC-MW05-7-8	NWTPH-Dx, PAH				Moist to wet, brown, silty, gravelly SAND (SM)	8
9								9
10	3/8" bentonite chips	BC-MW05-9-10	NWTPH-Dx					10
11								11
12		BC-MW05-12-13	NWTPH-Dx					12
13	▽						Whitish building material fragments	13
14							Becomes wet, becomes black	14
15	10-20 silica sand							15
16		BC-MW05-15-16	NWTPH-Dx, PAH					16
17	Prepacked screen, 0.020" slot, 3/4" dia.						Petroleum-like odor, slight sheen Woody debris	17
18							Trace gravel 18'-20'	18
19		BC-MW05-18-19	NWTPH-Dx					19
20	Threaded cap						Bottom of boring at 20'	20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	BC-SB11	1 of 1

Project Name: Georgia Pacific West Site
Location: Bunker C Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 6 ATD
Start/Finish Date: 12/22/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0						Asphalt	Asphalt	0
1–2							Slightly moist, brown, silty, slightly gravelly, SAND (SM); fine to medium sand, fine angular gravel, trace rootlets	1–2
3–4		BC-SB11-3-4	NWTPH-Dx, PAH				Moist, gray SAND (SW); fine to coarse sand, trace gravel, scattered building debris	3–4
5	Hole backfilled with 3/8" bentonite chips							5
6–7		BC-SB11-6-7	NWTPH-Dx, PAH				Wet, gray SILT (ML); trace coarse sand, trace fine gravel	6–7
8–9								8–9
9–10		BC-SB11-9-10	NWTPH-Dx					9–10
11							Wet, gray SAND (SW); fine to coarse sand, abundant seashell fragments, trace silt	11
12							SILT (ML)	12
13		BC-SB11-12-13	NWTPH-Dx				Wet, gray, silty SAND (SM), fine sand, abundant seashell fragments, trace fine gravel	13
14–15								14–15
15–16		BC-SB11-15-16	NWTPH-Dx					15–16
17–18								17–18
18–19		BC-SB11-18-19	NWTPH-Dx				Thin bed gravelly sand	18–19
20							Bottom of boring at 20'	20
21–24								21–24

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

- Static Water Level
- Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	BC-SB12	1 of 1

Project Name: Georgia Pacific West Site
Location: Bunker C Area / Bellingham, Washington
Driller/Method: Cascade/Pacific NW Probe & Drill / Air knife-vac/Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 6.5 ATD
Start/Finish Date: 12/21/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0						Asphalt	Asphalt	0
1							Excavated by air knife to 7'.	1
2							Slightly moist, brown SAND (SW); fine to coarse sand, trace gravel	2
3		BC-SB12-3-4	NWTPH-Dx				Top of fiberglas pipe encountered. Boring abondoned, backfilled, moved ~3' to NE, and resumed.	3
4								4
5	Hole backfilled with 3/8" bentonite chips							5
6	▽	BC-SB12-6-7	NWTPH-Dx					6
7							Becomes wet	7
8							Wet, gray, slightly sandy, silty GRAVEL (GM)	8
9		BC-SB12-9-10	NWTPH-Dx, PAH				Angular red brick debris Wet, gray, silty, gravelly SAND (SM) to silty, sandy GRAVEL (GM)	9
10							Slight petroleum-like odor, slight sheen	10
11								11
12		BC-SB12-12-13	NWTPH-Dx, PAH					12
13								13
14								14
15								15
16		BC-SB12-16-17	NWTPH-Dx					16
17							Bottom of boring at 17'	17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: JWC
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	BC-SB13	1 of 1

Project Name: Georgia Pacific West Site
Location: Bunker C Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 7 ATD
Start/Finish Date: 12/21/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0						Asphalt	Asphalt	0
1							Excavation with air knife to 7'	1
2							Moist, brown SAND (SW); fine to coarse sand, trace gravel	2
3		BC-SB13-3-4	NWTPH-Dx					3
4								4
5	Hole backfilled with 3/8" bentonite chips							5
6		BC-SB13-6-7	NWTPH-Dx, PAHs					6
7	▽						Wood	7
8							Grades to gray	8
9		BC-SB13-9-10	NWTPH-Dx, PAHs					9
10								10
11							Wet, gray, slightly sandy SILT (ML); trace organics	11
12		BC-SB13-12-13	NWTPH-Dx					12
13								13
14		BC-SB13-14-15	NWTHP-Dx				Wet, very silty SAND (SM)	14
15								15
16		BC-SB12-16-17	NWTPH-Dx				Abundant seashell fragments	16
17							Bottom of boring at 17'	17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: JWC
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	BC-SB14	1 of 1

Project Name: Georgia Pacific West Site
Location: Bunker C Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 6.5 ATD
Start/Finish Date: 12/23/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1							Slightly moist to moist, silty, sandy GRAVEL (GW-GM); fine to coarse subangular gravel	1
2		BC-SB14-2-3	NWTPH-Dx					2
3								3
4								4
5	Hole backfilled with 3/8" bentonite chips							5
6	▽							6
7		BC-SB14-6.5-7.5	NWTPH-Dx, EPH				Free, heavy petroleum-like product and sheen 6.5'-9'	7
8		BC-SB14-8-9	NWTPH-Dx				Wet, gray, SILT (ML); interbedded with SAND (SP)	8
9		BC-SB14-9-10	NWTPH-Dx, PAH				Wet, gray SAND (SP/SW); fine sand interbedded with poorly graded fine to coarse sand, scattered seashell fragments, scattered woody debris	9
10								10
11								11
12		BC-SB14-12-13	NWTPH-Dx, PAH				Petroleum-like odor and sheen 12'-16'	12
13								13
14								14
15		BC-SB14-15-16	NWTPH-Dx					15
16								16
17								17
18		BC-SB14-18-19	NWTPH-Dx					18
19								19
20							Bottom of boring at 20'	20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: JWC
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	BC-SB15	1 of 1

Project Name: Georgia Pacific West Site
Location: Bunker C Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 7 ATD
Start/Finish Date: 12/23/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0							Asphalt	0
1							Gray, GRAVEL (GW); medium to coarse, angular gravel	1
2		BC-SB15-2-3	NWTPH-Dx				Slightly moist, brown, SAND (SW); fine to coarse, subrounded to subangular sand, trace fine to medium gravel, scattered shell fragments	2
3								3
4								4
5	Hole backfilled with 3/8" bentonite chips							5
6								6
7 ▽		BC-SB15-6.5-7.5	NWTPH-Dx, PAH				Wet, gray, SILT (ML)	7
8								8
9		BC-SB15-9-10	NWTPH-Dx, PAH					9
10								10
11							Wet, gray, silty SAND (SP-SM); fine sand to silty fine sand	11
12		BC-SB15-12-13	NWTPH-Dx					12
13							Wet, gray, silty SAND (SW-SM); fine to coarse sand	13
14							Wet, gray, silty, SAND (SP-SM); fine sand to silty fine sand, scattered shell fragments and woody debris	14
15		BC-SB15-15-16	NWTPH-Dx					15
16								16
17								17
18		BC-SB15-18-19	NWTPH-Dx				Grades to wet, gray, silty SAND (SW-SM); fine to coarse sand	18
19								19
20							Bottom of boring at 20'	20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: JWC
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	BC-SB16	1 of 1

Project Name: Georgia Pacific West Site
Location: Bunker C Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 10 ATD
Start/Finish Date: 12/22/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0							Building material debris	0
2							Moist, dark brown to dark gray, gravelly SAND (SW); fine to coarse sand	2
3		BC-SB16-3-4	NWTPH-Dx, TOC				Slightly moist, brown SAND (SP); poorly sorted fine to medium sand, trace gravel	3
5	Hole backfilled with 3/8" bentonite chips						Slightly moist, dark brown to dark gray, silty SAND (SW); well-sorted fine to coarse sand, trace gravel	5
6		BC-SB16-6-7	NWTPH-Dx, PAH				6" bed of silt	6
8							Slightly moist, gray, sandy SILT (ML); scattered seashell fragments	8
9		BC-SB16-9-10	NWTPH-Dx, PAH					9
10	▽						Wet, brown to dark gray, silty SAND (SP); poorly graded, fine to medium sand	10
10		BC-SB16-10-11	NWTPH-Dx					10
12		BC-SB16-12-13	NWTPH-Dx					12
13							Wet, dark gray GRAVEL (GP); poorly graded, fine, subrounded gravel, trace sand, trace silt	13
14		BC-SB16-14-15	NWTPH-Dx					14
15							Bottom of boring at 15'	15
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MAR
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	BC-SB17	1 of 1

Project Name: Georgia Pacific West Site
Location: Bunker C Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 7' ATD
Start/Finish Date: 12/22/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0						Concrete	Concrete	0
1						Slightly moist, gray, red, and brown, gravelly SAND (SP); fine to medium sand	Slightly moist, gray, red, and brown, gravelly SAND (SP); fine to medium sand	1
2								2
3								3
4		BC-SB17-3-4	NWTPH-Dx, TOC					4
5	Hole backfilled with 3/8" bentonite chips	BC-SB17-4-5	NWTPH-Dx				Crushed concrete	5
6						Moist, brown, silty SAND (SM)	Moist, brown, silty SAND (SM)	6
7	▽	BC-SB17-6-7	NWTPH-Dx			Moist, brown to black SAND (SP); fine to medium sand	Moist, brown to black SAND (SP); fine to medium sand Strong petroleum-like odor	7
8		BC-SB17-8-9	NWTPH-Dx, PAH, EPH	31.5				8
9		BC-SB17-9-10	NWTPH-Dx, PAH					9
10							Woody debris Refusal on wood at 10'. Bottom of boring at 10'	10
11								11
12								12
13								13
14								14
15								15
16								16
17								17
18								18
19								19
20								20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Soil sample
- Continuous Core

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MAR
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	BC-SB18	1 of 1

Project Name: Georgia Pacific West Site
Location: Bunker C Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 9 ATD
Start/Finish Date: 12/22/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1							Slightly moist, brown to white, trace silt to slightly silty SAND (SM); medium sand, scattered woody debris, scattered concrete rubble	1
2								2
3		BC-SB18-3-4	NWTPH-Dx	0				3
4							Woody debris	4
5	Hole backfilled with 3/8" bentonite chips							5
6		BC-SB18-6-7	NWTPH-Dx, TOC	0				6
7								7
8								8
9 ▽		BC-SB18-9-10	NWTPH-Dx, PAH, EPH	0			Becomes moist and brown Strong petroleum-like odor and sheen 9.0' to 13.5'	9
10							Becomes wet	10
11								11
12		BC-SB18-12-13	NWTPH-Dx	0				12
13							Wet, gray, slightly sandy SILT (ML); trace rounded gravel	13
14		BC-SB18-14-15	NWTPH-Dx, PAH					14
15							No petroleum-like odor or sheen 15'-20'	15
16								16
17				0				17
18		BC-SB-18-19	NWTPH-Dx	0			Woody debris	18
19								19
20							Bottom of boring at 20'	20
21								21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: SJG
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	BC-SB19	1 of 1

