

**Final Long-Term Monitoring and Reporting Plan
Olympic View Resource Area
Non-Time-Critical Removal Action
Tacoma, Washington**



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Tacoma

**Prepared for
The City of Tacoma**

Work Order DC 1098

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**FINAL LONG-TERM MONITORING AND REPORTING PLAN
OLYMPIC VIEW RESOURCE AREA
NON-TIME-CRITICAL REMOVAL ACTION
TACOMA, WASHINGTON**

1.0 INTRODUCTION

This document presents the Long-Term Monitoring and Reporting Plan (LMRP) for the Olympic View Resource Area (OVRA) Removal Action located in Tacoma, Washington (Figure 1). The City of Tacoma (City) completed sediment excavation and capping for the OVRA Removal Action in 2002, and submitted a Removal Action Completion Report (RACR) to the U.S. Environmental Protection Agency (EPA) on March 28, 2003. The EPA issued final approval of the RACR on March 31, 2003. All design, construction, and reporting tasks for the OVRA Removal Action were completed in accordance with requirements of an Administrative Order on Consent (AOC – Docket Number CERCLA 10-2001-0069 dated July 24, 2001) between the City and EPA.

1.1 Purpose and Scope of the LMRP

This LMRP describes physical and chemical monitoring to be completed at the OVRA site for 5 years following construction for the Removal Action. The LMRP sets forth specific performance standards for planned physical and chemical monitoring activities to demonstrate that long-term objectives for the project are being met. The LMRP also details the process for contingency planning and response in the event that performance standards are not met.

The need for continued monitoring will also be evaluated during EPA's 5-year review of the OVRA site, and the LMRP will be revised as necessary. As discussed in Section 6.3, the 5-year review will provide a basis for evaluating the long-term monitoring program and making any adjustments that may be necessary.

1.2 OVRA Habitat Monitoring and Adaptive Management Plan

A separate Monitoring and Adaptive Management Plan (MAMP) was developed during the design phase of the OVRA Removal Action to assess the success of habitat restoration efforts. Monitoring described in the MAMP will occur for 5 years following completion of construction for the Removal Action in 2002. The MAMP and associated habitat monitoring are not specified deliverables in the AOC. MAMP monitoring and related activities are being implemented in accordance with a separate Consent Decree between the City and Natural

Resource Trustees. The MAMP monitoring results will be reviewed by the Natural Resource Trustees. The MAMP includes qualitative and quantitative sampling methods to monitor cap/backfill substrate performance with regard to habitat restoration objectives. Monitoring for the MAMP will evaluate the long-term progress of restoration of ecological functions, including eelgrass and riparian zone components.

1.3 LMRP Organization

The remainder of this LMRP contains the following sections:

- 2.0 Project Objectives and Monitoring Strategy;
- 3.0 Performance Standards and Early Warning Levels;
- 4.0 Physical Integrity Monitoring;
- 5.0 Surface Sediment Quality Monitoring;
- 6.0 Reporting Schedule;
- 7.0 Contingency Planning and Response; and
- 8.0 Site Access and Institutional Controls.

Supporting figures and tables are presented at the end of the LMRP text. A schedule of planned monitoring and reporting deliverables is presented on Figure 2. Appendix A presents a Sampling and Analysis Plan (SAP) for monitoring activities described in this LMRP. The SAP is excerpted from the December 10, 2001, Construction Quality Assurance Plan for OVRA construction. The SAP includes a Field Sampling Plan (FSP), Quality Assurance Project Plan (QAPP), and Health and Safety Plan (HSP). Revisions to these documents pertinent to the LMRP are described in the preface to Appendix A.

2.0 PROJECT OBJECTIVES AND MONITORING STRATEGY

The removal action objective for the OVRA, as described in the 2001 AOC and EPA's 2001 Action Memorandum, is to:

- Significantly reduce the potential risk to human health and/or marine ecological receptors resulting from potential exposure to contaminants present in sediments by removing and disposing of the contaminated

sediment at an acceptable disposal site, or capping contaminated sediments in the project area.

As approved by EPA in the March 28, 2003, Removal Action Completion Report, the objectives of the AOC and supporting design were achieved, including:

- Removal or long-term isolation of chemical materials from the environment; and
- Elimination or significant reduction of potential human health and environmental risks.

The goals of the long-term monitoring program for the OVRA are to ensure that the selected cleanup action continues to be protective of human health and the environment. The specific objectives of the long-term monitoring program are to ensure that:

- The sediment cap continues to isolate toxic concentrations of previously identified chemicals of concern (COCs) in underlying sediments from marine biota and other biological receptors; and
- The sediment cap is not recontaminated with COCs from underlying sediments.

The integrity of the capped areas is fundamental to achieving these objectives. Cap integrity depends upon maintaining the designed cap thickness to avoid potential contaminant releases, and to attain the specific performance standards discussed below. To ensure cap integrity, the LMRP includes the following:

- **Physical Integrity Monitoring.** Physical integrity monitoring will ensure that the erosion is not occurring to an extent that would compromise the ability of the cap to physically isolate contaminated sediments from environmental receptors. Bathymetric and/or conventional transect surveys are planned to detect erosion.
- **Surface Sediment Quality Monitoring.** Sediment quality monitoring will be conducted to confirm that contaminants are not moving upward to the top of the cap via diffusion or other transport mechanisms.

Monitoring results will be used to determine whether project objectives are being met, or when contingency measures are needed to address deficiencies noted.

The City of Tacoma is responsible for conducting long-term monitoring at the OVRA site. The City will notify EPA and the Natural Resource Trustees at least 3 weeks prior to all planned monitoring activities. The City will schedule such activities to accommodate EPA and Trustee participation, if requested.

3.0 PERFORMANCE STANDARDS AND EARLY WARNING LEVELS

The LMRP establishes the performance standards that will be used to assess whether the long-term monitoring objectives continue to be met at the OVRA site. These objectives are described above in Section 2.0. The following section establishes performance standards for the physical integrity and surface sediment quality of capped areas at the OVRA site. Capped areas are identified on Figure 3 and include intertidal Areas A, B, C-5, and D; and subtidal Area E. Although monitoring will also include portions of intertidal backfill Area C, and uncontaminated Area G, specific performance standards do not apply to these areas because they are not capped. Non-attainment of the performance standards will be considered an indication that the containment function of the caps has failed, and will trigger discussions with the EPA through the Contingency Planning and Response process described below in Section 7.0. The listed performance standards are based on the design and constructed cap thicknesses summarized in Table 1.

Also listed are early warning levels to provide notice of potential problems at individual locations. Early warning levels are not performance standards, but are set at more stringent levels to assess whether performance standards could be exceeded in the future.

Performance standards apply to all physical integrity and surface sediment chemical quality monitoring events. This includes physical integrity monitoring conducted following major storm and earthquake events, as well as scheduled events described in Section 4.0 and Section 5.0.

3.1 Physical Integrity Monitoring

3.1.1 Performance Standards

The performance standard for the Area A, B, D, and E caps is maintenance of minimum cap thickness that are equal to or greater than the minimum design thickness listed in Table 1.

The performance standard for the Area C-5 cap is loss of more than 6 inches, including erosion protection material overlying the capped area. This

performance standard is established to protect the underlying 24-inch thickness of sand material over an area with relatively low levels of residual dioxins detected during sediment confirmation sampling (34.8 nanograms per kilogram dioxin TEQ). The constructed thickness of the underlying sand material exceeds the minimum design standard thickness components for bioturbation protection, physical/chemical isolation, and nominal consolidation detailed in the Table 1 footnotes.

3.1.2 Early Warning Levels

- **Intertidal Area A, B, and D Caps.** Two early warning levels are established at a loss of more than 6 inches of cap thickness, and a loss of more than 12 inches of cap thickness. For Area B and Area D, which cap dioxin-contaminated sediments, a 12-inch loss would still maintain an 11-inch-thick buffer above the minimum cap design thickness of 32 inches (see Table 1).
- **Subtidal Area E Cap.** One early warning level is established at a loss of more than 12 inches of cap thickness.

