TECHNICAL MEMORANDUM

LANDAU ASSOCIATES
ENVIRONMENTAL | GEOTECHNICAL | NATURAL RESOURCES

TO: Jing Liu, Washington State Department of Ecology

CC: Sonia Fernandez, Washington State Department of Ecology
Mike Stoner, Port of Bellingham

FROM: Jeremy Davis, P.E., C.H.M.M., and Larry Beard, P.E., L.G.

DATE: April 1, 2014

RE: REMEDIAL INVESTIGATION WORK PLAN ADDENDUM
WESTMAN MARINE INC. SITE
BLAINE, WASHINGTON

INTRODUCTION

This technical memorandum presents a summary of the work to be conducted during Phase II of the remedial investigation (RI) of the Westman Marine Inc. site (Site) in Blaine, Washington (Figure 1). The RI is being conducted in accordance with the approved RI Work Plan (Landau Associates 2013), under Agreed Order No. DE 9001 (Ecology 2013) between the Port of Bellingham (Port) and the Washington State Department of Ecology (Ecology).

Summary reports for Phase I of the RI were submitted to Ecology on February 5, 2014 to present the initial upland and sediment investigation results. Figures 2 and 3 show the locations where samples were collected during Phase I. The Port and Ecology met on March 13, 2014 to discuss the Phase I results and to confirm the scope of work for Phase II. The purpose of this technical memorandum is to provide a concise summary of the scope of work for Phase II, as there are some minor differences from the scope presented in the RI Work Plan. A brief description of the work is provided below and the attached figures and tables indicate where samples will be collected, and what the samples will be analyzed for at the laboratory. Additional information regarding the development of the scope of work discussed below is available in the RI Work Plan (Landau Associates 2013), the RI Upland Data Summary (Landau Associates 2014a), and the Phase I Marine Sediment Data Summary (Landau Associates 2014b).

UPLAND INVESTIGATION

This section describes the investigation activities that will be conducted in the uplands during Phase II of the RI. The procedures for implementing the work, such as field screening for potential contamination, sample collection, laboratory analyses, and quality assurance/quality control, will be conducted in accordance with the RI Work Plan and the sampling and analysis plans incorporated in that document.

The following activities will be completed during Phase II, as indicated on Figures 4 and 5, and summarized in Tables 1 and 2:

- Advance soil borings: WM-GP-20 through WM-GP-32
  - Collect soil samples to delineate contaminants of potential concern (COPCs) in four areas
  - Advance additional borings as necessary to delineate the extent of potential contamination based on field observations
- Analyze eight existing surface soil samples that were collected during Phase I
- Install and develop eight groundwater monitoring wells: WM-MW-1 through WM-MW-8
- Conduct two groundwater monitoring events (April and June).

WM-GP-20 through WM-GP-23

Borings WM-GP-20 through WM-GP-23 will be advanced to determine the lateral and vertical extent of affected soil observed in the northeastern portion of the Site in the interval of approximately 10 to 12 feet (ft) below ground surface (BGS). Contamination detected within this depth interval in this area was associated with a dark-colored soil that exhibited an organic odor and sheen. Soil samples will be collected from WM-GP-20 through WM-GP-23 based on visual and olfactory indications of potential contamination. Soil samples will be collected from within, above, and below the potentially contaminated interval. If no evidence of contamination is observed during drilling, soil samples will be collected from 9 to 10 ft BGS, 10.5 to 11.5 ft BGS, and 12 to 13 ft BGS. The soil samples from the potentially contaminated interval (or the 10.5- to 11.5-ft BGS interval if no potential contamination is observed) will be analyzed for metals (arsenic, copper, zinc) by U.S. Environmental Protection Agency (EPA) Method 6020; gasoline-range petroleum hydrocarbons by Method NWTPH-G; and polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8270D SIM. Samples from above and below the potentially contaminated intervals will be archived at the laboratory and will be analyzed only for COPCs that exceed the preliminary screening levels (PSLs) in the potentially contaminated interval.

Additional "step-out" borings may be advanced at these locations if evidence of potential contamination is observed in the planned borings. The actual locations would be decided based on field observations and existing data from Phase I.

WM-GP-24 through WM-GP-26

Borings WM-GP-24 through WM-GP-26 will be advanced to determine the lateral and vertical extent of metals contamination observed in WM-GP-10. The borings will be advanced to a depth of 10 ft BGS and soil samples will be collected from 1-ft intervals down to the maximum depth of the boring. Since the data from Phase I indicate that surface soil is generally affected throughout the east work yard, the first sample tested at each location will be the 1- to 2-ft interval. The soil samples from this interval

will be analyzed for metals (arsenic, copper, mercury, and zinc), and PAHs. The deeper samples will be analyzed sequentially downward, consistent with the protocols identified in the RI Work Plan, for constituents detected at concentrations greater than the PSLs in the shallower sample.

Additional "step-out" borings may be advanced at these locations if evidence of potential contamination is observed in the planned borings. The actual locations would be decided based on field observations and existing data from Phase I.

WM-GP-27 through WM-GP-29

Borings WM-GP-27 through WM-GP-29 will be advanced to 10 ft BGS to determine the lateral and vertical extent of diesel-range total petroleum hydrocarbons (TPH-D) and carcinogenic PAHs (cPAHs) present in soil at concentrations greater than the PSLs in the vicinity of Phase I boring WM-GP-11. PSL exceedances at WM-GP-11 were in the 5-to 6-ft BGS interval and corresponded to elevated photoionization detector (PID) readings and petroleum hydrocarbon odors. Soil samples will be collected from WM-GP-27 through WM-GP-29 from within, above, and below the zone(s) exhibiting elevated PID readings and/or petroleum hydrocarbon odor, if present. If field screening does not indicate the presence of potential contamination, a soil sample will be collected from the 5- to 6-ft BGS and the 6- to 7-ft BGS intervals. The soil samples from the potentially contaminated zone (or the 5- to 6-ft BGS and 6- to 7-ft BGS intervals if no indications of potential contamination are observed) will be analyzed for TPH-D and PAHs. Samples from above and below the potentially contaminated interval will be archived at the laboratory and will be analyzed only for COPCs detected at concentrations greater than PSLs in the initially analyzed sample.