Project Name: Georgia Pacific West Site
Location: Bunker C Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev:
Depth to Water (ft BGS): 6 ATD
Start/Finish Date: 12/22/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
1							Slightly moist, brown to gray, silty, gravelly, SAND (SM); scattered building material debris	1
2								2
3							Concrete debris	3
4		BC-SB19-3-4	NWTPH-Dx, TOC				Becomes black	4
5								5
6	▽							6
7		BC-SB19-6-7	NWTPH-Dx, PAH				Becomes wet, becomes dark gray	7
8	Hole backfilled with 3/8" bentonite chips							8
9								9
10		BC-SB19-9-10	NWTPH-Dx				Petroleum-like odor	10
11								11
12								12
13		BC-SB19-12-13	NWTPH-Dx, PAH				Crushed concrete and woody debris	13
14							Wet, dark gray, gravelly, slightly sandy SILT (ML); gravel to 1.5" diameter	14
15							Petroleum-like odor	15
16							No recovery	16
17								17
18		BC-SB19-17-18	NWTPH-Dx				Wet, gray, silty SAND (SM); scattered woody debris, abundant seashell fragments	18
19							Building material debris	19
20							No recovery	20
21							Bottom of boring at 20'	21
22								22
23								23
24								24

Sampler Type:
- ○ No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: Mv
Approved by: SJG
Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Boring Log

Aspect CONSULTING

Project Number	Boring Number	Sheet
070188	BC-SB20	1 of 1

Project Name: Georgia Pacific West Site
Ground Surface Elev:
Location: Bunker C Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Depth to Water (ft BGS): 2.5 ATD
Sampling Method: 1.5" core
Start/Finish Date: 12/22/2010

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0							Wet, brown, silty, gravelly SAND (SW); well-graded fine to coarse sand, subrounded to angular gravel	0
5	Hole backfilled with 3/8" bentonite chips						Wet, dark gray, sandy GRAVEL (GP); subrounded fine gravel, coarse sand, trace silt	5
7		BC-SB20-7-8	NWTPH-Dx				Hit refusal on cobbles, moved hole over two feet	7
10							Poor recovery	10
14		BC-SB20-14.5-15	NWTPH-Dx				Becomes wet, dark gray to black, silty, sandy GRAVEL (GM); subrounded gravel 1/2" to 1 1/2" diameter	14
16							Wet, dark gray to black, gravelly, silty SAND (SM); poorly graded fine sand, subrounded fine gravel, scattered woody debris	16
19		BC-SB20-19-20	NWTPH-Dx					19
20							Bottom of boring at 20'	20

Sampler Type:
- No Recovery
- Continuous Core
- Soil sample

PID - Photoionization Detector (Headspace Measurement)

Static Water Level

Water Level (ATD)

Logged by: MAR

Approved by: SJG

Figure No. A1-

_GP_ENV BORING LOG GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	BC-VP01	1 of 1

Project Name: Georgia Pacific West Site
Location: Bunker C Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS): not encountered
Start/Finish Date: 2/2/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0	Hydrated bentonite crumbles					Asphalt	Asphalt	
1	3.4" diam Sch 40 PVC riser					Moist, brown, gravelly SAND (SW); fine to coarse sand, trace silt	Moist, brown, gravelly SAND (SW); fine to coarse sand, trace silt	1
2	3/4" diam 0.010" slot Sch 40 PVC screen; 10-20 sand							2
3	Slip cap					Moist, gray, gravelly, very silty SAND (SM); fine to medium sand, abundant seashell fragments	Moist, gray, gravelly, very silty SAND (SM); fine to medium sand, abundant seashell fragments	3
4	Slough						Bottom of boring 4'	4

Sampler Type:
○ No Recovery

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MvdA
Approved by: SJG
Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	BC-VP02	1 of 1

Project Name:	Georgia Pacific West Site	Ground Surface Elev	
Location:	Bunker C Area / Bellingham, Washington	Top of Casing Elev.	
Driller/Method:	Pacific NW Probe & Drill / Direct push soil probe	Depth to Water (ft BGS)	not encountered
Sampling Method:	1.5" core	Start/Finish Date	2/2/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
							Asphalt	
	Hydrated bentonite crumbles						Moist, gray, gravelly SAND (SW); fine to coarse sand	
1	3.4" diam Sch 40 PVC riser							1
	3/4" diam 0.010" slot Sch 40 PVC screen							
2	10-20 sand							2
3	Slip cap						Moist, gravelly, silty SAND (SM); fine to medium sand	3
	Slough							
4							Bottom of boring at 4'	4

Sampler Type:
○ No Recovery

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MvdA

Approved by: SJG

Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Monitoring Well Construction Log

Aspect CONSULTING

Project Number	Well Number	Sheet
070188	BC-VP03	1 of 1

Project Name: Georgia Pacific West Site
Location: Bunker C Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS): not encountered
Start/Finish Date: 2/2/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
0							Moist, brown to gray, silty, sandy, GRAVEL (GM)	0
1	Hydrated bentonite crumbles; 3.4" diam Sch 40 PVC riser							1
2	3/4" diam 0.010" slot Sch 40 PVC screen; 10-20 sand							2
3	Slip cap; Slough							3
4							Bottom of boring at 3.6'	4

Sampler Type:
○ No Recovery

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MvdA
Approved by: SJG
Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

Aspect CONSULTING

Monitoring Well Construction Log

Project Number	Well Number	Sheet
070188	BC-VP04	1 of 1

Project Name: Georgia Pacific West Site
Location: Bunker C Area / Bellingham, Washington
Driller/Method: Pacific NW Probe & Drill / Direct push soil probe
Sampling Method: 1.5" core

Ground Surface Elev
Top of Casing Elev.
Depth to Water (ft BGS): not encountered
Start/Finish Date: 2/2/2011

Depth / Elevation (feet)	Borehole Completion	Sample Type/ID	Tests	PID (ppm)	Soil pH	Material Type	Description	Depth (ft)
	Hydrated bentonite crumbles						Concrete	
1	3.4" diam Sch 40 PVC riser						Moist, brown, gravelly SAND (SP); fine to medium sand, trace silt	1
2	3/4" diam 0.010" slot Sch 40 PVC screen 10-20 sand							2
3	Slip cap							3
	Slough							
4							Bottom of boring at 4'	4

Sampler Type:
○ No Recovery

PID - Photoionization Detector (Headspace Measurement)

▼ Static Water Level

▽ Water Level (ATD)

Logged by: MvdA
Approved by: SJG
Figure No. A1-

_GP_MONITORING WELL GEORGIA PACIFIC WEST SITE RIFS.GPJ March 7, 2011

APPENDIX B

EPH Data and MTCATPH Calculations for Subarea-Specific, Risk-Based TPH Soil Screening Levels

Table B-1 - Extractable Petroleum Hydrocarbon (EPH) Data for Soil Petroleum, Million Gallon Tanks and Bunker C Tank Subareas

GP West Site RI/FS

	Bunker C Tank Subarea															Million Gallon Tank Subarea														
Chemical Name	BC-MW02 (8-10 ft.)		BC-MW02 (17-19 ft.)		BC-SB07 (4-5 ft.)		BC-SB08 (15.5-16.5 ft)		BC-SB14 (6.5-7.5 ft)		BC-SB17 (8-9 ft)		BC-SB18 (9-10ft)		**Average for Bunker C Tank Subarea**	MG-SB07 (6-8 ft.)		MG-SB09 (6-7 ft.)		MG-SB12 (6-7 ft.)		MG-SB13 (7-8 ft.)		MG-SB14 (12-13 ft.)		MG-SB15 (9-10 ft.)		**Average for Million Gallon Tank Subarea**
Total Petroleum Hydrocarbons (NWTPH-D) in mg/kg																														
Diesel Range Hydrocarbons	360		950		350		2,600		5,500		16,000				**553**	4,200		9,200		580		920		92		14		**2,107**
Oil (C25-C36)	840		2,000		4,300		3,000		8,000		15,000				**2,380**	5,100		1,200		4,000		1,700		180		44		**2,572**
Total TPH	1,200		2,950		4,650		5,600		13,500		31,000				**2,933**	9,300		10,400		4,580		2,620		272		58		**4,679**
Extractable Petroleum Hydrocarbons (EPH) in mg/kg																														
Aliphatics C8-C10 (EPH)	3 U	0.5%	20	0.5%	4.3 U	0.3%	24 U	0.5%	13 U	0.1%	64	0.3%	49 U	0.3%	**12**	41 U	0.4%	12 U	0.2%	15	0.7%	3.6	0.4%	2.5 U	6.7%	2.3 U	6.8%	**3**
Aliphatics C10-C12 (EPH)	3 U	0.5%	35	0.8%	4.3 U	0.3%	150	3.4%	120	1.2%	650	3.2%	340	1.9%	**185**	41 U	0.4%	88	1.4%	10	0.4%	3.8	0.4%	2.5 U	6.7%	2.3 U	6.8%	**17**
Aliphatics C12-C16 (EPH)	12	2.2%	58	1.4%	12	0.7%	430	9.8%	560	5.8%	3100	15.4%	2200	12.4%	**910**	220	2.4%	860	13.4%	39	1.7%	31	3.1%	2.5 U	6.7%	2.3 U	6.8%	**192**
Aliphatics C16-C21 (EPH)	38	6.8%	120	2.8%	20	1.2%	420	9.6%	770	8.0%	1900	9.4%	2100	11.9%	**767**	510	5.6%	3,000	46.6%	140	6.2%	140	14.2%	2.5 U	6.7%	2.3 U	6.8%	**632**
Aliphatics C21-C34 (EPH)	320	57.7%	1,600	37.6%	610	36.0%	1,400	32.0%	3200	33.2%	4700	23.3%	4400	24.9%	**2,319**	2,900	31.6%	1,200	18.6%	1600	70.4%	440	44.6%	6.7	18.1%	11	32.6%	**1,026**
Aromatics C8-C10 (EPH)	3 U	0.5%	28 U	0.7%	11 U	0.6%	24 U	0.5%	67 U	0.7%	44 U	0.2%	49 U	0.3%	**-**	41 U	0.4%	24 U	0.4%	2.7 U	0.1%	2.9 U	0.3%	2.5 U	6.7%	2.3 U	6.8%	**-**
Aromatics C10-C12 (EPH)	3 U	0.5%	28 U	0.7%	11 U	0.6%	24 U	0.5%	49	0.5%	44 U	0.2%	49 U	0.3%	**7**	58	0.6%	24 U	0.4%	2.7 U	0.1%	2.9 U	0.3%	2.5 U	6.7%	2.3 U	6.8%	**10**
Aromatics C12-C16 (EPH)	3 U	0.5%	28 U	0.7%	11 U	0.6%	100	2.3%	450	4.7%	1066	5.3%	795	4.5%	**344**	362	3.9%	72	1.1%	7.83	0.3%	2.9 U	0.3%	2.5 U	6.7%	2.3 U	6.8%	**74**
Aromatics C16-C21 (EPH)	20	3.6%	240	5.6%	33	1.9%	500	11.4%	1400	14.5%	3400	16.9%	2700	15.3%	**1,185**	1,300	14.2%	820	12.7%	94	4.1%	170	17.2%	4.5	12.1%	2.8	8.3%	**399**
Aromatics C21-C34 (EPH)	150	27.0%	2,100	49.3%	980	57.8%	1,300	29.7%	3000	31.2%	5200	25.8%	5000	28.3%	**2,533**	3,700	40.3%	340	5.3%	360	15.9%	190	19.2%	8.4	22.6%	3.8	11.3%	**767**
Total EPH	555	100.0%	4,257	100.0%	1,697	100.0%	4,372	100.0%	9,629	100.0%	20,168	100.0%	17,682	100.0%	**8,262**	9,173	100.0%	6,440	100.0%	2,271	100.0%	987	100.0%	37	100.0%	34	100.0%	**3,119**
Polycyclic Aromatic Hydrocarbons (PAHs) in mg/kg																														
Naphthalene	0.029		0.96		0.098		0.037		na		14		1.5		**2.77**	4.1		0.860		1.30		na		0.140		na		**1.6**
2-Methylnaphthalene	0.061		0.35		0.140		0.058		na		120		3.1		**20.62**	24		0.350		0.27		na		0.110		na		**6.2**
Total cPAH (TEF)	0.07		1.92		0.29		0.07		na		6.10		6.7		**2.52**	3.55		1.14		0.77		na		0.11		na		**1.4**