Section 7.0 describes possible response contingency measures for each of these early warning levels.

Intertidal beach elevations at selected transect locations in Area C and Area G will be also be monitored to detect potential backfill erosion over time that could affect adjacent capped areas. No specific performance standards or early warning levels are established for non-capped areas, however.

3.2 Surface Sediment Quality Monitoring

OVRA site Sediment Quality Criteria (SQC) for COCs were established in the April 30, 2001, Engineering Evaluation/Cost Analysis (EE/CA) report. SQCs for OVRA site areas are listed in Table 2. For dioxin, the SQC of 20 nanograms per kilogram was established to achieve a post-construction site-wide background average dioxin concentration of approximately 6.9 ng/kg in surface sediments. As discussed in EPA's July 16, 2001, Action Memorandum, this concentration is less than the site-specific background level of 7.4 ng/kg.

EPA determined in the EE/CA that the site SQCs are sufficiently protective of human health and the environment, such that biological standards are not included in the long-term monitoring requirements.

3.2.1 Performance Standards

Long-term performance standards for the OVRA site are based on the SQCs listed in Table 2 for applicable COCs in each site area. Exceedance of SQCs will be considered as failure of the caps to contain site chemical contamination, provided that such failures are determined to originate from on-site releases.

3.2.2 Early Warning Levels

The early warning level is one-half the applicable SQCs listed for each area in Table 2.

4.0 PHYSICAL INTEGRITY MONITORING

Physical integrity monitoring includes periodic elevation surveying of the surfaces of capped and backfilled areas. Changes to surface elevations will be monitored to evaluate net sediment erosion or accumulation over time. Monitoring in capped areas will ensure that the containment properties of the cap are not compromised by erosion or other physical disturbance.

Planned elevation survey transects for the intertidal area are shown on Figure 3. In addition to elevation surveys, visual surveys will also be conducted in the intertidal area. Subtidal elevations surveys will include Area E as shown on Figure 3.

4.1 Elevation Surveys and Intertidal Visual Inspections

4.1.1 Frequency

As summarized on Figure 2, elevation surveys for intertidal and subtidal areas will generally be performed annually during Years 1 (2003), 3 (2005), and 5 (2007). Except for Year 1 (2003), elevation surveys for the intertidal areas will be conducted within a 1-month work window in April of each target monitoring year. The elevation survey for Year 1 (2003) is planned within an approximate 6-week time period after EPA approval of the LMRP. For subtidal Area E, annual elevation surveys during Years 1, 3, and 5 will be conducted in August.

Visual inspections in the intertidal zone will be conducted twice annually during Year 2 (2004) through Year 5 (2007). One visual inspection for the intertidal zone will be conducted in Year 1 (2003). As for the elevation surveys, visual inspections will be scheduled during April and August, except for Year 1 (2003) where only one visual inspection will be conducted in August. For Year 3 and

Year 5, the first visual inspections will be scheduled to coincide with the April elevation surveys to provide consistency of data for use in time trend evaluation. The second visual inspection for Years 3, and 5 will be conducted within a 4-week window in August. As practical, elevation surveys and visual inspections for the intertidal area will be scheduled to coincide with planned habitat monitoring described in the MAMP.

Intertidal visual inspections and survey results may also warrant additional monitoring events, particularly following extreme tide storm events. Should any major storm or earthquake of significance occur, an elevation survey coupled with a visual inspection will be conducted as soon as possible after the event. Significant storm events are defined as those in which winds from the north with speeds of 30 miles per hour or greater persist for more than 4 hours.

All intertidal elevation and visual inspections will be conducted during low-tide conditions that expose the beach at elevations of 2 feet or lower during the April event, and to elevations of 0 feet or lower during the August event (Corps of Engineers Vertical Datum).

4.1.2 Methods

Intertidal Areas

Visual Inspections and Video/Photo Log. Visual inspections will consist of observing the exposed intertidal areas of the OVRA site. The inspections will document and photograph and/or videotape pertinent physical and biological features. Details to be noted include general contours and topography of the site; the color, texture, and odor of surface sediments; the presence of observable biological communities and all organisms and indication of organisms; and the presence and locations of special, unusual, or abnormal features. The visual inspection will also note any indications of erosion, gully, raveling, groundwater seepage, damage from debris, moorage, etc. In intertidal capped areas and other locations where erosion protection rock was placed, monitoring will include qualitative evaluations of the nature and extent of the coverage and distribution of the rock.

Elevation Surveys. Elevation surveys in the intertidal areas will be conducted using land-based equipment along intertidal transect lines T1 through T4 between approximately elevation 0 to 14 feet (Figure 3). Each transect contains eight to ten survey points and includes a minimum of two points in capped Areas A, B, C-5, and D. The City will establish permanent benchmarks as necessary for survey reference points. Concurrent with the transects survey, the

City's field representative will conduct a visual inspection along and between the transects, noting special or unusual features in the field log book.

Elevation surveys for intertidal areas will be accomplished using conventional land-based surveying or Electronic Positioning System (EPS) methods. Survey methods will have a horizontal accuracy of 1 foot or better. Vertical control will be established with an accuracy of 0.1 foot or better. Survey data management by the City will include electronic files with survey dates, survey point designations, transect numbers, and X, Y, Z coordinates referenced to control points and coordinate systems.

Subtidal Area E

Hydrographic Surveys. The subtidal survey for Area E will be conducted using bathymetric methods from a vessel. The horizontal control for this system will meet Third Order, Class I standards as defined in standard hydrographic survey manuals. Hydrographic surveys will be performed using EPS methods for determining locations within an accuracy of 3 feet (1 meter) or better. Vertical accuracy will vary depending on slope and water depth, but accuracies in the range of 0.5 foot are typical. Survey equipment will be maintained and calibrated prior to each monitoring event.

4.2 Data Analysis

Topographic and transect profiles will be generated for the intertidal area from raw survey elevation data using a computer-aided drafting system. The survey transect data will be entered into tables for comparison to previous survey data, and to track elevation changes over time. Net elevation changes from the post-remedial performance elevation survey baseline data will be compared with erosion performance standards and early warning levels specified above. The Year 1 survey should be compared to the post-remedial elevation survey to ensure that the Year 1 survey points are adequately representative of the survey points that were used during the post-construction elevation survey. If survey points are not adequately represented, the Year 1 survey may be used as baseline only with EPA approval. Time-series bathymetric maps will be generated using hydrographic survey data from subtidal Area E.

A summary of the visual inspections and video logs from intertidal area will be prepared and included in monitoring reports. Comparison to previous visual survey observations will be documented.

5.0 SURFACE SEDIMENT QUALITY MONITORING

Surface sediment quality monitoring will be completed to verify that the capped areas are performing as intended to chemically isolate residual contaminants from the environment. Analytical results will be compared with performance standards and early warning levels based on the OVRA site SQCs presented in Table 2. These criteria are also considered to be protective of benthic organisms.

In addition, sediment quality monitoring data will be compared with post-construction confirmation sampling results collected in 2002 from excavated sediment surfaces in Areas A, B, C, and D. Results of the post-construction sampling event are presented in the March 28, 2003, RACR.

5.1 Surface Sediment Sampling

5.1.1 Frequency and Locations – Capped Areas

As summarized on Figure 2, long-term monitoring for surface sampling in capped areas will generally be performed during Year 1 (2003), Year 3 (2005), and Year 5 (2007). Sampling will be conducted within the August work window for intertidal and subtidal areas. Planned sampling for each year is further summarized below by year and sample grid area. Sample area grids are identified on Figure 4. The listed grids for the intertidal capped areas were previously established for the purpose of construction confirmation sampling.

Year 1 (2003)

- Intertidal capped area grids A-1, A-2, B-1, B-2, C-5, and D-1; and
- Subtidal capped area grid E-1.

Year 2 (2004)

- No cap sampling planned.

Year 3 (2005)

- Intertidal capped area grids A-1, A-2, B-1, B-2, C-5, and D-1; and
- Subtidal capped area grid E-2.