Additional "step-out" borings may be advanced at these locations if evidence of potential contamination is observed in the planned borings. The actual locations would be decided based on field observations and existing data from Phase I of the RI.

WM-GP-30 through WM-GP-32

Borings WM-GP-30 through WM-GP-32 will be advanced to 15 ft BGS to determine the lateral and vertical extent of soil with concentrations of metals and cPAHs greater than the PSLs as observed at WM-GP-7. Soil samples will be collected from alternating 1-ft intervals to reduce the number of samples requiring analysis (i.e., 1 to 2 ft, 3 to 4 ft, 5 to 6 ft BGS, etc.) down to the maximum depth of the boring. Soil samples from the upper three intervals from each boring location will be analyzed for metals (arsenic, copper, mercury, and zinc), and PAHs. The deeper samples will be analyzed sequentially downward if PSL exceedances are detected in an overlying sample.

Additional "step-out" borings may be advanced at these locations if evidence of potential contamination is observed in the planned borings. The actual locations would be decided based on field observations and existing data from Phase I of the RI.

Analysis of Existing Archived Samples

As discussed in the Upland Phase I RI Data Report (Landau Associates 2014a) surface soil samples collected during Phase I will be analyzed for organotins and/or polychlorinated biphenyls (PCBs) to further delineate the lateral extent of these COPCs in surface soil:

- PCBs: WM-GP-7, WM-GP-10, WM-GP-13, and WM-GP-15
- Organotins: WM-GP-10 through WM-GP-13

The PCBs will be analyzed by EPA Method 8082. A portion of each sample sufficient to allow for future PCB congener analysis will be archived at the analytical laboratory. Landau Associates will verify that sufficient archived material was collected during Phase I to allow for this analysis prior to field activities. If necessary, additional samples will be collected from these locations.

Groundwater Monitoring Well Installation and Development

Groundwater monitoring wells WM-MW-1 through WM-MW-8 will be installed at the locations indicated on Figure 4. The wells will be constructed by a licensed drilling contractor using a direct-push probe rig. The well locations will be adjusted as necessary for the presence of underground utilities or if subsurface obstructions are encountered during drilling. Landau Associates field personnel will oversee the drilling and well installation activities, and maintain a detailed record of well construction. Soil samples will be collected from three wells at the approximate depth of the groundwater at the time of drilling for grain size analysis by ASTM International Method D422, to support hydrogeologic characterization. Soil will be field-screened for potential contamination at the time of drilling and additional soil samples will be collected from a 1-ft interval vertically centered on any contamination indicated by field screening. These supplemental samples will be submitted to the laboratory for archiving and may be analyzed for COPCs based on the results of field observations after reviewing existing data, if the additional data are needed to supplement the existing Site characterization data.

The wells will be constructed in accordance with Washington State Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 of the Washington Administrative Code). The wells will be constructed with 1-inch-diameter, flush-threaded, Schedule 40 polyvinyl chloride (PVC) casing with pre-packed 10 ft 0.010-inch machine-slotted screens. The filter packs will consist of pre-washed, pre-sized number 20/40 silica sand. The pre-packed filter screens consist of an outer layer of stainless steel mesh within which a sand pack of uniform thickness is maintained around the slotted well

casing. One foot of sand will be placed in the boring annulus above the screen and a minimum of 2 ft of bentonite will be placed above the sand to provide an annular seal. The remaining annular space will be grouted or sealed with additional bentonite and will be completed with a flush-mount protective monument set in concrete.

Based on review of the Phase I data, the groundwater wells will be installed to a maximum depth of approximately 15 ft BGS, screened over the lower 10 ft. The well location and top of casing elevation will be surveyed following well installation. The monitoring wells near the shoreline will be placed as close as possible to the shoreline so groundwater samples from these wells will characterize groundwater at the point of discharge to surface water to the greatest degree possible.

The new groundwater monitoring wells will be developed to obtain representative water samples and groundwater elevation measurements. The wells will be developed at least 24 hours after completion to avoid compromising the annular seal. Development will be achieved by limited surging of the screen and purging the well. During development, the purged groundwater quality will be monitored as described in the RI Work Plan to determine when development is complete. The purge volume to attain development criteria is anticipated to be between 10 and 25 gallons of water based on the pre-pack well installation test conducted during Phase I of the RI.

Groundwater Monitoring

Groundwater quality will be monitored once during the wet season, and once during the dry season, as described in the RI Work Plan. These events are tentatively scheduled to occur in April and June 2014. Each event will include collecting groundwater elevation data from each well at low tide to support the hydrogeologic characterization of the Site. Groundwater samples will be collected and analyzed for the following COPCs based on the results of the Phase I RI and discussions with Ecology, as summarized in Table 2:

- All locations:
  - PAHs by EPA Method 8270D SIM
  - Petroleum Hydrocarbon Identification (HCID) by Method NWTPH-HCID
  - Gasoline, diesel- and/or oil-range petroleum hydrocarbons by Method NWTPH-G, or NWTPH-Dx if petroleum hydrocarbons are identified in the HCID analyses
  - Total metals (arsenic, cadmium, chromium, copper, lead, and zinc) by EPA Method 6020
  - Dissolved metals (if total metals concentrations exceed the PSLs) by EPA Method 6020.
- Select locations:
  - PCBs by EPA Method 8082 (WM-MW-7 and WM-MW-6)
  - Semivolatile organic compounds by EPA Method 8270 (WM-MW-6).

SEDIMENT INVESTIGATION

Phase II of the sediment investigation includes collecting surface and core sediment samples near the upland portion of the Site (Figure 5) to evaluate the distribution of COPCs, and surface samples throughout Blaine Harbor to evaluate the distribution of persistent bioaccumulative toxins (PBTs; Figure 6).

The sediment characterization is being conducted in two phases in order to compare the results of organotin analyses in bulk and porewater surface samples (Phase I) before collecting the sediment core samples (Phase II). Phase I has already been completed. The sediment characterization data indicated a strong correlation between organotin concentrations in porewater surface and sediment core samples; therefore, organotins will be evaluated only in bulk samples. Upon review of the Phase I sediment data, it was determined that additional characterization data are required to determine whether metals detected in WM-SG-15 are related to Site releases, and to further evaluate the distribution of PBTs in Blaine Harbor so that cleanup levels can be developed for PCBs and cPAHs in sediment.