na: No analysis.
U: Not detected at associated reporting limit.
The listed percentages are each petroleum fraction's relative percentage of total petroleum mixture composition.

A2. 1B Worksheet for Calculating Soil Cleanup Levels for Protection of Human Health: (Soil Direct Contact Pathway)

Method B: Unrestricted Land Use (WAC 173-340-740)

Date: 2/11/2011
Site Name: GP West
Sample Name: Average concentrations for Million Gallon Tanks Subarea

Chemical of Concern or EC group	Current Condition				Adjusted Condition			
	Measured Soil Conc @dry basis	HQ	RISK	Pass or Fail?	Soil Conc being tested	HQ	RISK	Pass or Fail?
	mg/kg	unitless	unitless		mg/kg	unitless	unitless	
Petroleum EC Fraction								
AL_EC >5-6	0				0.00E+00			
AL_EC >6-8	0				0.00E+00			
AL_EC >8-10	3.1	1.40E-03			3.99E+00	1.80E-03		
AL_EC >10-12	16.96666667	7.65E-03			2.18E+01	9.84E-03		
AL_EC >12-16	191.6666667	1.15E-01			2.47E+02	1.48E-01		
AL_EC >16-21	631.6666667	5.69E-03			8.12E+02	7.31E-03		
AL_EC >21-34	1026.283333	9.24E-03			1.32E+03	1.19E-02		
AR_EC >8-10	0				0.00E+00			
AR_EC >10-12	9.666666667	6.54E-03			1.24E+01	8.41E-03		
AR_EC >12-16	73.58666667	2.65E-02			9.46E+01	3.41E-02		
AR_EC >16-21	398.55	2.39E-01			5.13E+02	3.08E-01		
AR_EC >21-34	767.0333333	3.45E-01			9.87E+02	4.44E-01		
Benzene	0		0.00E+00		0.00E+00		0.00E+00	
Toluene	0				0.00E+00			
Ethylbenzene	0				0.00E+00			
Total Xylenes	0				0.00E+00			
Naphthalene	1.6	1.32E-03			2.06E+00	1.70E-03		
1-Methyl Naphthalene	0				0.00E+00	0.00E+00		
2-Methyl Naphthalene	6.2	1.99E-02			7.97E+00	2.56E-02		
n-Hexane	0				0.00E+00	0.00E+00		
MTBE	0				0.00E+00			
Ethylene Dibromide (EDB)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	1.30575		1.26E-06	*For*	1.68E+00		1.62E-06	*For*
Benzo(b)fluoranthene	0.8185		7.90E-07	*all*	1.05E+00		1.02E-06	*all*
Benzo(k)fluoranthene	0.23275		2.25E-07	*cPAHs*	2.99E-01		2.89E-07	*cPAHs*
Benzo(a)pyrene	1.06725		1.03E-05		1.37E+00		1.32E-05	
Chrysene	2.505		2.42E-07	*Fail*	3.22E+00		3.11E-07	*Fail*
Dibenz(a,h)anthracene	0.278575		2.69E-07	Σ Risk=	3.58E-01		3.46E-07	Σ Risk=
Indeno(1,2,3-cd)pyrene	0.35125		3.39E-07	1.34E-05	4.52E-01		4.36E-07	1.73E-05
Sum	**3132.879075**	7.78E-01	1.34E-05	Fail	4.03E+03	1.00E+00	1.73E-05	Fail

TEST CURRENT CONDITION

Measured TPH Soil Conc, mg/kg= 3132.879
HI= 7.775E-01
RISK= 1.342E-05

Pass or Fail? ***Fail***

CALCULATE PROTECTIVE CONDITION

This tool allows the user to calculate protective TPH soil concentration based on various soil quality criteria. The Workbook uses the same composition ratio as for the measured data.

Calculate Protective TPH Soil Conc

Selected Criterion: @HI=1
Most Stringent? ***NO***

Protctive TPH Soil Conc, mg/kg = 4029.28
HI = 1.00E+00
RISK = 1.73E-05

TEST ADJUSTED CONDITION

This tool allows the user to test whether a particular TPH soil concentration is protective of human health. The Workbook uses the same composition ratio as for the measured data.

Test Adjusted TPH Soil Conc

Tested TPH Soil Conc, mg/kg =
HI =
RISK =

Pass or Fail?

A2. 1C Worksheet for Calculating Soil Cleanup Levels for Protection of Human Health: (Soil Direct Contact Pathway)
Method C: Industrial Land Use (WAC 173-340-745)

Date: 2/11/2011
Site Name: GP West
Sample Name: Average concentrations for Million Gallon Tanks Subarea

Chemical of Concern or EC Group	Current Condition				Adjusted Condition			
	Measured Soil Conc @dry basis	HQ	RISK	Pass or Fail?	Soil Conc being tested	HQ	RISK	Pass or Fail?
	mg/kg	unitless	unitless		mg/kg	unitless	unitless	
Petroleum EC Fraction								
AL_EC >5-6	0				0.00E+00			
AL_EC >6-8	0				0.00E+00			
AL_EC >8-10	3.1	7.10E-05			4.88E+01	1.12E-03		
AL_EC >10-12	16.96666667	3.89E-04			2.67E+02	6.12E-03		
AL_EC >12-16	191.6666667	9.58E-03			3.02E+03	1.51E-01		
AL_EC >16-21	631.6666667	4.74E-04			9.95E+03	7.46E-03		
AL_EC >21-34	1026.283333	7.70E-04			1.62E+04	1.21E-02		
AR_EC >8-10	0				0.00E+00			
AR_EC >10-12	9.666666667	3.32E-04			1.52E+02	5.23E-03		
AR_EC >12-16	73.58666667	2.21E-03			1.16E+03	3.48E-02		
AR_EC >16-21	398.55	1.99E-02			6.28E+03	3.14E-01		
AR_EC >21-34	767.0333333	2.88E-02			1.21E+04	4.53E-01		
Benzene	0		0.00E+00		0.00E+00		0.00E+00	
Toluene	0				0.00E+00			
Ethylbenzene	0				0.00E+00			
Total Xylenes	0				0.00E+00			
Naphthalene	1.6	9.84E-05			2.52E+01	1.55E-03		
1-Methyl Naphthalene	0				0.00E+00	0.00E+00		
2-Methyl Naphthalene	6.2	8.72E-04			9.77E+01	1.37E-02		
n-Hexane	0				0.00E+00	0.00E+00		
MTBE	0				0.00E+00			
Ethylene Dibromide (EDB)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	1.30575		3.13E-07		2.06E+01		4.93E-06	
Benzo(b)fluoranthene	0.8185		1.96E-07		1.29E+01		3.09E-06	
Benzo(k)fluoranthene	0.23275		5.57E-08		3.67E+00		8.78E-07	
Benzo(a)pyrene	1.06725		2.56E-06		1.68E+01		4.03E-05	
Chrysene	2.505		6.00E-08		3.95E+01		9.45E-07	
Dibenz(a,h)anthracene	0.278575		6.67E-08		4.39E+00		1.05E-06	
Indeno(1,2,3-cd)pyrene	0.35125		8.41E-08		5.53E+00		1.33E-06	
Sum	**3132.879075**	6.35E-02	3.33E-06		4.93E+04	1.00E+00	5.25E-05	Fail

TEST CURRENT CONDITION

Measured TPH Soil Conc, mg/kg= 3132.879
HI= 6.349E-02
RISK= 3.331E-06
Pass or Fail? Pass
Check Residual Saturation (WAC340-747(10))

CALCULATE PROTECTIVE CONDITION

This tool allows the user to calculate protective TPH soil concentration based on various soil quality criteria. The Workbook uses the same composition ratio as for the measured data.

Calculate Protective TPH soil Conc

Selected Criterion: @HI=1
Most Stringent? *NO*

Protctive TPH Soil Conc, mg/kg = 49345.925
HI = 1.000E+00
RISK = 5.247E-05

TEST ADJUSTED CONDITION

This tool allows the user to test whether a particular TPH soil concentration is protective of human health. The Workbook uses the same composition ratio as for the measured data.

Test Adjusted TPH Soil Conc

Tested TPH Soil Conc, mg/kg=
HI=
RISK=
Pass or Fail?