Year 4 (2006)

- No cap sampling planned.

Year 5 (2007)

- Intertidal capped area grids A-1, A-2, B-1, B-2, C-5, and D-1; and
- Subtidal capped area grid E-3.

5.1.2 Frequency and Location – Area C Backfill Grids

Additional sampling in grids C-9 and C-10 of Area C will occur in Years 1, 2, and 5 to evaluate the potential for off-site migratory contamination related to remediation in an adjacent part of the Middle Waterway Problem Area (Figure 4). Remediation for this portion of the Middle Waterway is planned for 2003. Sampling in Area C grids C-9 and C-10 is intended to verify that metals recontamination is not occurring at the OVRA site following the Middle Waterway remediation. Grids C-9 and C-10 are directly adjacent to the Middle Waterway remediation area. The purpose of Year 1 (2003) sampling is to provide baseline data from which to compare future sediment quality monitoring results following Middle Waterway remediation. Sampling for Year 1 (2003), Year 2 (2004), and Year 5 (2007) will be completed during the annual August work window for sampling intertidal capped areas at the OVRA site.

5.1.3 Sampling and Analysis Methods

Surface samples of sediment will be collected from each grid at depths of 0 to 10 centimeters, in general accordance with protocols outlined in the Puget Sound Estuary Program (Tetra Tech 1986). Details are specified in the SAP in Appendix A. Each sample will be composited from at least three individual “aliquot” surface locations within the sampling grid and chosen at random at the time of sampling. This method is analogous to collection of confirmation samples during construction for the OVRA Removal Action in 2002. Sampling protocols, location control, analytical methods, and data validation procedures are presented in the SAP in Appendix A. Samples from each grid will be submitted for chemical analysis of the applicable COCs listed below.

5.1.4 Chemical Analytes

The chemical analytes for long-term monitoring of the cap areas will be the same as those analyzed as part of the chemical confirmation sampling and analysis performed following construction. The chemical analytes include the following:

- Area A – total metals (arsenic, copper, lead, mercury, and zinc);
- Area B – dioxin and polychlorinated biphenyls (PCBs); and
- Areas C-5, D, and E – dioxin.

In addition, Areas C-9 and C-10 adjacent to the Middle Waterway Problem Area will be analyzed for arsenic, copper, mercury, and zinc. These metals are the COCs identified at the portion of the Middle Waterway Problem Area lying east of the OVRA site.

5.2 Data Analysis

Chemical testing results for surface sediment samples from the cap and backfill areas will be compiled with quality assurance review qualifiers into summary tables. Summary tables of the data will also contain the OVRA site SQCs for the COCs analyzed, results of the 2002 confirmation sampling event, and results of previous long-term monitoring events, for each chemical. Any exceedances of the SQCs will be highlighted in summary tables. Summary tables will be included in sediment quality monitoring reports to be submitted to EPA, as discussed below.

6.0 REPORTING SCHEDULE

Figure 2 presents the reporting schedule for the project, in addition to the sampling events described previously. Monitoring reports and content are summarized below. In addition to EPA, reports will also be forwarded to Washington State Department of Ecology and the NOAA Damage Assessment and Restoration Center.

6.1 Annual Reports – Year 1 (2003), Year 3 (2005), and Year 5 (2007)

Draft annual reports will be submitted by early December for Years 1, 3, and 5 to summarize the combined results of elevation surveys, visual inspections, and sediment quality sampling. Sediment quality sampling will include results from capped intertidal grids in Areas A, B, D, and C-5, as well as from subtidal Area E-1. Results from backfill Area C grids C-9 and C-10 will also be included. The target delivery dates in early December listed on Figure 2 schedule are necessary to allow sufficient time for laboratory analysis of dioxins, related QA/QC, and data validation. The target delivery dates may be modified based on approval by EPA in the event that additional sediment sampling or other

contingency response actions become necessary. Final reports will be submitted pending EPA's review.

The reports will include:

- Summaries of field observations from all inspection, survey, and sediment sampling events;
- Photographs and video records;
- Compiled survey data and transect profiles;
- A summary of field sampling activities and samples collected;
- Field sampling logs;
- Tabulated chemical testing data,
- QA/QC and data validation results; and
- Complete laboratory analysis reports.

The reports will present summary conclusions regarding performance of the capped areas with regard to performance standards and early warning levels. As applicable, the reports will discuss exceedances of applicable SQC performance standards and early warning levels, as well as a summary of any contingency planning and response actions taken.

The final visual inspection, survey monitoring, and sediment quality monitoring reports for Year 5 will also include overall conclusions regarding the performance of the cap areas for the OVRA project.

6.1.1 Major Storm/Earthquake Reports

If major storm or earthquake events occur, a report will be submitted to EPA within 30 days of completing requisite monitoring and surveying, as described above in Section 3.0. The reports will include summaries of field observations from the inspections, surveys, and compiled survey data.

6.2 Annual Reports – Year 2 (2004) and Year 4 (2006)

The Year 2 annual report will include discussion of visual monitoring results and sediment sampling for Area C grids C-9 and C-10. No other sampling or

monitoring tasks are scheduled. The target report submittal date is in mid-October, following completion of the August 2004 visual inspections and Area C sediment sampling. The Year 2 report will include results of visual monitoring only (no other monitoring activities are scheduled), and is plan to be submitted by mid-August.

6.3 EPA 5-Year Review

EPA conducts 5-year reviews at sites when hazardous substances, pollutants, or contaminants remain on site above concentrations that allow for unlimited use and unrestricted exposure. For the OVRA site, these 5-year reviews are tied to the start of the Removal Action in May 2002. The primary purpose of a 5-year review is to determine whether the cleanup continues to be protective of human health and the environment. A 5-year review will be conducted for the OVRA because the area is included within the boundaries of the Commencement Bay Nearshore/Tideflats (CB/NT) Superfund site, the cleanup was performed pursuant to CERCLA authorities, and hazardous substances remain on site above concentrations that allow for unlimited use and unrestricted exposure. The 5-year review will also evaluate the need for additional monitoring at the OVRA site based on previous monitoring results.

Consistent with EPA's 2001 Comprehensive Five-Year Review Guidance (EPA 540-R-01-001, No. 9355.7-03B-P), the 5-year review for the Olympic View Resource Area will be incorporated into the overall 5-year reviews for the CB/NT site. The next 5-year review for the CB/NT site is currently scheduled for December 2004.

7.0 CONTINGENCY PLANNING AND RESPONSE

In the event that physical integrity or sediment quality monitoring indicates that performance standards or early warning levels are not being met, the City will notify EPA and implement contingency planning. In addition to EPA, notifications and reports will also be forwarded to Washington State Department of Ecology and the NOAA Damage Assessment and Restoration Center. The contingency planning process is summarized on Figure 5 and consists of three parts: (1) contingency screening, (2) contingency planning, and (3) contingency response. These elements are summarized below.

EPA may direct the City to expedite contingency planning and response in the event that immediate actions are necessary to protect human health and the environment. Required actions may also be readily apparent and can be

implemented without further monitoring or completion of extensive remedial alternatives analysis/design.

7.1 Contingency Screening

The contingency screening process is initiated by exceedances of either physical or chemical performance standards or early warning levels listed in Section 3.0. The City will notify EPA of such conditions within 3 days upon receipt and preliminary analysis of field survey or validated laboratory analytical data documenting the condition. Draft summary documentation of the conditions will be forwarded to the EPA as part of the notification process. For physical monitoring, the City may elect to resurvey to confirm results.

Following notification, the City will discuss the monitoring results with EPA to determine whether further data verification may be appropriate (e.g., additional surveying, resampling, or other response actions). The purpose of additional surveying and/or sampling is to confirm the initial data and further determine the extent of the affected area. Additional surveying could include, but is not limited to, more frequent surveys, additional survey points along given transects, or new survey points or transect lines. Additional sediment sampling could include, but is not limited to, resampling or more frequent sampling in currently identified locations, and sampling at additional locations. Additional survey information and/or validated laboratory analytical data will be forwarded to EPA within 3 days of receipt.