The sediment sample locations are presented on Figures 5 and 6. The rationale for planned sample collection and laboratory analyses are presented in Table 3. Sample collection procedures will be consistent with the RI Work Plan. Sediment core samples will be analyzed for COPCs using a tiered approach starting at 1 ft below the mudline, and analyzing deeper samples in a sequential manner for COPCs detected at concentrations greater than their PSLs in the overlying interval in accordance with the RI Work Plan. Sediment core samples will be analyzed for bulk organotins as noted in Table 3.

SCHEDULE

Planning and coordination for Phase II of the RI is currently under way. The Phase II work described in this document is scheduled to occur in April 2014. The current schedule consists of sediment sampling from April 10 to 11, 2014 to be followed by soil sampling and groundwater monitoring well installation from April 14 to April 17, 2014. Groundwater samples will be collected from the newly installed wells on April 29 and April 30, 2014, then again in June 2014. The Port will provide field schedule updates to Ecology and Pacific Crest Environmental so they can observe field activities, if desired.

USE OF THIS TECHNICAL MEMORANDUM

This document has been prepared for the use of the Port of Bellingham and the Washington State Department of Ecology for specific application to the Westman Marine Site. None of the information, conclusions, and recommendations included in this document can be used for any other project without the express written consent of Landau Associates. Further, the reuse of information, conclusions, and

recommendations provided herein for extensions of the project or for any other project, without review and authorization by Landau Associates, shall be at the user's sole risk. Landau Associates warrants that within the limitations of scope, schedule, and budget, our services have been provided in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in the Pacific Northwest under similar conditions as this project. We make no other warranty, either express or implied.

JMD/LDB/ccy

REFERENCES

Ecology. 2013. *Agreed Order No. DE 9001, in the Matter of Remedial Action by Port of Bellingham*. Washington State Department of Ecology. Effective Date: April 22.

Landau Associates. 2014a. Technical Memorandum: *Remedial Investigation Upland Data Summary, Westman Marine Site, Blaine, Washington*. From Larry Beard, P.E., to Jing Liu, Washington State Department of Ecology. February 4.

Landau Associates. 2014b. Technical Memorandum: *Phase I Marine Sediment Data Summary Westman Marine Site, Blaine, Washington*. From Larry Beard, P.E., to Jing Liu, Washington State Department of Ecology. February 4.

Landau Associates. 2013a. *Remedial Investigation Work Plan, Westman Marine Site, Blaine, Washington*. Prepared for the Port of Bellingham. August 21.

ATTACHMENTS

Figure 1: Vicinity Map
Figure 2: Phase I Upland Sample Locations
Figure 3: Phase I Sediment Sample Locations
Figure 4: Phase II Upland Sample and Groundwater Monitoring Well Locations
Figure 5: Phase II Site Sediment Sample Locations
Figure 6: Phase II Blaine Harbor Sediment Persistent Bioaccumulative Toxin Sample Locations

Table 1: Summary of Phase II Remedial Investigation Soil Sample Locations
Table 2: Groundwater Monitoring Well Locations, Rationale, and Analyses
Table 3: Proposed Surface Sediment Sample Locations and Rationale

Data Source: Esri 2012

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Westman Marine Blaine Harbor Blaine, Washington	**Vicinity Map**	Figure 1

Dock
Boundary Fish
Sigurdson Ave
Macmillan Ave
Berg St
Boundary Fish New Building Footprint
WM-GP-17
WM-GP-9
WM-GP-19
WM-GP-14
WM-GP-18
WM-GP-10
WM-GP-3
WM-GP-6
WM-GP-2
WM-GP-4
WM-GP-7
WM-GP-15
WM-GP-11
WM-GP-5
WM-GP-12
WM-GP-16
WM-GP-8
WM-GP-13
9.5
6
4
2
-6
-10
-8
0
-2
-4
8
9

Inset

Boundary Fish New Building Footprint
WM-BF-GP-4
WM-SS-19
WM-SS-18
WM-SS-17
WM-BF-Vault-S-3
WM-BF-GP-3
WM-BF-GP-1
WM-BF-Vault-S-1
WM-SS-7
WM-SS-14
WM-SS-13
WM-SS-16
WM-BF-SS-27
WM-SS-15
WM-BF-GP-2
WM-BF-SS-25
WM-BF-SS-24
WM-SS-23
WM-BF-SS-28
WM-SS-12
WM-BF-SS-29
WM-BF-SS-26
WM-SS-4
WM-SS-11
WM-HA-01
WM-BF-SS-31
WM-BF-SS-30

Project North
True North
N

Legend

- Groundwater Grab Sample Location and Designation
- Geoprobe Sample Location and Designation
- Interim Action Soil Sample Location
- Historical Track Location (1966)
- Bathymetric Contours (MLLW)
- Preliminary Westman Marine Site Boundary; Site Limits to be Determined in the RI/FS
- Structure Over Water

Notes

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 30 60
Scale in Feet

Source: Wilson Engineering 2011, Port of Blaine 2011, Walker and Associates, Inc.