A2. 2 Worksheet for Calculating Soil Cleanup Level for the Protection of Ground Water Quality - (Leaching Pathway)
WAC 173-340-740 and 747

Date: 2/11/2011

Site Name: GP West

Sample Name: Average concentrations for Million Gallon Tanks Subarea

Chemical of Concern or EC Group	Measured Soil Conc @dry basis	GW Cleanup Level	Adjusted Condition: Soil Conc being tested	Predicted Conc @Well	HQ @ Well	RISK @ Well	Pass or Fail?
	mg/kg	ug/L	mg/kg	ug/L	unitless	unitless	
Petroleum EC Fraction							
AL_EC >5-6	0		0.00E+00	0.00E+00	0.00E+00		
AL_EC >6-8	0		0.00E+00	0.00E+00	0.00E+00		
AL_EC >8-10	3.1		9.90E+00	8.33E-01	3.47E-03		
AL_EC >10-12	16.96666667		5.42E+01	3.00E-01	1.25E-03		
AL_EC >12-16	191.6666667		6.12E+02	6.13E-02	1.28E-04		
AL_EC >16-21	631.6666667		2.02E+03	2.53E-04	7.91E-09		
AL_EC >21-34	1026.283333		3.28E+03	3.27E-09	1.02E-13		
AR_EC >8-10	0		0.00E+00	0.00E+00	0.00E+00		
AR_EC >10-12	9.666666667		3.09E+01	1.30E+02	8.10E-01		
AR_EC >12-16	73.58666667		2.35E+02	2.22E+02	2.78E-01		
AR_EC >16-21	398.55		1.27E+03	8.92E+01	1.86E-01		
AR_EC >21-34	767.0333333		2.45E+03	1.79E+00	2.80E-03		
Benzene	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Toluene	0	1000	0.00E+00	0.00E+00	0.00E+00		
Ethylbenzene	0	700	0.00E+00	0.00E+00	0.00E+00		
Total Xylenes	0	1000	0.00E+00	0.00E+00	0.00E+00		
Naphthalene	1.6	160	5.11E+00	2.91E+01	1.82E-01		
1-Methyl Naphthalene	0		0.00E+00	0.00E+00	0.00E+00		
2-Methyl Naphthalene	6.2		1.98E+01	7.39E+01	2.31E+00		
n-Hexane	0		0.00E+00	0.00E+00	0.00E+00		
MTBE	0	20	0.00E+00	0.00E+00	0.00E+00		
Ethylene Dibromide (EDB)	0	0.01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	1.30575	for	4.17E+00	4.54E-03		3.79E-08	for
Benzo(b)fluoranthene	0.8185	all	2.61E+00	4.12E-04		3.44E-09	all
Benzo(k)fluoranthene	0.23275	cPAHs	7.43E-01	6.26E-05		5.22E-10	cPAHs
Benzo(a)pyrene	1.06725	Risk=	3.41E+00	5.81E-04		4.84E-08	
Chrysene	2.505	1E-05	8.00E+00	1.49E-03		1.24E-09	
Dibenz(a,h)anthracene	0.278575		8.89E-01	2.10E-04		1.76E-09	Σ Risk=
Indeno(1,2,3-cd)pyrene	0.35125		1.12E+00	2.38E-06		1.98E-11	9.33E-08
Sum	3132.879075		1.00E+04	5.47E+02	3.77E+00	9.33E-08	***Fail***

Site-Specific Hydrogeological Properties previously entered:

Item	Symbol	Value	Units
Total soil porosity:	n	0.43	unitless
Volumetric water content:	Q_w	0.3	unitless
Volumetric air content:	Q_a	0.13	unitless
Soil bulk density measured:	r_b	1.5	kg/L
Fraction Organic Carbon:	f_{oc}	0.017	unitless
Dilution Factor:	DF	1	unitless

Target Ground Water TPH conc adjusted previously if any:

Target Ground Water TPH Conc, ug/L ⇒ 500

CALCULATE PROTECTIVE CONDITION OR TEST ADJUSTED CONDITION

Calculate or Test

TPH Test button used.

Pass or Fail? *Fail*

Tested TPH Soil Conc, mg/kg = **10000.00**

Predicted TPH GW Conc, ug/L = 5.47E+02

RISK @ Well = 9.33E-08

HI @Well = 3.77E+00

DEDAILED MODEL RESULTS TPH Range Test

Type of model used for computation:	4-Phase Model
Computation completed?	Yes!
Initial Weighted Average MW of NAPL, g/mol:	262.5
Equilibrated Weighted Average MW of NAPL, g/mol:	263.4
Initial Weighted Average Density of NAPL, kg/L:	0.917
Volumetric NAPL Content, Q_{NAPL} :	1.6E-02
NAPL Saturation (%), Q_{NAPL}/n :	3.76%
100% NAPL, mg/kg	79497.4

Mass Distribution Pattern @ 4-phase in soil pore system: Mass Balance Pattern

Total Mass distributed in Water Phase: 0.00% in Solid: 1.05%

Total Mass distributed in Air Phase: 0.00% in NAPL: 98.95%

Please Check Soil Residual Saturation TPH Levels: Refer to Table 747-5!

A2. 2 Worksheet for Calculating Soil Cleanup Level for the Protection of Ground Water Quality: (Leaching Pathway)
WAC 173-340-740 and 747

Date: 2/11/2011

Site Name: GP West

Sample Name: Average concentrations for Million Gallon Tanks Subarea

Chemical of Concern or EC Group	Measured Soil Conc @dry basis	GW Cleanup Level	Adjusted Condition: Soil Conc being tested	Predicted Conc @Well	HQ @ Well	RISK @ Well	Pass or Fail?
	mg/kg	ug/L	mg/kg	ug/L	unitless	unitless	
Petroleum EC Fraction							
AL_EC >5-6	0		0.00E+00	0.00E+00	0.00E+00		
AL_EC >6-8	0		0.00E+00	0.00E+00	0.00E+00		
AL_EC >8-10	3.1		2.38E+01	8.48E-01	3.53E-03		
AL_EC >10-12	16.96666667		1.30E+02	3.01E-01	1.25E-03		
AL_EC >12-16	191.6666667		1.47E+03	6.12E-02	1.27E-04		
AL_EC >16-21	631.6666667		4.86E+03	2.54E-04	7.94E-09		
AL_EC >21-34	1026.283333		7.89E+03	3.24E-09	1.01E-13		
AR_EC >8-10	0		0.00E+00	0.00E+00	0.00E+00		
AR_EC >10-12	9.666666667		7.43E+01	1.44E+02	8.98E-01		
AR_EC >12-16	73.58666667		5.66E+02	2.31E+02	2.89E-01		
AR_EC >16-21	398.55		3.06E+03	8.95E+01	1.86E-01		
AR_EC >21-34	767.0333333		5.90E+03	1.78E+00	2.78E-03		
Benzene	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Toluene	0	1000	0.00E+00	0.00E+00	0.00E+00		
Ethylbenzene	0	700	0.00E+00	0.00E+00	0.00E+00		
Total Xylenes	0	1000	0.00E+00	0.00E+00	0.00E+00		
Naphthalene	1.6	160	1.23E+01	3.10E+01	1.94E-01		
1-Methyl Naphthalene	0		0.00E+00	0.00E+00	0.00E+00		
2-Methyl Naphthalene	6.2		4.77E+01	8.25E+01	2.58E+00		
n-Hexane	0		0.00E+00	0.00E+00	0.00E+00		
MTBE	0	20	0.00E+00	0.00E+00	0.00E+00		
Ethylene Dibromide (EDB)	0	0.01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	1.30575	for	1.00E+01	4.52E-03		3.77E-08	for
Benzo(b)fluoranthene	0.8185	all	6.29E+00	4.10E-04		3.42E-09	all
Benzo(k)fluoranthene	0.23275	cPAHs	1.79E+00	6.22E-05		5.19E-10	cPAHs
Benzo(a)pyrene	1.06725	Risk=	8.21E+00	5.77E-04		4.81E-08	
Chrysene	2.505	1E-05	1.93E+01	1.48E-03		1.23E-09	
Dibenz(a,h)anthracene	0.278575		2.14E+00	2.10E-04		1.75E-09	Σ Risk=
Indeno(1,2,3-cd)pyrene	0.35125		2.70E+00	2.36E-06		1.97E-11	9.28E-08
Sum	3132.879075		2.41E+04	5.81E+02	4.15E+00	9.28E-08	***Fail***

Site-Specific Hydrogeological Properties previously entered:

Item	Symbol	Value	Units
Total soil porosity:	n	0.43	unitless
Volumetric water content:	Q_w	0.3	unitless
Volumetric air content:	Q_a	0.13	unitless
Soil bulk density measured:	r_b	1.5	kg/L
Fraction Organic Carbon:	f_{oc}	0.017	unitless
Dilution Factor:	DF	1	unitless

Target Ground Water TPH conc adjusted previously if any:

Target Ground Water TPH Conc, ug/L ⇒ 500

CALCULATE PROTECTIVE CONDITION OR TEST ADJUSTED CONDITION

Calculate or Test

TPH Test button used.

Pass or Fail? *Fail*

Tested TPH Soil Conc, mg/kg = **24087.00**

Predicted TPH GW Conc, ug/L = 5.81E+02

RISK @ Well = 9.28E-08

HI @Well = 4.15E+00

DEDAILED MODEL RESULTS TPH Range Test

Type of model used for computation: 4-Phase Model

Computation completed? Yes!

Initial Weighted Average MW of NAPL, g/mol: 262.5

Equilibrated Weighted Average MW of NAPL, g/mol: 262.9

Initial Weighted Average Density of NAPL, kg/L: 0.917

Volumetric NAPL Content, Q_{NAPL} : 3.9E-02

NAPL Saturation (%), Q_{NAPL}/n : 9.12%

100% NAPL, mg/kg 79497.4

Mass Distribution Pattern @ 4-phase in soil pore system: Mass Balance Pattern

Total Mass distributed in Water Phase: 0.00% in Solid: 0.44%

Total Mass distributed in Air Phase: 0.00% in NAPL: 99.56%

Please Check Soil Residual Saturation TPH Levels: Refer to Table 747-5!

A2. 1B Worksheet for Calculating Soil Cleanup Levels for Protection of Human Health: (Soil Direct Contact Pathway)

Method B: Unrestricted Land Use (WAC 173-340-740)

Date: 2/11/2011
Site Name: GP West
Sample Name: Average concentrations for Bunker C Subarea

Chemical of Concern or EC group	Current Condition				Adjusted Condition			
	Measured Soil Conc @dry basis	HQ	RISK	Pass or Fail?	Soil Conc being tested	HQ	RISK	Pass or Fail?
	mg/kg	unitless	unitless		mg/kg	unitless	unitless	
Petroleum EC Fraction								
AL_EC >5-6	0				0.00E+00			
AL_EC >6-8	0				0.00E+00			
AL_EC >8-10	12	5.41E-03			4.43E+00	2.00E-03		
AL_EC >10-12	185	8.34E-02			6.82E+01	3.08E-02		
AL_EC >12-16	910.2857143	5.46E-01			3.36E+02	2.01E-01		
AL_EC >16-21	766.8571429	6.90E-03			2.83E+02	2.55E-03		
AL_EC >21-34	2318.571429	2.09E-02			8.55E+02	7.70E-03		
AR_EC >8-10	0				0.00E+00			
AR_EC >10-12	7	4.74E-03			2.58E+00	1.75E-03		
AR_EC >12-16	344.4721429	1.24E-01			1.27E+02	4.57E-02		
AR_EC >16-21	1184.714286	7.11E-01			4.37E+02	2.62E-01		
AR_EC >21-34	2532.857143	1.14E+00			9.34E+02	4.20E-01		
Benzene	0		0.00E+00		0.00E+00		0.00E+00	
Toluene	0				0.00E+00			
Ethylbenzene	0				0.00E+00			
Total Xylenes	0				0.00E+00			
Naphthalene	2.77	2.29E-03			1.02E+00	8.44E-04		
1-Methyl Naphthalene	0				0.00E+00	0.00E+00		
2-Methyl Naphthalene	20.62	6.62E-02			7.61E+00	2.44E-02		
n-Hexane	0				0.00E+00	0.00E+00		
MTBE	0				0.00E+00			
Ethylene Dibromide (EDB)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	2.888166667		2.79E-06	*For*	1.07E+00		1.03E-06	*For*
Benzo(b)fluoranthene	1.216333333		1.17E-06	*all*	4.49E-01		4.33E-07	*all*
Benzo(k)fluoranthene	0.276333333		2.67E-07	*cPAHs*	1.02E-01		9.83E-08	*cPAHs*
Benzo(a)pyrene	1.934		1.87E-05		7.13E-01		6.88E-06	
Chrysene	4.57		4.41E-07	*Fail*	1.69E+00		1.63E-07	*Fail*
Dibenz(a,h)anthracene	0.425333333		4.10E-07	Σ Risk=	1.57E-01		1.51E-07	Σ Risk=
Indeno(1,2,3-cd)pyrene	0.645166667		6.22E-07	2.44E-05	2.38E-01		2.30E-07	8.98E-06
Sum	**8297.10319**	2.71E+00	2.44E-05	Fail	3.06E+03	1.00E+00	8.98E-06	Fail