EPA may also determine that no additional data verification is needed to proceed to the contingency planning stage.

7.2 Contingency Planning

Unless otherwise directed by EPA, the City will submit a Contingency Planning Proposal following notification that a performance standard or early warning level has been exceeded. The Contingency Planning Proposal will describe plans and contingency response actions to be taken, if necessary, to address the problems identified at the contingency screening stage. The Contingency Planning Proposal will include the type of action to be initiated and a proposed schedule for implementation. Contingency planning may also anticipate results of future monitoring or potential cap failure. The schedule for submitting the Contingency Planning Proposal will be determined by EPA.

The initial Contingency Planning Proposal may be conceptual in nature, with further revisions completed if necessary and as directed by EPA. EPA will establish a schedule for submittal of the proposal and possible revisions,

depending on the nature and complexity of the conditions noted. EPA will then determine whether to (1) implement the recommended action at the contingency response stage (described below), (2) defer implementation (e.g., based on results of future monitoring), or (3) refrain from further action at that time.

Specific response actions will be determined as part of the Contingency Planning Proposal and approved by EPA. For early warning levels established for intertidal Areas A, B, and D, response actions to address cap thickness losses of more than 6 inches may include resurveying or increased survey frequency of the affected cap area. Losses exceeding 12 inches could trigger increased survey effort, more-detailed visual or physical characterization of the affected area, or other actions as determined at the time of the work.

7.3 Contingency Response

Following EPA approval of the Contingency Response Proposal, the City will implement the agreed-upon actions. This will include agreement on a final implementation schedule, follow-up contingency actions and related confirmation monitoring, and reporting/documentation. EPA may revise or amend the AOC/SOW for the OVRA project as necessary to describe the contingency response process and actions taken.

8.0 SITE ACCESS AND INSTITUTIONAL CONTROLS

The City will continue to maintain site access and related institutional controls during the 5-year monitoring period and beyond. These controls include:

- Designation as a City Natural Resource Damage Assessment (NRDA) Settlement Site;
- Designation as a Washington State Department of Natural Resources (DNR) Environmental Reserve – the City will continue to work with DNR to ensure that this designation remains in place;
- Execution of a 30-year lease with DNR by the City to maintain access and control over the capped areas;
- Creation of a U.S. Coast Guard Regulated Navigation Area (RNA); and

- Development of signage postings in the upland portion of the site to limit disturbance by the general public, and establishing off-shore buoys per Coast Guard requirements to prohibit moorage or anchorage.

The objective of the OVRA site institutional controls is to prohibit activities that would disturb the capped areas of the site. These controls were developed based on reasonably expected future uses of the site for non-commercial purposes. Navigation of vessels through the area will continue to be allowed.

Consistent with EPA's September 2000 Institutional Controls Site Manager's Guide (OSWER 9355.0-74FS-P, EPA 540-F-00-005), OVRA site institutional controls (1) provide a layered approach by applying several types of administrative measures and (2) ensure long-term protection. Consistent with the EPA guidance document, designations of the OVRA site as a NRDA Settlement Site, Environmental Reserve, and RNA represent governmental controls and restrictions over site uses. Sign posting controls are informational devices to provide notification of site conditions.

8.1 NRDA Settlement Site

The City of Tacoma signed a Consent Decree with the Commencement Bay Natural Resource Trustees establishing this site (among others) as a settlement site. This decree places many long-term institutional controls on the site that must be implemented by the City. Chief among these are:

- Prohibitions against taking, or permitting another to take, any action that may jeopardize the function of the restored areas; and
- Deed restrictions and/or equivalent methods to prevent any land use on the site at odds with the project goals.

Most, if not all, potential threats to the Removal Action are addressed by these NRDA Consent Decree restrictions.

8.2 DNR Environmental Reserve

On May 24, 2000, the State Commissioner of Public Lands established the OVRA project area as part of an environmental reserve under RCW 79.68.060. The reserve is administered by the DNR to protect regionally valuable aquatic resources from further commercial use and potential development or commercial leasing. DNR is further evaluating the OVRA site in 2003 using evaluation criteria detailed in DNR's Final Environmental Impact Statement for

the Aquatic Reserve Program (Programmatic EIS). A Technical Advisory Committee will also be convened to review the reserve status of the OVRA site.

8.3 City of Tacoma Long-Term Lease

In December 2002, the City of Tacoma executed a 30-year lease with DNR to cover the capped areas of the OVRA project site. This lease will allow the City to maintain access to and control over the project site during long-term monitoring. The lease includes provisions for additional periods after the first 30 years if additional monitoring and/or corrective action are required by EPA.

8.4 Coast Guard RNA

The Coast Guard has established a permanent RNA in Commencement Bay to preserve and protect the integrity of the OVRA site. The RNA was issued as a Final Rule under 33 Code of Federal Regulations Part 165 as presented in Federal Register Volume 68, No. 70 (April 11, 2003). The RNA prohibits activities that would disturb the sea bed, such as anchoring, dredging, spudding, laying cable, or other disturbance of the bottom. The regulated area is identified on the LMRP figures. The Coast Guard is responsible for enforcing provisions of the RNA, while the City and DNR share in the responsibility for visually monitoring the site for non-compliance with the RNA.

8.5 Public Access, Signage, and Marker Buoys

The City is installing signs to inform the public of the need to limit any disturbance on upland, intertidal, and offshore areas of the site. Signs in upland areas will take the form of educational displays, prominently visible to the general public from land areas of the site. The content of this signage will discuss the project and clearly encourage the public to avoid any disturbance of the site. Signs at the waterward edge will consist of signs prohibiting any moorage or anchorage. The City will maintain the signs and ensure that they remain in place.

Figure 6 identifies locations of off-shore buoys installed on June 28, 2003 to mark the RNA for the OVRA site. These buoys conform to requirements described in CFR Title 33 Part 66, Private Aids to Navigation (PATON). The PATON buoys are orange and white regulatory markers having a cross within a diamond and the words "EXCLUSION AREA" in black letters to indicate the area for boaters. This will protect off-shore areas of the OVRA site from any disruptions resulting from vessel traffic, such as dragging anchor. Following procurement of the buoys by DNR, the City will continue to maintain the buoys

and ensure that they remain in place. The buoys have been authorized by the U.S. Coast Guard Aids to Navigation & Waterways Management Branch.

A mock-up of the public information sign is presented in Appendix B. This sign will be placed at the end of the public access walkway and is approximately 2 by 3 feet. In addition to the public information sign, four additional signs (approximately 12 by 18 inches) will be placed along the public access pathway, stating "This site is a sensitive environmental cleanup and restoration area, please do not disturb the beach sand, the plants, or the animals. Please stay on the established path." The approximate locations of these signs is shown on Figure 6. Sign posting will be completed within 180 days following finalization of the LMRP.

Public access is not currently available to the site from the end of East "F" Street. Should such access become available in the future, it will controlled with fencing and the signage mentioned above.

Signs and marker buoys installed at the OVRA site meet the intent of the site public access plan, described in EPA's July 2001 Action Memorandum for OVRA.

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**Table 1 - Design and Post-Construction Cap Thicknesses
OVRA Non-Time-Critical Removal Action Project**

	Intertidal Cap Area				Subtidal Cap Area E
	A	B ^a	C-5	D ^a	
Minimum Design Cap Thickness in Inches	31 ^b	32 ^b	29 ^c	32 ^b	33 ^{b,d}
Minimum Post-Construction Cap Thickness in Inches ^e	42	55	30	55	24 to about 108

Notes:

- a Area B and Area D caps also include geotextile and high total organic carbon layers.
- b Thickness based on design requirements for erosion protection, bioturbation protection, consolidation, and physical/chemical isolation components presented in Final (100 Percent) Design Analysis Report, December 10, 2001, Amended January 31, 2002.
- c Design thickness determined during construction based on sediment confirmation sampling results, and requirements from the Design Analysis Report for erosion protection (6 inches), bioturbation protection (10 inches), physical/chemical isolation (11 inches), and nominal consolidation (2 inches).
- d Design thickness includes up to 12 inches of consolidation allowance for thicker portions of cap in excess of 120 inches. Minimum design thickness for bioturbation and physical/chemical isolation is 21 inches. (erosion protection allowance = 0 inches for subtidal).
The minimum cap thickness for Area E applies to the Area E boundary identified on Figure 3, and not the adjacent area capping limits shown on the figure.
- e Minimum post-construction thicknesses, which are inclusive of erosion protection material, are presented for reference purposes based on 2003 survey data.
Refer to Section 2.4 and Appendix C of the Final Removal Action Completion Report, March 28, 2003, for average thicknesses and survey data, respectively.
The minimum excavation cut depth for Area B and Area D was 4.1 feet (49 inches).