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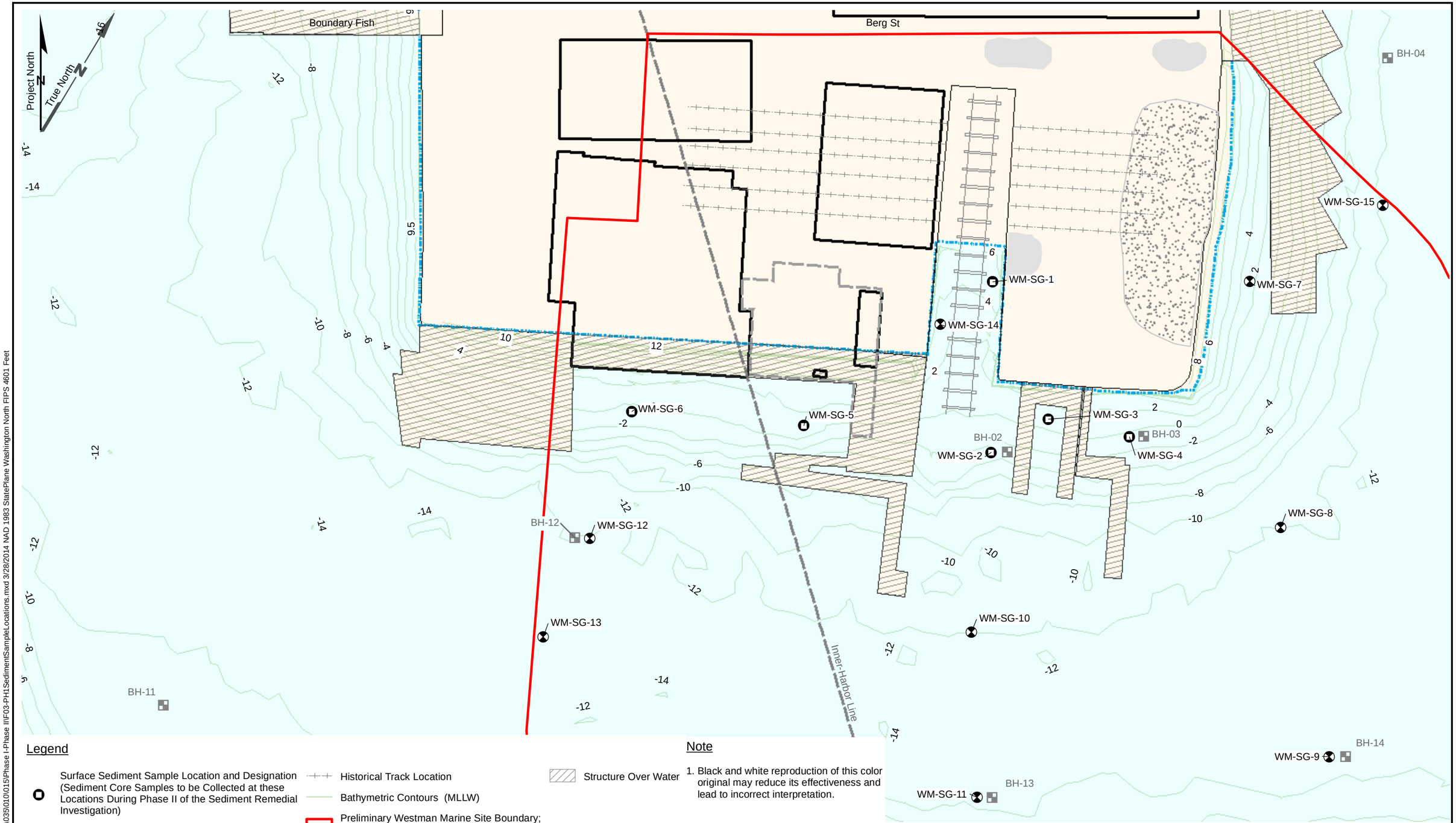
Westman Marine
Blaine Harbor
Blaine, Washington

Phase I Upland Sample Locations

Figure 2

G:\Projects\001\035\010\015\Phase I-Phase II\F02-PH1UplandSampleLocations.mxd 3/28/2014 NAD 1983 StatePlane Washington North FIPS 4601 Feet



Legend

- Surface Sediment Sample Location and Designation (Sediment Core Samples to be Collected at these Locations During Phase II of the Sediment Remedial Investigation)
- Surface Sediment Sample Location and Designation
- Historical Surface Sediment Sample
- Historical Track Location
- Bathymetric Contours (MLLW)
- Preliminary Westman Marine Site Boundary; Site Limits to be Determined in the RI/FS
- Potential Surface Contamination - Paint Chips (1993)
- Potential Surface Contamination - Staining (1993)
- Structure Over Water

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 50 100

Scale in Feet

Source: Wilson Engineering 2011, Port of Blaine 2011, Walker and Associates, Inc.

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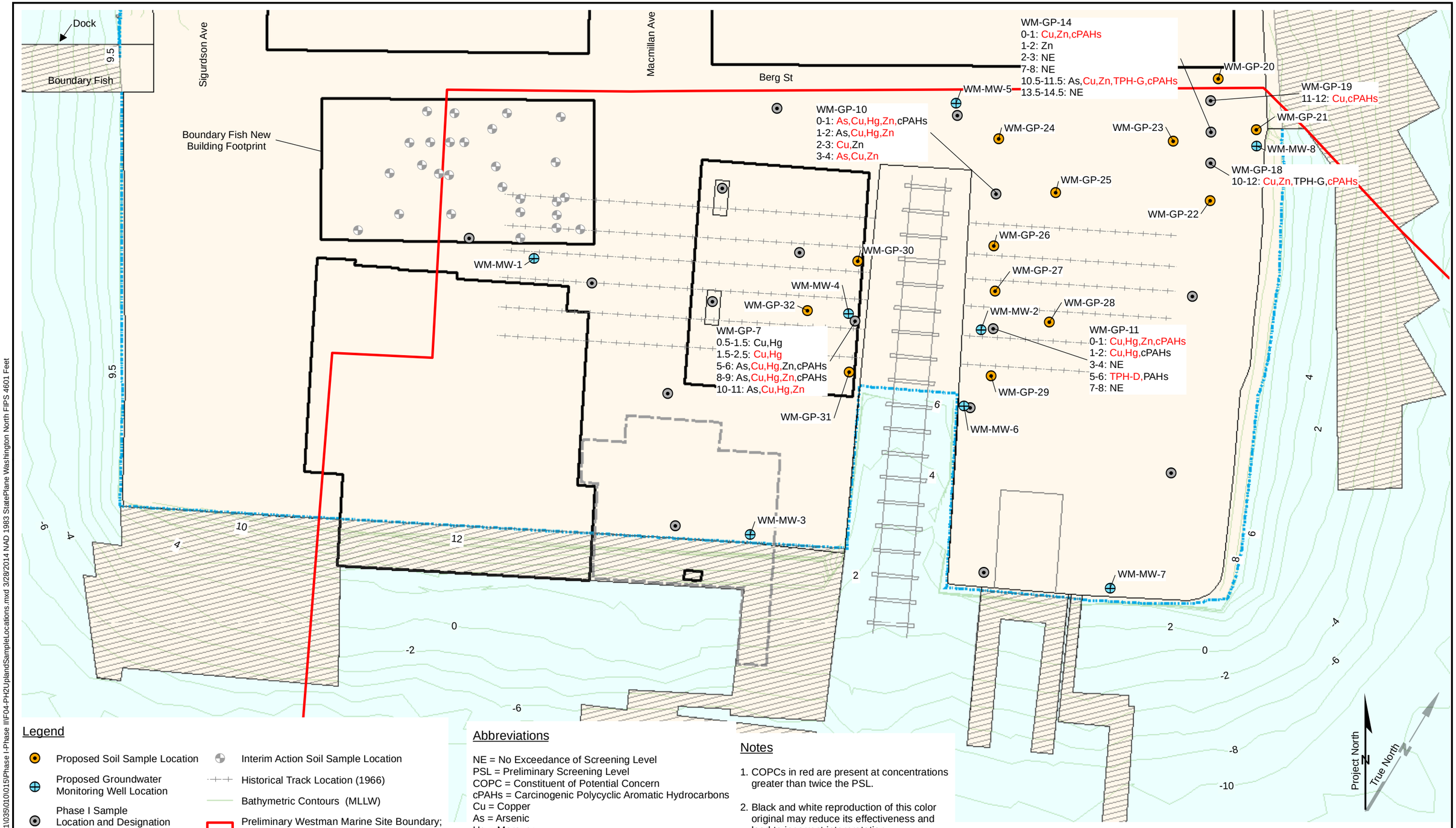
Westman Marine Blaine Harbor Blaine, Washington	**Phase I Sediment Sample Locations**	Figure 3