TEST CURRENT CONDITION

Measured TPH Soil Conc, mg/kg= 8297.103
HI= 2.711E+00
RISK= 2.435E-05
Pass or Fail? ***Fail***

CALCULATE PROTECTIVE CONDITION

This tool allows the user to calculate protective TPH soil concentration based on various soil quality criteria. The Workbook uses the same composition ratio as for the measured data.

Calculate Protective TPH Soil Conc

Selected Criterion: @HI=1
Most Stringent? ***NO***

Protctive TPH Soil Conc, mg/kg = 3060.92
HI = 1.00E+00
RISK = 8.98E-06

TEST ADJUSTED CONDITION

This tool allows the user to test whether a particular TPH soil concentration is protective of human health. The Workbook uses the same composition ratio as for the measured data.

Test Adjusted TPH Soil Conc

Tested TPH Soil Conc, mg/kg =
HI =
RISK =
Pass or Fail?

A2. 1C Worksheet for Calculating Soil Cleanup Levels for Protection of Human Health: (Soil Direct Contact Pathway)
Method C: Industrial Land Use (WAC 173-340-745)

Date: 2/11/2011
Site Name: GP West
Sample Name: Average concentrations for Bunker C Subarea

Chemical of Concern or EC Group	Current Condition				Adjusted Condition			
	Measured Soil Conc @dry basis	HQ	RISK	Pass or Fail?	Soil Conc being tested	HQ	RISK	Pass or Fail?
	mg/kg	unitless	unitless		mg/kg	unitless	unitless	
Petroleum EC Fraction								
AL_EC >5-6	0				0.00E+00			
AL_EC >6-8	0				0.00E+00			
AL_EC >8-10	12	2.75E-04			5.45E+01	1.25E-03		
AL_EC >10-12	185	4.24E-03			8.40E+02	1.93E-02		
AL_EC >12-16	910.2857143	4.55E-02			4.13E+03	2.07E-01		
AL_EC >16-21	766.8571429	5.75E-04			3.48E+03	2.61E-03		
AL_EC >21-34	2318.571429	1.74E-03			1.05E+04	7.90E-03		
AR_EC >8-10	0				0.00E+00			
AR_EC >10-12	7	2.41E-04			3.18E+01	1.09E-03		
AR_EC >12-16	344.4721429	1.03E-02			1.56E+03	4.69E-02		
AR_EC >16-21	1184.714286	5.92E-02			5.38E+03	2.69E-01		
AR_EC >21-34	2532.857143	9.50E-02			1.15E+04	4.31E-01		
Benzene	0		0.00E+00		0.00E+00		0.00E+00	
Toluene	0				0.00E+00			
Ethylbenzene	0				0.00E+00			
Total Xylenes	0				0.00E+00			
Naphthalene	2.77	1.70E-04			1.26E+01	7.74E-04		
1-Methyl Naphthalene	0				0.00E+00	0.00E+00		
2-Methyl Naphthalene	20.62	2.90E-03			9.36E+01	1.32E-02		
n-Hexane	0				0.00E+00	0.00E+00		
MTBE	0				0.00E+00			
Ethylene Dibromide (EDB)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0		0.00E+00		0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	2.888166667		6.92E-07		1.31E+01		3.14E-06	
Benzo(b)fluoranthene	1.216333333		2.91E-07		5.52E+00		1.32E-06	
Benzo(k)fluoranthene	0.276333333		6.62E-08		1.25E+00		3.01E-07	
Benzo(a)pyrene	1.934		4.63E-06		8.78E+00		2.10E-05	
Chrysene	4.57		1.09E-07		2.08E+01		4.97E-07	
Dibenz(a,h)anthracene	0.425333333		1.02E-07		1.93E+00		4.63E-07	
Indeno(1,2,3-cd)pyrene	0.645166667		1.55E-07		2.93E+00		7.02E-07	
Sum	**8297.10319**	2.20E-01	6.05E-06		3.77E+04	1.00E+00	2.75E-05	Fail

TEST CURRENT CONDITION

Measured TPH Soil Conc, mg/kg= 8297.103
HI= 2.202E-01
RISK= 6.047E-06
Pass or Fail? Pass
Check Residual Saturation (WAC340-747(10))

CALCULATE PROTECTIVE CONDITION

This tool allows the user to calculate protective TPH soil concentration based on various soil quality criteria. The Workbook uses the same composition ratio as for the measured data.

Calculate Protective TPH soil Conc

Selected Criterion: @HI=1
Most Stringent? *NO*

Protctive TPH Soil Conc, mg/kg = 37678.880
HI = 1.000E+00
RISK = 2.746E-05

TEST ADJUSTED CONDITION

This tool allows the user to test whether a particular TPH soil concentration is protective of human health. The Workbook uses the same composition ratio as for the measured data.

Test Adjusted TPH Soil Conc

Tested TPH Soil Conc, mg/kg=
HI=
RISK=
Pass or Fail?

A2. 2 Worksheet for Calculating Soil Cleanup Level for the Protection of Ground Water Quality: (Leaching Pathway)
WAC 173-340-740 and 747

Date: 2/11/2011

Site Name: GP West

Sample Name: Average concentrations for Bunker C Subarea

Chemical of Concern or EC Group	Measured Soil Conc @dry basis	GW Cleanup Level	Adjusted Condition: Soil Conc being tested	Predicted Conc @Well	HQ @ Well	RISK @ Well	Pass or Fail?
	mg/kg	ug/L	mg/kg	ug/L	unitless	unitless	
Petroleum EC Fraction							
AL_EC >5-6	0		0.00E+00	0.00E+00	0.00E+00		
AL_EC >6-8	0		0.00E+00	0.00E+00	0.00E+00		
AL_EC >8-10	12		1.45E+01	1.13E+00	4.73E-03		
AL_EC >10-12	185		2.23E+02	1.15E+00	4.80E-03		
AL_EC >12-16	910.2857143		1.10E+03	1.03E-01	2.15E-04		
AL_EC >16-21	766.8571429		9.24E+02	1.08E-04	3.39E-09		
AL_EC >21-34	2318.571429		2.79E+03	2.62E-09	8.18E-14		
AR_EC >8-10	0		0.00E+00	0.00E+00	0.00E+00		
AR_EC >10-12	7		8.44E+00	3.23E+01	2.02E-01		
AR_EC >12-16	344.4721429		4.15E+02	3.64E+02	4.55E-01		
AR_EC >16-21	1184.714286		1.43E+03	9.36E+01	1.95E-01		
AR_EC >21-34	2532.857143		3.05E+03	2.09E+00	3.27E-03		
Benzene	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Toluene	0	1000	0.00E+00	0.00E+00	0.00E+00		
Ethylbenzene	0	700	0.00E+00	0.00E+00	0.00E+00		
Total Xylenes	0	1000	0.00E+00	0.00E+00	0.00E+00		
Naphthalene	2.77	160	3.34E+00	1.75E+01	1.09E-01		
1-Methyl Naphthalene	0		0.00E+00	0.00E+00	0.00E+00		
2-Methyl Naphthalene	20.62		2.49E+01	8.45E+01	2.64E+00		
n-Hexane	0		0.00E+00	0.00E+00	0.00E+00		
MTBE	0	20	0.00E+00	0.00E+00	0.00E+00		
Ethylene Dibromide (EDB)	0	0.01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	2.888166667	for	3.48E+00	3.55E-03		2.96E-08	for
Benzo(b)fluoranthene	1.216333333	all	1.47E+00	2.17E-04		1.81E-09	all
Benzo(k)fluoranthene	0.276333333	cPAHs	3.33E-01	2.63E-05		2.20E-10	cPAHs
Benzo(a)pyrene	1.934	Risk=	2.33E+00	3.72E-04		3.11E-08	
Chrysene	4.57	1E-05	5.51E+00	9.62E-04		8.03E-10	
Dibenz(a,h)anthracene	0.425333333		5.13E-01	1.14E-04		9.49E-10	Σ Risk=
Indeno(1,2,3-cd)pyrene	0.645166667		7.78E-01	1.55E-06		1.29E-11	6.45E-08
Sum	8297.10319		1.00E+04	5.96E+02	3.61E+00	6.45E-08	***Fail***

Site-Specific Hydrogeological Properties previously entered:

Item	Symbol	Value	Units
Total soil porosity:	n	0.43	unitless
Volumetric water content:	Q_w	0.3	unitless
Volumetric air content:	Q_a	0.13	unitless
Soil bulk density measured:	r_b	1.5	kg/L
Fraction Organic Carbon:	f_{oc}	0.021	unitless
Dilution Factor:	DF	1	unitless

Target Ground Water TPH conc adjusted previously if any:

Target Ground Water TPH Conc, ug/L ⇒ 500

CALCULATE PROTECTIVE CONDITION OR TEST ADJUSTED CONDITION

Calculate or Test

TPH Test button used.

Pass or Fail? *Fail*

Tested TPH Soil Conc, mg/kg = **10000.00**

Predicted TPH GW Conc, ug/L = 5.96E+02

RISK @ Well = 6.45E-08

HI @Well = 3.61E+00

DEDAILED MODEL RESULTS TPH Range Test

Type of model used for computation: 4-Phase Model

Computation completed? Yes!

Initial Weighted Average MW of NAPL, g/mol: 245.5

Equilibrated Weighted Average MW of NAPL, g/mol: 246.6

Initial Weighted Average Density of NAPL, kg/L: 0.952

Volumetric NAPL Content, Q_{NAPL} : 1.6E-02

NAPL Saturation (%), Q_{NAPL}/n : 3.62%

100% NAPL, mg/kg 82484.2

Mass Distribution Pattern @ 4-phase in soil pore system: Mass Balance Pattern

Total Mass distributed in Water Phase: 0.00% in Solid: 1.22%

Total Mass distributed in Air Phase: 0.00% in NAPL: 98.78%

Please Check Soil Residual Saturation TPH Levels: Refer to Table 747-5!