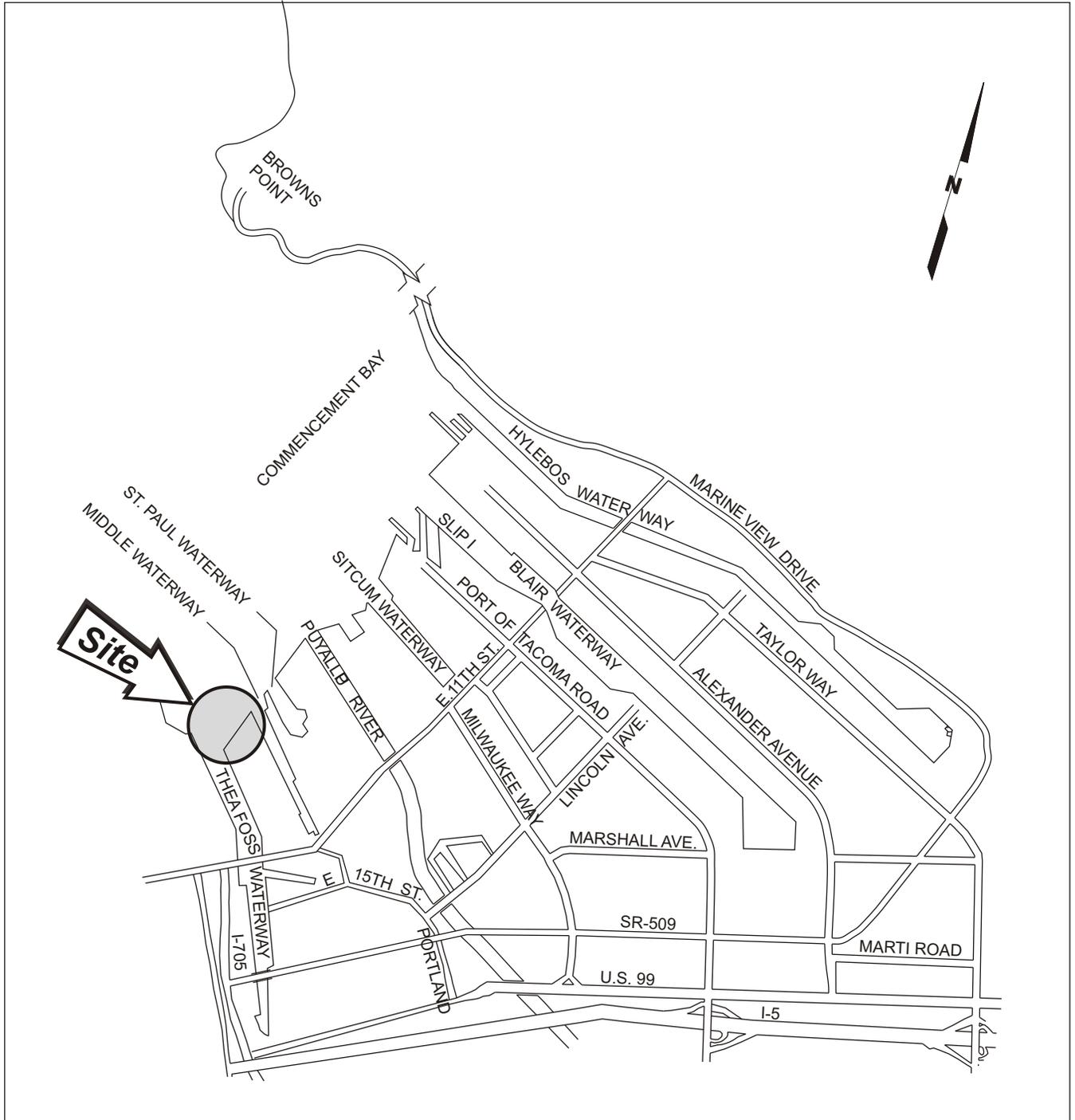
Table 2 - SQCs for Long-Term Monitoring COCs

Chemical of Concern	OVRA SQC	Applicable OVRA Areas
Metals in mg/kg		Area A
Arsenic	57	
Copper	390	
Lead	450	
Mercury	0.41	
Zinc	410	
Total PCBs in mg/kg	0.3	Area D
Dioxin in ng/kg (TEQ)		Area B, Area D and Area E
TCDD/TCDF	20	

Notes:

SQC for dioxin is set at 20 ng/kg TEQ to achieve a sitewide, post-remediation average of less than the site-specific background goal of 7.4 ng/kg.

Vicinity Map



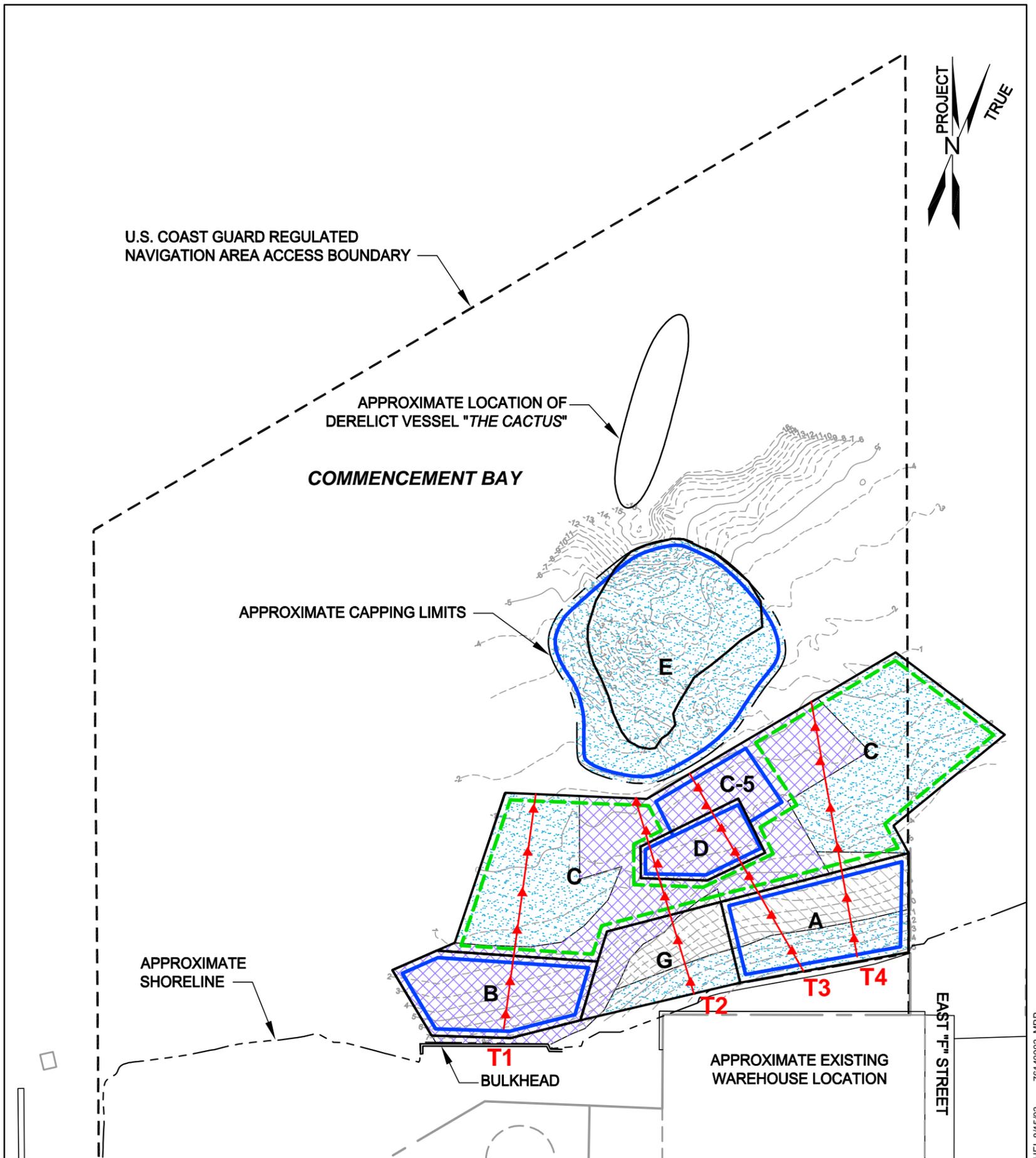
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NOT TO SCALE