G:\Projects\001\035\010\015\Phase I-Phase II\F03-PH1SedimentSampleLocations.mxd 3/28/2014 NAD 1983 StatePlane Washington North FIPS 4601 Feet



Legend

- Proposed Soil Sample Location
- Proposed Groundwater Monitoring Well Location
- Phase I Sample Location and Designation
- 0-1: Cu — Depth Interval and COPCs with Concentrations Greater than PSLs
- Interim Action Soil Sample Location
- Historical Track Location (1966)
- Bathymetric Contours (MLLW)
- Preliminary Westman Marine Site Boundary; Site Limits to be Determined in the RI/FS
- Structure Over Water

Abbreviations

NE = No Exceedance of Screening Level
PSL = Preliminary Screening Level
COPC = Constituent of Potential Concern
cPAHs = Carcinogenic Polycyclic Aromatic Hydrocarbons
Cu = Copper
As = Arsenic
Hg = Mercury
Zn = Zinc
TPH-D = Diesel-Range Petroleum Hydrocarbons
TPH-G = Gasoline-Range Petroleum Hydrocarbons

Notes

1. COPCs in red are present at concentrations greater than twice the PSL.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 30 60
Scale in Feet

Source: Wilson Engineering 2011, Port of Blaine 2011, Walker and Associates, Inc.

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Westman Marine
Blaine Harbor
Blaine, Washington

Phase II Upland Sample and Groundwater Monitoring Well Locations

Figure 4

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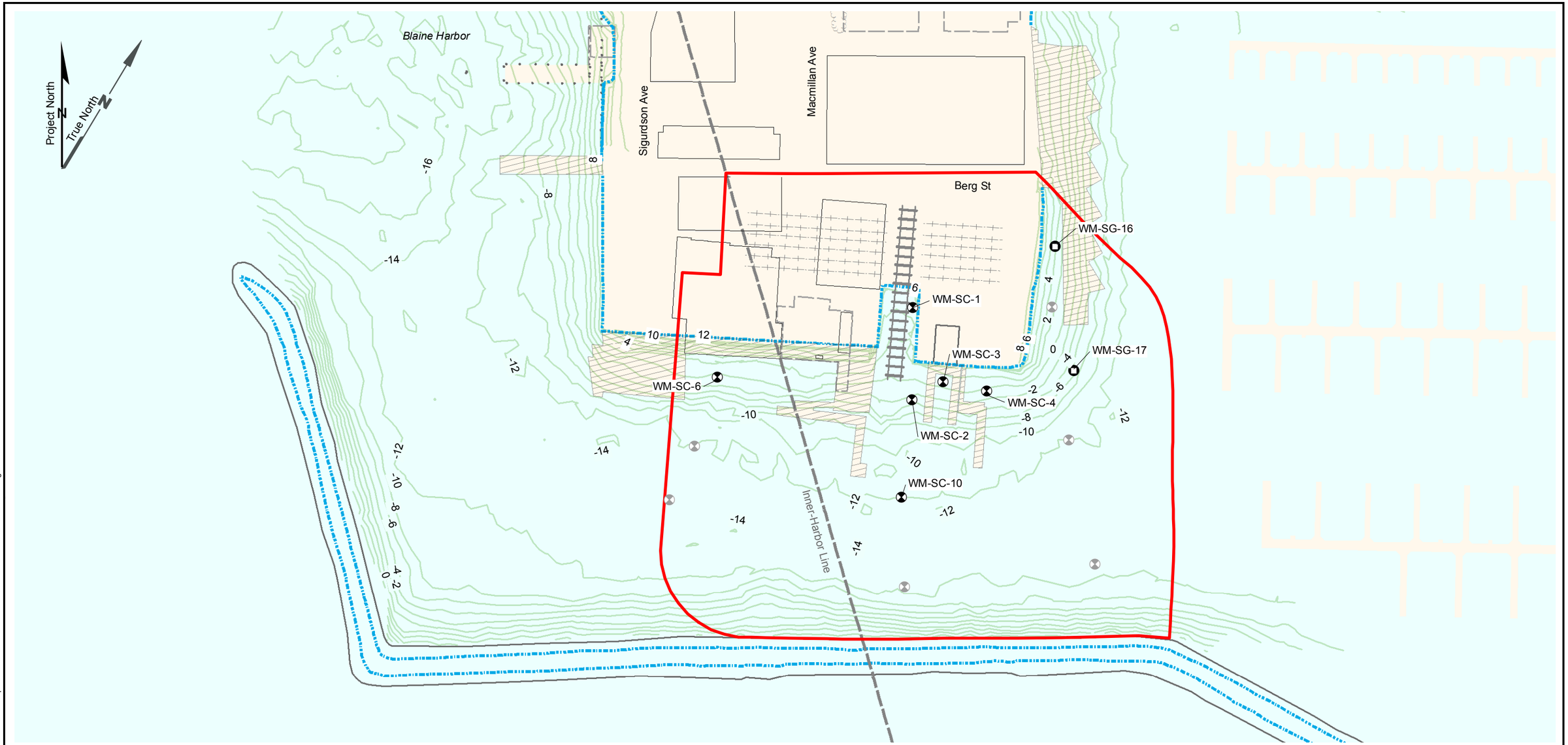