A2. 2 Worksheet for Calculating Soil Cleanup Level for the Protection of Ground Water Quality: (Leaching Pathway) WAC 173-340-740 and 747

Date: 2/28/2011

Site Name: GP West

Sample Name: Average concentrations for Bunker C Tank Subarea

Chemical of Concern or EC Group	Measured Soil Conc @dry basis	GW Cleanup Level	Adjusted Condition: Soil Conc being tested	Predicted Conc @Well	HQ @ Well	RISK @ Well	Pass or Fail?
	mg/kg	ug/L	mg/kg	ug/L	unitless	unitless	
Petroleum EC Fraction							
AL_EC >5-6	0		0.00E+00	0.00E+00	0.00E+00		
AL_EC >6-8	0		0.00E+00	0.00E+00	0.00E+00		
AL_EC >8-10	12		6.86E+01	1.17E+00	4.86E-03		
AL_EC >10-12	185		1.06E+03	1.16E+00	4.84E-03		
AL_EC >12-16	910.2857143		5.21E+03	1.03E-01	2.14E-04		
AL_EC >16-21	766.8571429		4.39E+03	1.09E-04	3.41E-09		
AL_EC >21-34	2318.571429		1.33E+04	2.58E-09	8.07E-14		
AR_EC >8-10	0		0.00E+00	0.00E+00	0.00E+00		
AR_EC >10-12	7		4.00E+01	3.80E+01	2.37E-01		
AR_EC >12-16	344.4721429		1.97E+03	3.87E+02	4.84E-01		
AR_EC >16-21	1184.714286		6.78E+03	9.40E+01	1.96E-01		
AR_EC >21-34	2532.857143		1.45E+04	2.07E+00	3.23E-03		
Benzene	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Toluene	0	1000	0.00E+00	0.00E+00	0.00E+00		
Ethylbenzene	0	700	0.00E+00	0.00E+00	0.00E+00		
Total Xylenes	0	1000	0.00E+00	0.00E+00	0.00E+00		
Naphthalene	2.77	160	1.58E+01	1.93E+01	1.21E-01		
1-Methyl Naphthalene	0		0.00E+00	0.00E+00	0.00E+00		
2-Methyl Naphthalene	20.62		1.18E+02	1.00E+02	3.13E+00		
n-Hexane	0		0.00E+00	0.00E+00	0.00E+00		
MTBE	0	20	0.00E+00	0.00E+00	0.00E+00		
Ethylene Dibromide (EDB)	0	0.01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
1,2 Dichloroethane (EDC)	0	5	0.00E+00	0.00E+00	0.00E+00	0.00E+00	
Benzo(a)anthracene	2.888166667	for	1.65E+01	3.53E-03		2.94E-08	for
Benzo(b)fluoranthene	1.216333333	all	6.96E+00	2.15E-04		1.79E-09	all
Benzo(k)fluoranthene	0.276333333	cPAHs	1.58E+00	2.60E-05		2.17E-10	cPAHs
Benzo(a)pyrene	1.934	Risk=	1.11E+01	3.69E-04		3.07E-08	
Chrysene	4.57	1E-05	2.61E+01	9.51E-04		7.93E-10	
Dibenz(a,h)anthracene	0.425333333		2.43E+00	1.13E-04		9.42E-10	Σ Risk=
Indeno(1,2,3-cd)pyrene	0.645166667		3.69E+00	1.53E-06		1.27E-11	6.39E-08
Sum	8297.10319		4.75E+04	6.43E+02	4.19E+00	6.39E-08	***Fail***

Site-Specific Hydrogeological Properties previously entered:

Item	Symbol	Value	Units
Total soil porosity:	n	0.43	unitless
Volumetric water content:	Θ_w	0.3	unitless
Volumetric air content:	Θ_a	0.13	unitless
Soil bulk density measured:	ρ_b	1.5	kg/L
Fraction Organic Carbon:	f_{oc}	0.021	unitless
Dilution Factor:	DF	1	unitless

Target Ground Water TPH conc adjusted previously if any:

Target Ground Water TPH Conc, ug/L ⇒ 500

CALCULATE PROTECTIVE CONDITION OR TEST ADJUSTED CONDITION

Calculate or Test

TPH Test button used.

Pass or Fail? *Fail*

Tested TPH Soil Conc, mg/kg = **47450.00**

Predicted TPH GW Conc, ug/L = 6.43E+02

RISK @ Well = 6.39E-08

HI @Well = 4.19E+00

DEDAILED MODEL RESULTS TPH Range Test

Type of model used for computation:	4-Phase Model
Computation completed?	Yes!
Initial Weighted Average MW of NAPL, g/mol:	245.5
Equilibrated Weighted Average MW of NAPL, g/mol:	245.8
Initial Weighted Average Density of NAPL, kg/L:	0.952
Volumetric NAPL Content, Θ_{NAPL} :	7.5E-02
NAPL Saturation (%), Θ_{NAPL}/n :	17.35%
100% NAPL, mg/kg	82484.2

Mass Distribution Pattern @ 4-phase in soil pore system: Mass Balance Pattern

Total Mass distributed in Water Phase: 0.00% in Solid: 0.27%

Total Mass distributed in Air Phase: 0.00% in NAPL: 99.73%

Please Check Soil Residual Saturation TPH Levels: Refer to Table 747-5!

APPENDIX C

MTCAstat Calculations for Soil TPH Data

	A	B	C	D	E	F	G	H
2	15	12/20/10	*MTCAStat '97 Site Module*				Paste values	
3	18	12/20/10	**Number of samples**		**Uncensored values**		Sort data	
4	18	(7-8 ft)	Uncensored	89	Mean	1192.590	**Calculate UCL**	
5	34	(10-11 ft)	Censored		Lognormal mean	1464.950		**Finished**
6	37	12/20/10	Detection limit or PQL		Std. devn.	1702.063		
7	55	(12-16 ft)	Method detection limit		Median	524	Lognormal	**Exit MTCA*Stat***
8	57	12/16/10	TOTAL	89	Min.	14.9		
9	58	12/20/10	**ENTER DATA**		Max.	10400	Normal	
10	64	(10-11 ft)	*Distribution Decision*				Neither	
11	72	(16-18 ft)						
12	75	(7-8 ft)	**Probability plot method**		W test	D'Agostino's test		
13	91	12/17/10					Clear messages	
14	98	12/20/10	Lognormal distribution?		Normal distribution?			
15	99	12/20/10	r-squared is:	**0.983**	r-squared is:	**0.632**	Clear all	
16	102	(19-20 ft)	*Recommendations:*					
17	124	(2-4 ft)	**Use lognormal distribution.**					
18	146	12/16/10					**Histogram**	
19	153	(14-15 ft)						
20	179	(11-12 ft)					5 10 20	
21	196	(2-3 ft)	*Upper Confidence Limit (UCL)*					
22	196	(11-12 ft)					Create report	
23	197	(0-4 ft)						
24	198	(12-13 ft)	**UCL (Land's method) is 2223.20723837943**				Sample size	
25	201	12/20/10						
26	216	(4-8 ft)						
27	226	12/20/10						
28	227	12/20/10						
29	254	12/20/10						
30	272	12/20/10						
31	284	(5-7.5 ft)						
32	289	(4-8 ft)						
33	300	12/16/10						
34	309	(15-16 ft)						
35	310	(2-4 ft)						
36	320	(15-16 ft)						
37	360	12/20/10						
38	366	12/16/10						
39	371	(2-4 ft)						
40	380	(3-5 ft)						
41	410	12/20/10						
42	440	(0-2 ft)						
43	442	12/22/10						
44	450	(7-8 ft)						
45	490	12/20/10						
46	524	12/17/10						
47	570	12/22/10						
48	590	12/17/10						
49	600	(6-8 ft)						
50	701	(2 ft.)						
51	745	(1.5 ft.)						
52	800	(7-8 ft)						
53	830	12/20/10						
54	834	(8-12 ft)						
55	850	(2.5-5 ft)						
56	985	12/20/10						
57	1010	(1-2 ft)						
58	1130	(11-12 ft)						
59	1170	12/17/10						
60	1170	12/16/10						
61	1190	(1-2 ft)						
62	1260	(2.5-4 ft)						
63	1270	(1-2 ft)						
64	1310	(11-12 ft)						
65	1370	(8-12 ft)						
66	1585	(1.5 ft.)						
67	1700	12/20/10						
68	1724	(3 ft.)						
69	1750	12/17/10						
70	1760	12/20/10						
71	1770	12/20/10						
72	1820	12/20/10						
73	2030	12/22/10						
74	2070	(15-16 ft)						
75	2105	(1.5 ft.)						
76	2250	12/22/10						
77	2290	(7.5-10 ft)						
78	2520	12/20/10						
79	2620	12/20/10						
80	2650	(0-4 ft)						
81	2700	(7.5-9 ft)						
82	2810	(0-2.5 ft)						
83	2840	12/20/10						
84	2970	12/20/10						
85	3240	12/22/10						
86	3850	(0-4 ft)						
87	4580	12/22/10						
88	4700	12/20/10						
89	9300	(6-8 ft)						
90	10400	(6-7 ft)						

	A	B
2	15	12/20/10
3	18	12/20/10
4	18	(7-8 ft)
5	34	(10-11 ft)
6	37	12/20/10
7	55	(12-16 ft)
8	57	12/16/10
9	58	12/20/10
10	64	(10-11 ft)
11	75	(7-8 ft)
12	91	12/17/10
13	98	12/20/10
14	99	12/20/10
15	124	(2-4 ft)
16	146	12/16/10
17	153	(14-15 ft)
18	179	(11-12 ft)
19	196	(2-3 ft)
20	196	(11-12 ft)
21	197	(0-4 ft)
22	198	(12-13 ft)
23	201	12/20/10
24	216	(4-8 ft)
25	226	12/20/10
26	227	12/20/10
27	254	12/20/10
28	272	12/20/10
29	284	(5-7.5 ft)
30	289	(4-8 ft)
31	300	12/16/10
32	309	(15-16 ft)
33	310	(2-4 ft)
34	360	12/20/10
35	366	12/16/10
36	371	(2-4 ft)
37	380	(3-5 ft)
38	410	12/20/10
39	440	(0-2 ft)
40	442	12/22/10
41	450	(7-8 ft)
42	490	12/20/10
43	524	12/17/10
44	570	12/22/10
45	590	12/17/10
46	600	(6-8 ft)
47	701	(2 ft.)
48	745	(1.5 ft.)
49	800	(7-8 ft)
50	830	12/20/10
51	834	(8-12 ft)
52	850	(2.5-5 ft)
53	985	12/20/10
54	1010	(1-2 ft)
55	1130	(11-12 ft)
56	1170	12/17/10
57	1170	12/16/10
58	1190	(1-2 ft)
59	1260	(2.5-4 ft)
60	1270	(1-2 ft)
61	1310	(11-12 ft)
62	1370	(8-12 ft)
63	1585	(1.5 ft.)
64	1700	12/20/10
65	1724	(3 ft.)
66	1750	12/17/10
67	1760	12/20/10
68	1770	12/20/10
69	1820	12/20/10
70	2030	12/22/10
71	2105	(1.5 ft.)
72	2250	12/22/10
73	2290	(7.5-10 ft)
74	2520	12/20/10
75	2620	12/20/10
76	2650	(0-4 ft)
77	2700	(7.5-9 ft)
78	2810	(0-2.5 ft)
79	2840	12/20/10
80	2970	12/20/10
81	3240	12/22/10
82	3850	(0-4 ft)
83	4580	12/22/10
84	4700	12/20/10
85	9300	(6-8 ft)
86	10400	(6-7 ft)
87		

MTCAStat '97 Site Module

Number of samples		**Uncensored values**	
Uncensored	85	Mean	1218.547
Censored		Lognormal mean	1508.968
Detection limit or PQL		Std. devn.	1728.280
Method detection limit		Median	570
TOTAL	85	Min.	14.9
ENTER DATA		Max.	10400

Distribution Decision

Probability plot method — W test — D'Agostino's test

Lognormal distribution? — Normal distribution?

r-squared is: **0.981** — r-squared is: **0.633**

Recommendations:

Use lognormal distribution.