WASHINGTON

OVRA Site Areas and Survey Monitoring Transects

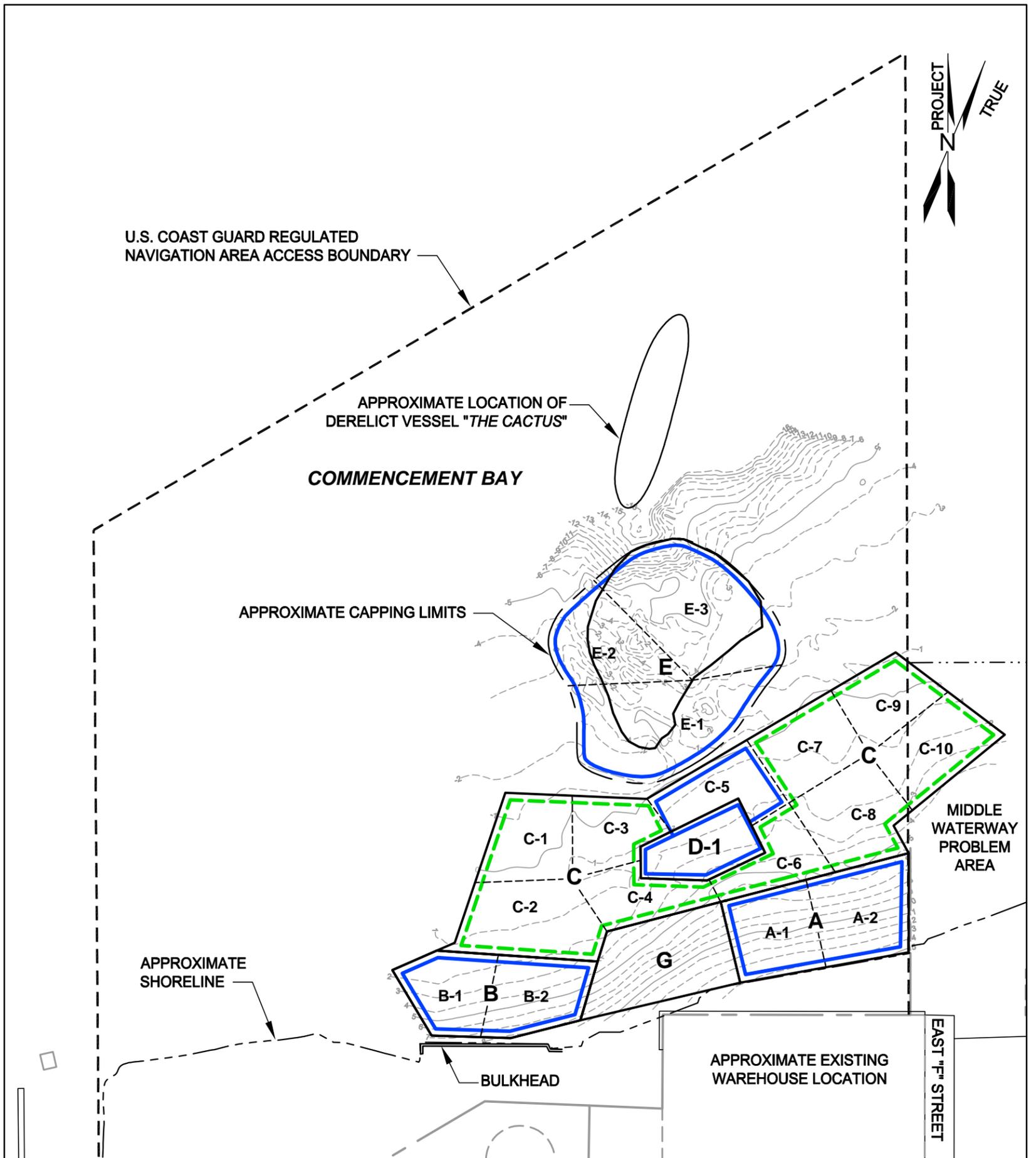


-  UPPER BEACH EROSION PROTECTION- EROSION PROTECTION MATERIAL B PLACED OVER SAND MATERIAL
-  LOWER BEACH EROSION PROTECTION- EROSION PROTECTION MATERIAL A PLACED OVER SAND MATERIAL
-  SAND MATERIAL
-  POST-CONSTRUCTION ELEVATION CONTOUR IN FEET (CORPS DATUM)
- C** OVRA SITE AREA DESIGNATION
-  BACKFILLED AREA
-  CAPPED AREA
- T1**  INTERTIDAL TRANSECT LOCATION AND NUMBER
-  INTERTIDAL SURVEY POINT



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OVRA Site Surface Sediment Sampling Grids