Legend

- Phase II Surface Sediment Sample Location
- Phase II Sediment Core Sample Location
- Phase I Surface Sediment Sample Location
- Preliminary Westman Marine Site Boundary; Site Limits to be Determined in the RI/FS
- Historical Track Location (1966)
- Bathymetric Contours (MLLW)
- Structure Over Water

Sediment Sample Location Coordinates

Name	Northing	Easting
WM-SC-1	732419	1177332
WM-SC-2	732338	1177379
WM-SC-3	732370	1177396
WM-SC-4	732385	1177439
WM-SC-6	732256	1177199
WM-SC-10	732248	1177420
WM-SG-16	732546	1177423
WM-SG-17	732448	1177504

Note

1. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 100 200
Scale in Feet

Source: Wilson Engineering 2011, Port of Blaine 2011, Walker and Associates, Inc.

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Westman Marine Blaine Harbor Blaine, Washington	**Phase II Site Sediment Sample Locations**	Figure 5

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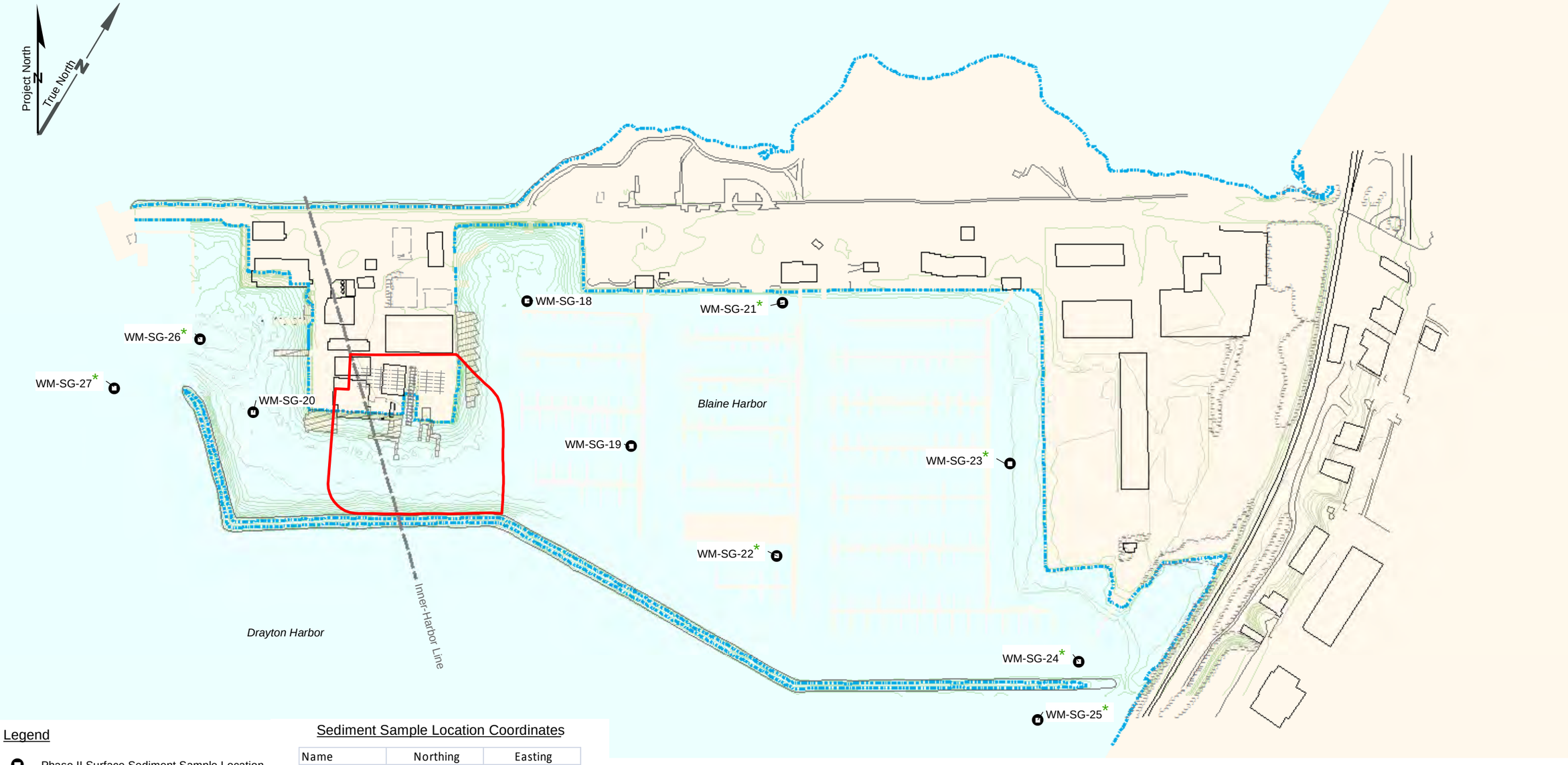

Legend

- Phase II Surface Sediment Sample Location
- Preliminary Westman Marine Site Boundary; Site Limits to be Determined in the RI/FS
- Historical Track Location (1966)
- Bathymetric Contours (MLLW)
- Structure Over Water

Sediment Sample Location Coordinates

Name	Northing	Easting
WM-SG-18	1177466	1177466
WM-SG-19	1177951	1177951
WM-SG-20	1176941	1176941
WM-SG-21	1178116	1178116
WM-SG-22	1178487	1178487
WM-SG-23	1178938	1178938
WM-SG-24	1179414	1179414
WM-SG-25	1179399	1179399
WM-SG-26	1176695	1176695
WM-SG-27	1176552	1176552

Notes

1. * Samples taken from these locations will be archived at the laboratory pending review of other analytical results.
2. Black and white reproduction of this color original may reduce its effectiveness and lead to incorrect interpretation.