Upper Confidence Limit (UCL)

UCL (Land's method) is 2314.85288554698

Paste values

Sort data

Calculate UCL

Lognormal

Normal

Neither

Clear messages

Clear all

Histogram

5 10 20

Create report

Sample size

Finished

Exit MTCA*Stat*

	A	B	C	D	E	F	G	H
2	8.4	12/22/10	*MTCAStat '97 Site Module*				Paste values	
3	8.5	12/23/10	**Number of samples**		**Uncensored values**		Sort data	
4	8.6	3/25/2010	Uncensored	117	Mean	1876.521	Calculate UCL	
5	8.9	12/22/10	Censored		Lognormal mean	1492.251		**Finished**
6	9.00	12/22/10	Detection limit or PQL		Std. devn.	5928.946	Lognormal	Exit MTCA*Stat*
7	10.4	12/22/10	Method detection limit		Median	78	Normal	
8	10.7	12/22/10	TOTAL	117	Min.	8.4	Neither	
9	11.2	12/22/10	**ENTER DATA**		Max.	37000		
10	11.6	3/25/2010	*Distribution Decision*				Clear messages	
11	12.1	12/22/10					Clear all	
12	12.1	3/25/2010	**Probability plot method**		W test	D'Agostino's test		
13	12.7	12/22/10					Histogram	
14	12.8	12/22/10	Lognormal distribution'		Normal distribution'		5 10 20	
15	14.1	12/22/10	r-squared is: **0.915**		r-squared is: **0.332**		Create report	
16	15	3/25/2010	*Recommendations:*				Sample size	
17	15.5	12/22/10	**Use lognormal distribution**					
18	15.9	3/25/2010						
19	16.4	12/21/10						
20	16.4	12/21/10						
21	16.8	3/25/2010	*Upper Confidence Limit (UCL)*					
22	19.3	9/22/2009						
23	19.4	12/17/10						
24	20.3	9/22/2009	**UCL (Land's method) is 3003.79879119008**					
25	20.4	12/21/10						
26	21.3	12/21/10						
27	21.5	3/25/2010						
28	22.5	12/21/10						
29	25.5	12/17/10						
30	25.6	9/22/2009						
31	26.1	12/21/10						
32	27	9/22/2009						
33	27	3/25/2010						
34	28.2	12/21/10						
35	30	9/22/2009						
36	30.1	12/23/10						
37	31.0	12/17/10						
38	31.5	12/17/10						
39	37.6	12/23/10						
40	40.0	12/23/10						
41	42.0	12/22/10						
42	45.4	12/23/10						
43	55.5	9/22/2009						
44	56.0	12/21/10						
45	56.0	12/22/10						
46	57.0	12/22/10						
47	58.5	9/22/2009						
48	62.1	12/22/10						
49	62.2	12/22/10						
50	64.5	9/22/2009						
51	68.0	12/21/10						
52	68.0	12/22/10						
53	68.3	12/23/10						
54	68.5	9/22/2009						
55	68.5	9/22/2009						
56	75	12/22/10						
57	75	9/22/2009						
58	75	9/22/2009						
59	75	9/22/2009						
60	78	3/25/2010						
61	80.5	9/22/2009						
62	80.5	9/22/2009						
63	80.5	9/22/2009						
64	80.5	9/22/2009						
65	81	9/22/2009						
66	81	3/25/2010						
67	92.5	3/25/2010						
68	93.5	9/22/2009						
69	98	9/22/2009						
70	103	9/22/2009						
71	105	12/17/10						
72	106	9/22/2009						
73	106	9/22/2009						
74	108	12/22/10						
75	123	12/17/10						
76	127	12/21/10						
77	144	12/22/10						
78	174	12/21/10						
79	182	9/22/2009						
80	186	9/22/2009						
81	261	9/22/2009						
82	284	9/22/2009						
83	337	12/22/10						
84	366	12/22/10						
85	383	12/22/10						
86	406	12/17/10						
87	413	12/17/10						
88	421	12/22/10						
89	500	12/22/10						
90	520	3/25/2010						
91	570	12/22/10						
92	770	9/22/2009						
93	1,060	12/17/10						
94	1200	9/22/2009						
95	1,590	12/22/10						
96	1680	9/22/2009						
97	1,910	12/22/10						
98	2,210	12/22/10						
99	2310	9/22/2009						
100	2,320	12/17/10						
101	2,330	12/22/10						
102	2,400	12/22/10						
103	2,670	12/22/10						
104	2950	9/22/2009						
105	3,830	12/22/10						
106	4,130	12/22/10						
107	4240	3/25/2010						
108	4650	9/22/2009						
109	5,300	12/21/10						
110	5,580	12/17/10						
111	5600	9/22/2009						
112	6,100	12/17/10						
113	7,500	12/22/10						
114	13,500	12/22/10						
115	24,000	12/22/10						
116	31,000	12/22/10						
117	33,000	12/22/10						
118	37,000	12/22/10						

	A	B	C	D	E	F	G	H
2	8.6	3/25/2010	*MTCAStat '97 Site Module*				Paste values	
3	8.9	12/22/10	**Number of samples**		**Uncensored values**		Sort data	
4	9.00	12/22/10	Uncensored	94	Mean	2224.638	**Calculate UCL**	**Finished**
5	10.4	12/22/10	Censored		Lognormal mean	1902.754		
6	11.6	3/25/2010	Detection limit or PQL		Std. devn.	6561.372	Lognormal	**Exit MTCA*Stat***
7	12.1	12/22/10	Method detection limit		Median	80.75	Normal	
8	12.7	12/22/10	TOTAL	94	Min.	8.6	Neither	
9	12.8	12/22/10	**ENTER DATA**		Max.	37000		
10	14.1	12/22/10	*Distribution Decision*					
11	15.5	12/22/10						
12	16.4	12/21/10	**Probability plot method**		W test	D'Agostino's test		
13	16.4	12/21/10					Clear messages	
14	16.8	3/25/2010	Lognormal distribution?		Normal distribution?			
15	19.3	9/22/2009	r-squared is:	**0.916**	r-squared is:	**0.363**	Clear all	
16	19.4	12/17/10	*Recommendations:*					
17	20.3	9/22/2009	**Use lognormal distribution.**				**Histogram**	
18	20.4	12/21/10					5 10 20	
19	21.5	3/25/2010						
20	22.5	12/21/10						
21	25.6	9/22/2009	*Upper Confidence Limit (UCL)*					
22	26.1	12/21/10					Create report	
23	27	9/22/2009						
24	27	3/25/2010	**UCL (Land's method) is 4332.02481787846**				Sample size	
25	28.2	12/21/10						
26	30	9/22/2009						
27	30.1	12/23/10						
28	31.5	12/17/10						
29	37.6	12/23/10						
30	40.0	12/23/10						
31	42.0	12/22/10						
32	45.4	12/23/10						
33	55.5	9/22/2009						
34	56.0	12/21/10						
35	56.0	12/22/10						
36	57.0	12/22/10						
37	58.5	9/22/2009						
38	64.5	9/22/2009						
39	68.0	12/21/10						
40	68.0	12/22/10						
41	68.3	12/23/10						
42	68.5	9/22/2009						
43	68.5	9/22/2009						
44	75	12/22/10						
45	75	9/22/2009						
46	75	9/22/2009						
47	80.5	9/22/2009						
48	80.5	9/22/2009						
49	81	9/22/2009						
50	81	3/25/2010						
51	92.5	3/25/2010						
52	93.5	9/22/2009						
53	98	9/22/2009						
54	103	9/22/2009						
55	105	12/17/10						
56	106	9/22/2009						
57	108	12/22/10						
58	127	12/21/10						
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69	413	12/17/10						
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81	2,670	12/22/10						
82	3,830	12/22/10						
83	4,130	12/22/10						
84	4240	3/25/2010						
85	4650	9/22/2009						
86	5,300	12/21/10						
87	5,580	12/17/10						
88	5600	9/22/2009						
89	6,100	12/17/10						
90	7,500	12/22/10						
91	13,500	12/22/10						
92	24,000	12/22/10						
93	31,000	12/22/10						
94	33,000	12/22/10						
95	37,000	12/22/10						

APPENDIX D

Information Supporting TPH Soil Residual Saturation Concentration, Million Gallon Tanks and Bunker C Tank Subareas

This appendix provides information upon which to develop a reasonable conservative estimate for a residual saturation concentration for oil-range soil TPH in the Bunker C Tank and Million Gallon Tanks subareas of the GP West Site.