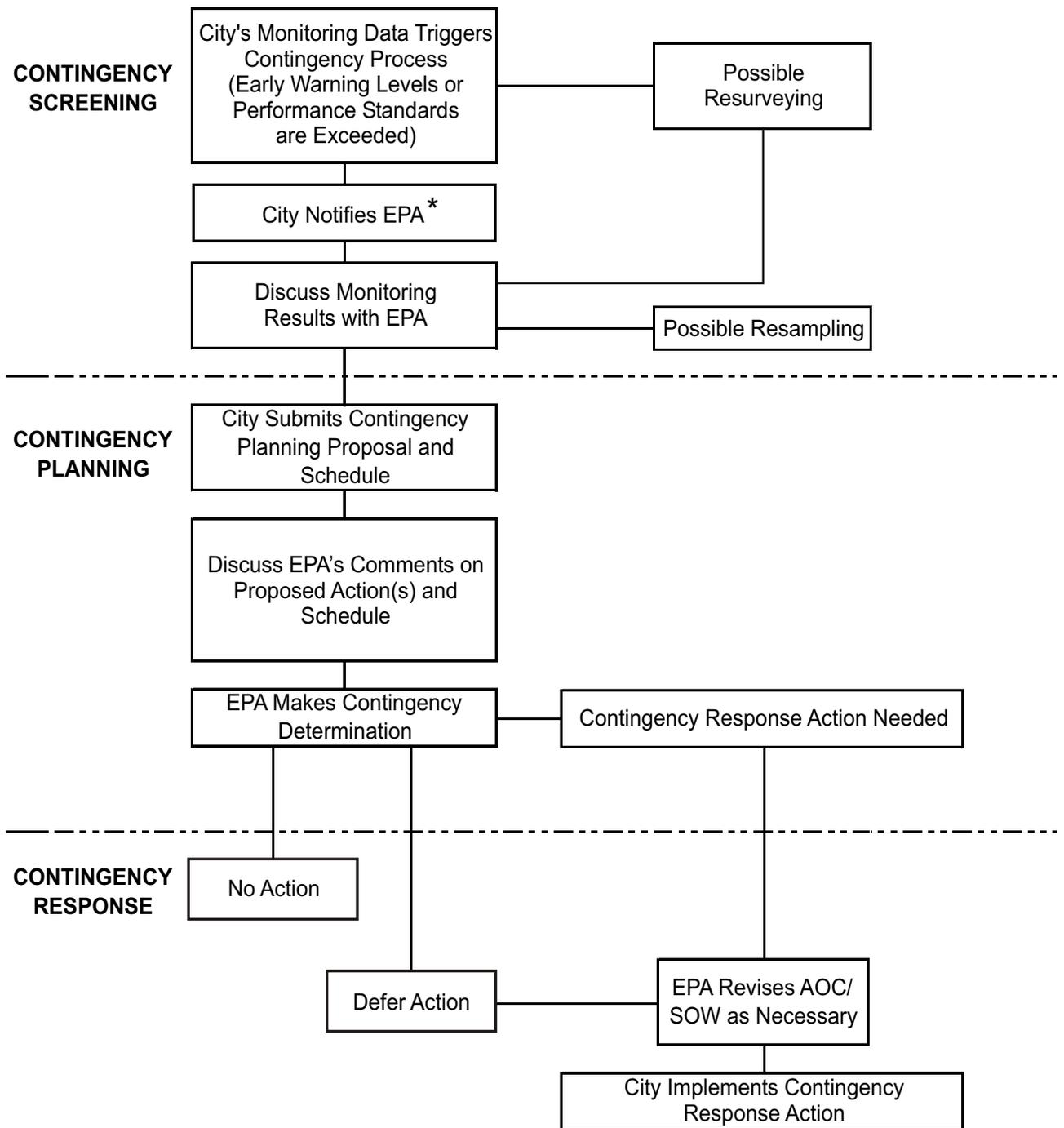


-10- POST-CONSTRUCTION ELEVATION CONTOUR IN FEET (CORPS DATUM)
C OVRA SITE AREA DESIGNATION
 [C-2] INTERTIDAL CONFIRMATION SAMPLING SEGMENT BOUNDARY AND DESIGNATION

- - - - BACKFILLED AREA
 _____ CAPPED AREA

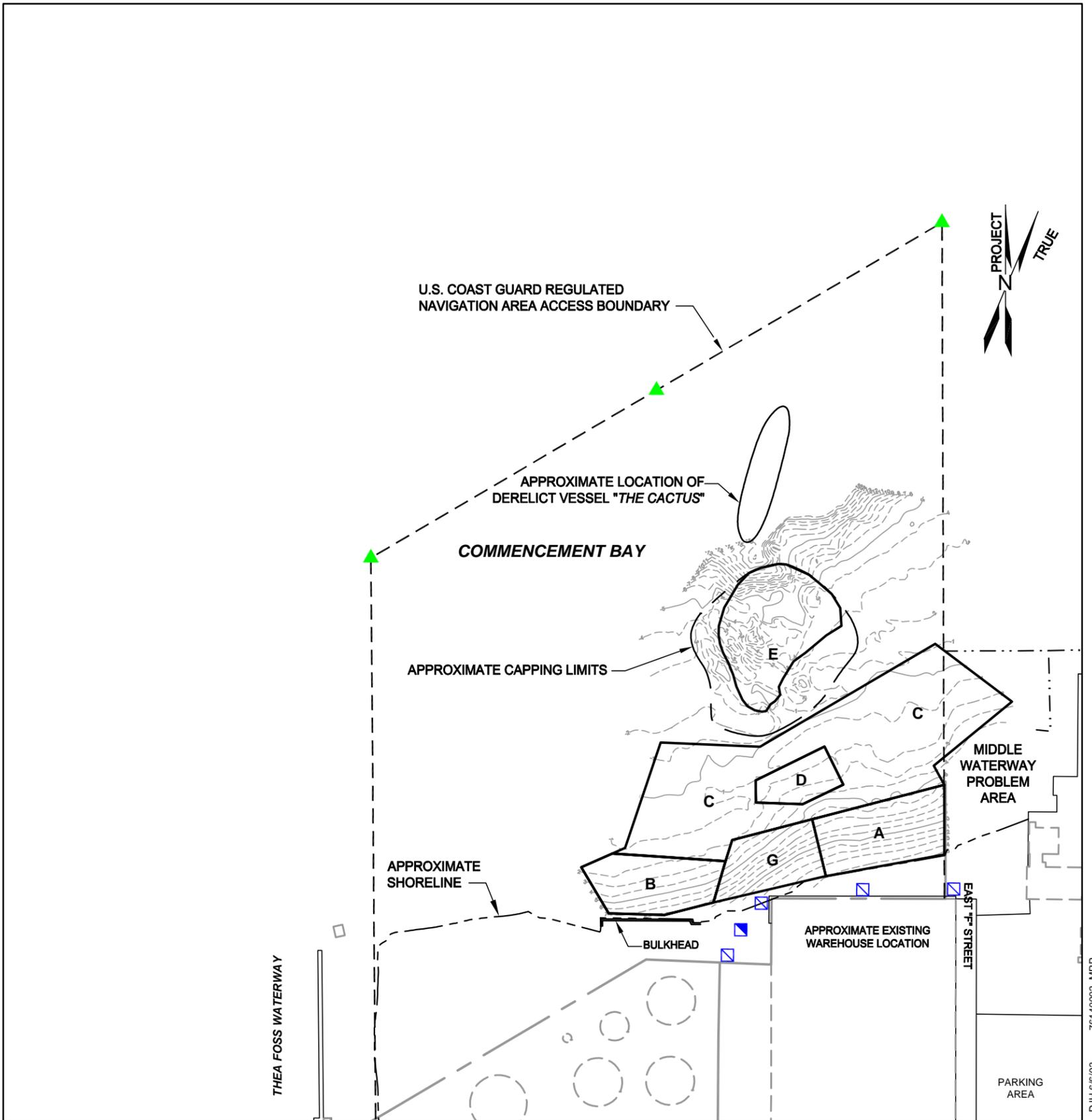


Contingency Planning Process



* Contingency Planning Process notifications will be forwarded to the Washington State Department of Ecology and the NOAA Damage and Restoration Center.

Proposed Buoy Marker, Public Information and Access Sign Location Map



- 10— POST-CONSTRUCTION ELEVATION CONTOUR IN FEET (CORPS DATUM)
- C** OVA SITE AREA DESIGNATION
- ▲ PROPOSED MARKER BUOY LOCATION (INSTALLED JUNE 28, 2003)
- APPROXIMATE LOCATION OF PUBLIC INFORMATION SIGN
- APPROXIMATE LOCATION OF ADDITIONAL PUBLIC ACCESS SIGN



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**APPENDIX A
SAMPLING AND ANALYSIS PLAN (SAP)
LONG-TERM MONITORING AND REPORTING PLAN (LMRP)
OLYMPIC VIEW RESOURCE AREA
NON-TIME-CRITICAL REMOVAL ACTION
TACOMA, WASHINGTON**

**APPENDIX A
SAMPLING AND ANALYSIS PLAN (SAP)
LONG-TERM MONITORING AND REPORTING PLAN (LMRP)
OLYMPIC VIEW RESOURCE AREA
NON-TIME-CRITICAL REMOVAL ACTION
TACOMA, WASHINGTON**

Preface

A Sampling and Analysis Plan (SAP) for the OVRA Removal Action design package was developed and submitted to EPA on December 10, 2001. The SAP was presented in Appendix A to the Construction Quality Assurance Project Plan and included the following attachments for field monitoring activities during construction:

- Attachment A-1—Field Sampling Plan (FSP);
- Attachment A-2—Quality Assurance Project Plan (QAPP); and
- Attachment A-3—Health and Safety Plan (HSP).

The SAP documents will also be used during long-term monitoring at the OVRA site and have been excerpted for inclusion as Appendix A to this LMRP.

General Revisions

Several general revisions apply throughout the excerpted SAP documents:

- FSP, QAPP, and HSP text describing sampling and chemical analysis of surface confirmation samples and import fill materials during construction is not applicable to the long-term monitoring.
- The Water Quality Monitoring Plan is not applicable and has been excluded.

The following sections provide an outline of the FSP, QAPP, and HSP documents included, with additional revisions specific to the long-term monitoring requirements described in the text of the LMRP report.