0 300 600

Scale in Feet

Source: Wilson Engineering 2011, Port of Blaine 2011, Walker and Associates, Inc.

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Westman Marine Blaine Harbor Blaine, Washington	**Phase II Blaine Harbor Sediment PBT Sample Locations**	Figure 6

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TABLE 1
SUMMARY OF PHASE II REMEDIAL INVESTIGATION SOIL SAMPLE LOCATIONS
WESTMAN MARINE INC. SITE
BLAINE HARBOR – BLAINE, WASHINGTON

Location ID	Location Description	Rationale for Sample Collection	Surface Conditions	Soil Sampling Protocol Overview	Soil Analytical Testing
WM-GP-20 through WM-GP-23	Northeastern portion of the Site Uplands; near WM-GP-14, WM-GP-18, WM-GP-19	Evaluate extent of contamination associated with dark soil with organic sheen and odor from 10 to 12 ft BGS in this area; metals (arsenic, copper, zinc), gasoline-range petroleum hydrocarbons, and cPAHs were above PSLs	Gravel	Collect samples within, above, and below potentially contaminated interval based on field screening; if no indication of contamination, assume 10 to 12 ft BGS is the potentially contaminatd interval	Metals (arsenic, copper, zinc) by EPA Method 6020 Gasoline-range petroleum hydrocarbons by Method NWTPH-G PAHs by EPA Method 8270D SIM
WM-GP-24 through WM-GP-26	East of the marine railway; near WM-GP-10	Evaluate extent of metals (arsenic, copper, mercury, and zinc) and cPAHs that were above PSLs in WM-GP-10	Gravel	Skip surface to 1 ft BGS; collect samples in 1-ft intervals to 10 ft BGS (9 samples)	Metals (arsenic, copper, mercury, zinc) by EPA Method 6020 PAHs by EPA Method 8270D SIM
WM-GP-27 through WM-GP-29	East of the marine railway; near WM-GP-11	Evaluate extent of diesel-range petroleum hydrocarbons and PAHs observed in WM-GP-11 at a depth of approximately 5 to 6 ft BGS	Gravel	Collect samples within, above, and below potentially contaminated interval based on field screening; if no indication of contamination, assume 5 to 6 ft BGS is the potentially contaminated interval	Diesel-range petroleum hydrocarbons by Method NWTPH-Dx PAHs by EPA Method 8270D SIM
WM-GP-30 through WM-GP-32	West of the marine railway; near WM-GP-7	Evaluate extent of metals (arsenic, copper, mercury, and zinc) and cPAHs detected above PSLs in WM-GP-7	Asphalt	Collect samples 1-2, 3-4, 5-6 ft BGS for analysis; collect samples 7-8, 9-10, 11-12, 14-15 ft BGS for archiving	Metals (arsenic, copper, mercury, zinc) by EPA Method 6020 PAHs by EPA Method 8270D SIM

Notes:

1. Additional borings may be required to evaluate the lateral extent of potential contamination in the four areas listed above, as determined by field screening.
2. Soil will be screened in the field for potential contamination as described in the RI Work Plan. Soil exibiting the potential for VOC or gasoline-range petroleum hydrocarbon contamination (PID readings above 5 ppm) will be sampled and analyzed for for these volatile constituents.
3. Soil samples collected for TPH-G or VOC analyses will be collected discretely (not a composite) by EPA Method 5035 from unhomogenized soil.

EPA = U.S. Environmental Protection Agency
BGS = Below Ground Surface
cPAHs = Carcinogenic Polycyclic Aromatic Hydrocarbons
SVOCs = Semivolatile Organic Compounds
TPH-Dx = Total Petroleum Hydrocarbons - Diesel and Motor-Oil Range
TPH-G = Total Petroleum Hydrocarbons - Gasoline Range
VOCs = Volatile Organic Compounds
PSLs = Preliminary Screening Levels
SIM = Selective Ion Monitoring

TABLE 2
GROUNDWATER MONITORING WELL LOCATIONS, RATIONALE, AND ANALYSES
WESTMAN MARINE INC. SITE
BLAINE HARBOR – BLAINE, WASHINGTON

Location ID	Location Description	Rationale for Sample Collection	Groundwater Analytical Testing
WM-MW-1	Northwest area of Site near historical rail side tracks	Evaluate groundwater potentially impacted by previous Site activities along the rail side tracks	**All wells:** -Total metals (arsenic, chromium, copper, lead, and zinc); EPA Method 6020 -Dissolved metals (for total metals detected above PSLs); EPA Method 6020 -Petroleum Hydrocarbon Identification; NWTPH-HCID -NWTPH-G and/or NWTPH-Dx, as follow-up if petroleum hydrocarbons are identified -PAHs; EPA Method 8270D SIM **At WM-MW-6:** -Add SVOCs; EPA Method 8270D SIM **At WM-MW-6 and WM-MW-7:** -Add PCBs; EPA Method 8082
WM-MW-2	East of marine railway; near WM-GP-11	Evaluate groundwater quality near point of discharge to surface water; COPCs including TPH-D and cPAHS detected in soil at WM-GP-11	
WM-MW-3	South of the canopy; near former shop	Evaluate groundwater quality near point of discharge to surface water	
WM-MW-4	West of marine railway beneath canopy; near WM-GP-7	Evaluate groundwater quality near point of discharge to surface water; COPCs including metals and cPAHs detected above PSLs in soil and dissolved arsenic and copper in groundwater grab samples	
WM-MW-5	North of the marine railway well; near WM-GP-9	Evaluate groundwater quality; COPCs detected above PSLs in groundwater grab samples at WM-GP-9 include cPAHs and dissolved arsenic	
WM-MW-6	West of the marine railway; near WM-GP-12	Evaluate groundwater quality near point of discharge to surface water; COPCs including metals, cPAHs, and PCP detected above PSLs in soil, and dissolved arsenic, dissolved copper, and PAHs (only acenaphthene) above PSLs in the groundwater grab sample	
WM-MW-7	East of the marine railway, southern portion of the uplands	Evaluate groundwater quality near the point of discharge to surface water potentially impacted by activities in the Site uplands east of the marine railway	
WM-MW-8	East of the marine railway in the northeastern portion of the Site	Evaluate groundwater quality near WM-GP-14 and WM-GP-18; COPCs detected above PSLs in this area include metals, TPH-G, and cPAHs in soil	