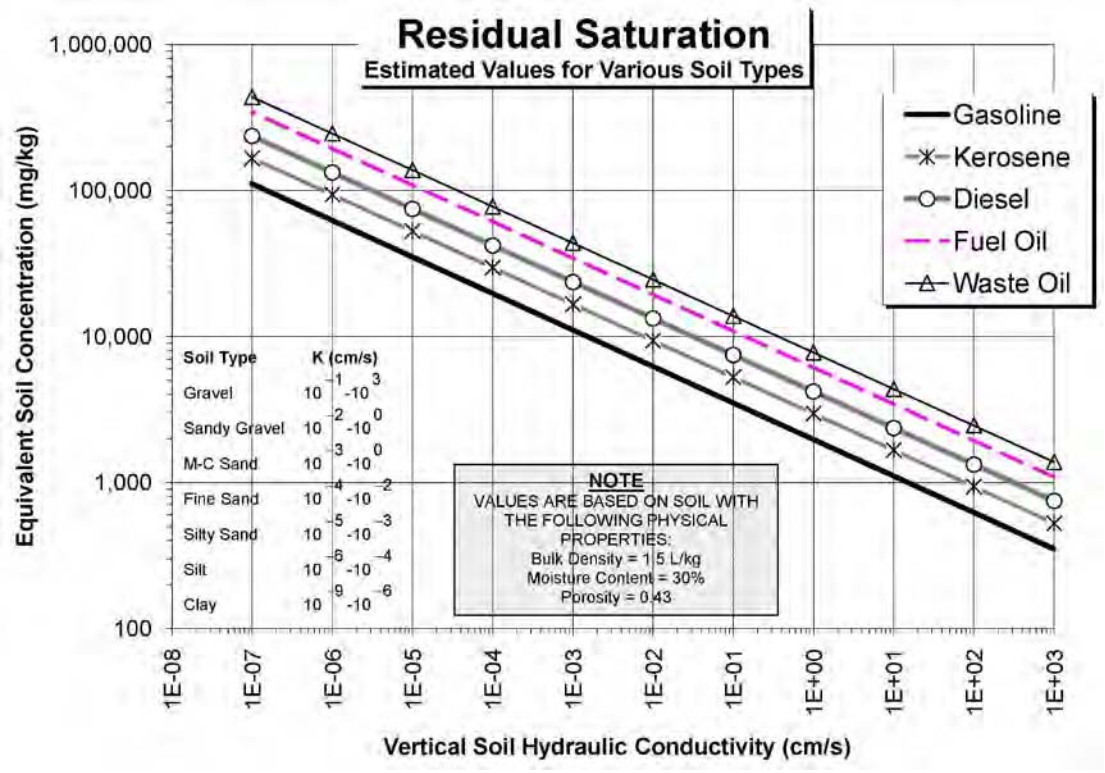
In addition to direct contact and soil-to-groundwater pathways, generation of mobile non-aqueous phase liquid (NAPL), i.e., residual saturation, also needs to be addressed when establishing TPH soil cleanup levels or remediation levels for a Site. Residual saturation is the concentration below which the NAPL (aka "free product") is not mobile. The residual saturation concentration depends on characteristics of the NAPL (e.g., density and viscosity) and soil (e.g., moisture content and permeability).

Defining a Site-specific or subarea-specific residual saturation concentration is complicated but can be conservatively estimated based on literature values for similar product types and Site-specific information regarding soil permeability, corroborated by empirical data on occurrence of mobile NAPL. Residual saturation applies to both unsaturated and saturated soil. Most field and laboratory experiments in the literature deal with residual saturation of unsaturated soil (above the water table).

For a given NAPL product, the residual saturation concentration is higher in saturated soil than unsaturated soil. On that topic, EPA (1995) states " Data compiled by Mercer and Cohen (1990) indicate the residual saturation of most NAPLs in these studies ranged from about 10% to 20% in the unsaturated zone and about 15% to 50% of the total pore volume in the saturated zone. The potential for higher retention of NAPLs in the saturated zone than in the unsaturated zone is due to several factors including: 1) potential existence of the NAPL as the wetting fluid relative to air in the unsaturated zone resulting in NAPL spreading to adjacent pores with residual held in small pore spaces, 2) existence of the NAPL as the non-wetting fluid in the saturated zone resulting in NAPL present as blobs in larger pore spaces, and 3) the relatively high fluid density ratio of NAPL to air in the vadose zone resulting in drainage (Anderson, 1988)."

In short, it is easier for NAPL to displace less-dense air and move into unsaturated pore space than to displace more-dense water and move into water-saturated pore space. The heavy-range fuel oil (e.g., Bunker C = Fuel Oil No. 6) stored in the Million Gallon Tanks and Bunker C Tank subareas and burned for steam heat on Site has a density very close to that of water (specific gravity of 0.95 to 1.03), so would more readily migrate into water-saturated pore space than lighter fuels such as diesel. It would, however, still drain more readily in the unsaturated zone than in the saturated zone. Therefore, it is conservative to apply a residual saturation value derived for NAPL in the unsaturated soil to soil below the water table (aquifer).

A reasonable conservative estimate for residual saturation of oil-range TPH in soil at the Million Gallon Tanks and Bunker C Tank subareas can be estimated from theoretical calculations and literature values derived from lab and field experiments. The plot below, generated by Ecology (Charles San Juan, personal communication) provides theoretical estimates of residual saturation (as equivalent soil concentration in mg/kg) for various petroleum product types as a function of soil saturated vertical hydraulic conductivity (Kv), and using MTCA-default values for soil physical properties (total porosity, moisture content, and bulk density). The heavy-range fuel oil in the Million Gallon Tanks and Bunker C Tank subareas is best represented by the dashed fuel oil line on the plot below.



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Based on the collective pre-RI and RI data, an average horizontal hydraulic conductivity (Kh) for the Fill Unit, based on slug testing of 25 wells, is 3 x10^{-4} cm/sec — a typical value for slightly silty to silty sand comprising most of the Fill Unit. Applying a typical anisotropy ratio of 10:1 for Kh/Kv (vertical K is 10 times lower than horizontal K because of horizontal stratification) indicates a Kv on the order of 10^{-5} cm/sec. For fuel oil in soil of this vertical permeability, a residual saturation on the order of 100,000 mg/kg is estimated from the plot above. Applying the 3 x 10^{-4} cm/sec Kh value, to represent lateral mobility in the aquifer rather than vertical drainage, suggests residual saturation on the order of 50,000 mg/kg.

The American Petroleum Institute (API) research on NAPL mobility (API, 2000) which is based on compilation of existing measured data on residual NAPL concentrations in soil, presents residual saturation soil concentrations for fuel oils in a range of soil types. They include (rounded to 2 significant digits): 5,100 mg/kg for coarse gravel, 8,700 mg/kg for coarse sand and gravel, 17,000 mg/kg for medium to coarse sand, 30,000 mg/kg for fine to medium sand, and 51,000 mg/kg for silt to fine sand. API (2000) also provides a value of 53,000 mg/kg for lube and heavy fuel oil in "soil." These estimates appear generally consistent with the theoretical calculations plotted above. Based on that information, API (2000) proposes a 17,000 mg/kg screening level for fuel oil residual saturation, as a lower limit. The New Jersey Department of Environmental Protection has adopted this concentration in guidance for addressing petroleum releases (NJDEP, 2010). As an additional point of reference, Alaska Department of Environmental Conservation (ADEC) cleanup regulations (18 AAC 75) establish a maximum allowable concentration of 22,000 mg/kg for residual-range (oil-range) TPH in soils across that state, based on NAPL migration.

It is probable that petroleum release(s) within the Million Gallon Tanks and Bunker C Tank subareas occurred during their operational periods decades ago. Therefore, it is likely that NAPL has migrated in the subsurface as far as it is going to as a separate mobile phase, such that the remaining NAPL is likely present at or below residual saturation levels. Additionally, it is important to keep in mind that the Bunker C was heated to allow its being pumped under pressure through pipelines across the Site. Absent the heat, and moving through porous media rather than being pumped under pressure in open pipes, mobility of Bunker C fuel oil is limited.

In addition to the justification provided above, a residual saturation soil TPH concentration of 10,000 mg/kg as a conservative estimate is supported by two other local MTCA cleanup site precedents:

1. Skykomish Maintenance and Fueling Facility. Page 5-7 of the site FS (RETEC, 2005) proposes a TPH residual saturation concentration of 30,000 mg/kg based on empirical data, but does not elaborate on those data. The site CAP (Ecology, 2007) defines 30,000 mg/kg TPH, with no evidence of mobile NAPL, as a remediation level for part of the facility, based on free production generation. Soil TPH cleanup levels based on other exposure pathways are lower concentrations; and

2. Port of Bellingham's Central Waterfront site. Based on a site-specific LNAPL mobility investigation including soil centrifuging data, an average residual saturation was measured as approximately 10 percent of pore volume (AECOM, 2009). Using measured soil and NAPL parameters for that site, this equates to a soil TPH concentration of approximately 1.9 percent, or 19,000 mg/kg (Table D-1).

Based on the weight of evidence outlined above, a residual saturation value of 10,000 mg/kg soil TPH is proposed as a reasonable conservative estimate in the Million Gallon Tanks subarea and Bunker C Tank subarea of the GP West Site. Soil TPH is present in both subareas at concentrations above that concentration.

References for Appendix D

AECOM-Environment, 2009, Remedial Investigation/Feasibility Study, Central Waterfront Site, Bellingham, Washington, Ecology review draft, August 2009.

American Petroleum Institute (API), 2000, Soil and Groundwater Research Bulletin No. 9, Non-Aqueous Phase Liquid (NAPL) Mobility Limits in Soil, June 2000.

RETEC, 2005, Final Feasibility Study, Former Maintenance and Fueling Facility, Skykomish, Washington, March 15, 2005.

Washington State Department of Ecology (Ecology), 2007, Cleanup Action Plan for BNSF Former Maintenance and Fueling Facility, Skykomish, Washington, October, 2007.

EPA, 1995, Ground Water Issue: Light Non-Aqueous Phase Liquids, EPA/540/S-95/500.

New Jersey Department of Environmental Protection (NJDEP), 2010, Protocol for Addressing Extractable Petroleum Hydrocarbons (Version 5.0, August 9, 2010).

Table D-1 - Calculation of Soil TPH Residual Saturation Concentration (dry weight), Central Waterfront Site

Mass of soil (M_{total}) = Mass water (M_w) + Mass Solid (M_s) + Mass NAPL (M_n) + Mass air (M_a, negligible). Water mass also negligible since dry weight-based TPH concentrations.

Mass = density (p) * volume (V)

So Mass of soil (M_t), dry weight = $M_s + M_n = p_s V_s + p_n V_n$

NAPL concentration, dry weight = $M_n / (M_s + M_n) = M_n / (p_s V_s + p_n V_n)$

	Assumed	
V_t	1	liter = 1000 cc (unit volume)
	Measured[(a)]	
p_s	2.69	g/cc
p_n	0.86	g/cc
NAPL resid sat as % of V_{void}	9.8%	(post-centrifuge measurement)
Total porosity (V_v/V_t)	38%	
	Calculated	
V_s	62%	= 1 - porosity
V_s	620	gram/1000 cc of soil (units conversion to put in terms of 1 L of soil)
M_s	1668	gram/1000 cc of soil, = $p_s V_s$
V_n	3.7%	= NAPL resid sat * porosity (void volume)
V_n	37	cc/1000 cc of soil (units conversion to put in terms of 1 L of soil)
M_n	32	grams/1000 cc soil, = $p_n V_n$
NAPL conc @ resid saturation	1.9%	= $M_n / (M_s + M_n)$
NAPL conc @ resid saturation	**19,000**	**mg/kg** (expressed as parts per million)

Notes

(a) Data from Section 3 (Table 3-6) of Central Waterfront Site RI/FS (AECOM, 2009).