cPAHs = Carcinogenic Polycyclic Aromatic Hydrocarbons
PAHs = Polycyclic Aromatic Hydrocarbons
PCBs = Polychlorinated Biphenyls
SVOCs = Semivolatile Organic Compounds
TPH-D = Total Petroleum Hydrocarbons - Diesel and motor-oil range
TPH-G = Total Petroleum Hydrocarbons - Gasoline Range
PCP = Pentachlorophenol

TABLE 3
PROPOSED SURFACE SEDIMENT SAMPLE LOCATIONS AND RATIONALE
WESTMAN MARINE INC. SITE
BLAINE HARBOR – BLAINE, WASHINGTON

Location ID	Location Description (a)	Rationale for Sample Collection	Sediment Analytical Testing
Surface Sediment Samples - General Chracterization			
WM-SG-16	WM-SG-16 is in the northwest corner of the in-water portion of the Site between previous sample location WM-SG-15 and the shoreline near the sawtooth dock. Sample collection may be revised in the field based on the presence of riprap but will be collected as close to the indicated location as possible.	Evaluate sediment quality between the Site uplands and WM-SG-15 to evaluate whether metals at WM-SG-15 are related to Site releases	Metals (cadmium, chromium, copper, lead, and zinc) and conventional parameters
WM-SG-17	South of the sawtooth dock.	Evaluate sediment quality in area between where most COPCs were detected and WM-SG-15 to evaluate whether metals at WM-SG-15 are related to Site releases	Metals (cadmium, chromium, copper, lead, and zinc) and conventional parameters
Surface Sediment Samples - PBT Chracterization			
WM-SG-18, WM-SG-19, and WM-SG-20	WM-SG-17 is northeast of the preliminary Site boundary near the historical tide grid; WM-SG-18 is east of the Site; WM-SG-19 is west of the preliminary Site boundary	Evaluate PBTs.	PAHs, PCBs, and conventional parameters
WM-SG-21 and WM-SG-22	Northeast and southeast of the preliminary Site boundary in the greater Blaine Harbor area	Archive Samples: Evaluate PBTs at both of these locations if PBT PSL exceeded in WM-SG-18 or WM-SG-19	PAHs, PCBs, and conventional parameters
WM-SG-23 and WM-SG-24	East of the preliminary Site boundary near the eastern boundary of Blaine Harbor (WM-SG-22) and southest of the preliminary Site boundary just inside the southeast corner of Blaine Harbor (WM-SG-23)	Archive Samples: Evaluate PBTs at both of these locations if PBT PSL exceeded in WM-SG-21 or WM-SG-22	PAHs, PCBs, and conventional parameters
WM-SG-25	Southeast of the preliminary Site boundary; outside the southeast corner of Blaine Harbor	Archive Samples: Evaluate PBTs if PBT PSL exceeded in WM-SG-24	PAHs, PCBs, and conventional parameters
WM-SG-26 and WM-SG-27	West of the preliminary Site boundary just inside (WM-SG-25) and just outside (WM-SG-25) the western entrance of Blaine Harbor	Archive Samples: Evaluate PBTs in WM-SG-26 if PBT PSL exceeded in WM-SG-20 Evaluate PBTs in WM-SG-27 if PBT PSL exceeded in WM-SG-26	PAHs, PCBs, and conventional parameters
Sediment Core Samples (b)			
WM-SC-1 (and WM-SG-1)	In the sediment along the eastern boundary of the marine railway inlet	Evaluate sediment conditions within the marine railway well	Metals, SVOCs, PCBs, conventional parameters, bulk organotins (c)
WM-SC-2 (and WM-SG-2)	Along the marine railway, approximately 100 ft south of WM-SC-1; near historical sampling location BH-02	Evaluate sediment conditions along the marine railway alignment outside of the marine railway well; evaluate changes in conditions over time by comparing results to historical data from BH-02	Metals, SVOCs, PCBs, conventional parameters, bulk organotins (c)
WM-SC-3 (and WM-SG-3)	At the travel lift pier	Evaluate sediment conditions associated with the activity at the travel lift pier	Metals, SVOCs, PCBs, conventional parameters, bulk organotins (c)
WM-SC-4 (and WM-SG-4)	Near southeast corner of the uplands; east of the travel lift; near historical sampling location BH-03	Evaluate sediment conditions near the shore; evaluate changes in sediment conditions over time by comparing results to historical data from BH-03	Metals, SVOCs, PCBs, conventional parameters, bulk organotins (c)
WM-SC-6 (and WM-SG-6)	South of the upland area of the Site; west of the former shop	Evaluate sediment conditions near the shore associated with historical Site uses	Metals, SVOCs, PCBs, conventional parameters, bulk organotins (c)
WM-SC-10 (and WM-SG-10)	Approximately 130 ft south of the marine railway well	Evaluate sediment conditions away from the immediate vicinity of the uplands area	Metals, SVOCs, PCBs, conventional parameters, bulk organotins (c)

Notes:
(a) Directions in this table are provided in reference to "Map North." Figures for this work plan are oriented to the northwest.
(b) Surface sediment samples already collected at these sediment core locations. Proposed samples and analyses remain unchanged from RI Work Plan.
(c) Organotin analyses from sediment core sample locations will be analyzed from bulk samples.

SVOCs = Semivolatile organic compounds
PCBs = Polychlorinated biphenyls
Metals = Arsenic, cadmium, chromium, copper, lead, mercury, silver, zinc except where otherwise noted
PAHs = Polycyclic aromatic hydrocarbons

Conventional Parameters = Grain size, total organic carbon, total volatile solids, total solids, ammonia, and total sulfides