Sampling and Analysis Plan (SAP) Revisions

Attachment A-1 – Field Sampling Plan (FSP)

Revisions. Field sampling for the FSP applies only to surface sediment samples to be collected during long-term monitoring.

Preparation for Sampling

Revision. Reference to Contractor's CQA is not applicable.

Sediment Sampling Procedures

Revisions. Each surface sediment sample will be collected as a composite sample from a minimum of three individual locations within the grid areas identified on LMRP Figure 4. One composite sample from each of the grid areas will be submitted for chemical analyses based on the LMRP Figure 2 schedule. This will result in the following samples for each year:

Year 1 (2003)

- Cap area grid samples A-1, A-2, B-1, B-2, C-5, D-1, and E-1;
- Backfill area grid samples C-9 and C-10;
- Two field duplicates (minimum 20 percent); and
- One rinseate blank.

Year 2 (2004)

- Backfill area grid samples C-9 and C-10;
- One field duplicate (minimum 20 percent); and
- One rinseate blank.

Year 3 (2005)

- Cap area grid samples A-1, A-2, B-1, B-2, C-5, D-1, and E-2;
- Two field duplicates (minimum 20 percent); and

- One rinseate blank.

Year 4 (2006) – No Sampling Planned

Year 5 (2007)

- Cap area grid samples A-1, A-2, B-1, B-2, C-5, D-1, and E-3;
- Backfill area grid samples C-9 and C-10;
- Two field duplicates (minimum 20 percent); and
- One rinseate blank.

The third bullet under Sediment Sampling Procedures referencing sampling within sheet pile enclosures is not applicable.

The second bullet under Location Control and Documentation should exclude “pre-backfilling.”

Surface sediment samples will be collected by boat using a van Veen or similar grab sampler from subtidal Areas E-1, E-2, and E-3 from the upper 10 cm.

Import Capping/Backfill Material Sampling Procedures (Not Applicable)

Stockpile Sampling (Not Applicable)

Chain of Custody and Shipment Records

Revision. Reference to Contractor’s QA Officer is not applicable.

References for Attachment A-1 (No Revisions)

Attachment A-2 – Quality Assurance Project Plan (QAPP) for Sediment Quality Analysis Chemistry

A4—Project/Task Organization

Revision. References to Contractor tasks for construction are not applicable.

A5—Problem Definition/Background

Revision. QAPP applies to long-term monitoring only as described in the text of the LMRP. References to previous Removal Action activities are not applicable.

A6—Project/Task Description

Revision. QAPP applies to surface sediment samples to be collected from grid areas identified and described in the LMRP text and figures.

A7—Quality Objectives and Criteria

Revision. QAPP Quality Objectives and Criteria apply to surveying and surface sediment samples to be collected from existing intertidal and subtidal areas identified and described in the LMRP text and figures.

A8—Special Training/Certification (No Revisions)

A9—Documentation and Records (No Revisions)

Group B—Data Generation and Acquisition B1—Sampling Process Design (Experimental Design)

Revision. Sampling design and rationale are described in the text of the LMRP.

B2—Sampling Methods

Revision. Surface sediment samples will be collected on the exposed intertidal and subtidal areas described in the LMRP text and figures.

B3—Sample Handling and Custody Requirements (No Revisions)

B4—Analytical Methods

Revision. Sections describing analysis of grain size, import capping materials, Area A sediment stockpile samples, TCLP metals, semivolatile organic compounds, pesticides, and volatile organic compounds are not applicable. Field duplicate samples will be collected at a minimum frequency of 20 percent, as described in the FSP.

B5—Laboratory Quality Control (No Revisions)

B6—Instrument/Equipment Testing, Inspection, and Maintenance (No Revisions)

B7—Instrument/Equipment Calibration and Frequency

Revision. Reference to field meters for water quality monitoring are not applicable.

B8—Inspection/Acceptance of Supplies and Consumables (No Revisions)

B9—Non-Direct Measurements (No Revisions)

B10—Data Management (No Revisions).

Group C—Assessment and Oversight

C1—Assessments and Response Actions (No Revisions)

C2—Reports

Revision. Reports and submittals are described in the LMRP.

Group D—Data Validation and Usability (No Revisions)

QAPP Table Revisions

The following tables are not applicable to the revised QAPP for the LMRP:

- Table A-2-4 Contract-Required Metal Quantitation Limits for TCLP;
- Table A-2-7 Semivolatile Organic Compound Analytes and Reporting Limit Goals;
- Table A-2-8 Chlorinated Pesticides Analytes and Reporting Limit Goals;
- Table A-2-9 Volatile Organic Analytes and Reporting Limit Goals;
- Table A-2-14 Summary of Quality Control Procedures, Criteria, and Corrective Actions for Volatile Organic Analyses;

- Table A-2-15 Summary of Quality Control Procedures, Criteria, and Corrective Actions for Semivolatile Organic Analyses; and
- Table A-2-16 Summary of Quality Control Procedures, Criteria, and Corrective Actions for Chlorinated Pesticides Analyses.

Attachment A-3 – Health and Safety Plan (HSP) for Confirmation Sampling

Title Revision

HEALTH AND SAFETY PLAN FOR LONG-TERM SEDIMENT SAMPLING OLYMPIC VIEW RESOURCE AREA (OVRA) CONTAMINATED SEDIMENT NON-TIME-CRITICAL REMOVAL ACTION TACOMA, WASHINGTON

Site Health and Safety Plan Summary

Revisions.

Proposed Dates of Activities: 2003 to 2005.

Plan Updated: June 2003

Site Activities: Intertidal and Subtidal Sediment Sampling and Surveys

2.0 Introduction

Section 2.4 Site Work Activities

Revision. Planned surface sampling activities are described in the LMRP and FSP revisions. Sampling will involve collection of surface sediment materials from the exposed tideflat and subtidal Area E, as identified on the LMRP figures.

Intertidal samples will be collected by hand using a sampling spoon. Subtidal samples from Area E are planned to be collected from a vessel using a van Veen sampler or similar grab sampling device.

Section 2.5 Site Description

Revision. Sediment excavation, capping, and backfilling for the OVRA Removal Action was completed in 2002. The March 28, 2003, Removal Action

Completion Report describes the work activities completed. Long-term monitoring of selected areas, as described in the LMRP, is planned over a 5-year period between 2003 and 2007.

Hazard Evaluation and Control Measures

Revision. The diving contractor retained to collect surface sediment samples in Area E will provide a Health and Safety Plan acceptable to the City and EPA.

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**ATTACHMENT A-1
FIELD SAMPLING PLAN (FSP)
OLYMPIC VIEW RESOURCE AREA (OVRA)
CONTAMINATED SEDIMENT NON-TIME-CRITICAL REMOVAL ACTION
TACOMA, WASHINGTON**

**ATTACHMENT A-1
FIELD SAMPLING PLAN (FSP)
OLYMPIC VIEW RESOURCE AREA (OVRA)
CONTAMINATED SEDIMENT NON-TIME-CRITICAL REMOVAL ACTION
TACOMA, WASHINGTON**

This Field Sampling Plan (FSP) describes techniques for the collection, shipment, and documentation of sediment confirmation samples. These samples will be collected from the post-excavation sediment surface prior to backfilling the excavations. In addition, samples of imported backfill and capping materials will be collected for chemical testing to verify the background concentrations of a variety of chemical constituents including dioxins and other OVRA COCs. Samples of stockpiled soil from Area A will also be collected for additional chemical characterization prior to disposal of these sediments. Sampling objectives are presented in Section 6.0 of the CQAP.

The City of Tacoma (City) is responsible for coordinating field confirmation sampling activities. Alternatively, the City may delegate some or all field sampling tasks to consultants under the City's direction. Samples of proposed import fill from off-site sources will be provided by the Contractor to the City for laboratory chemical testing.

This FSP provides guidance to field personnel performing sediment sampling. The following sections of the FSP specifies the following:

- Preparation for sampling;
- Sediment sampling procedures;
- Import fill sampling procedures;
- Stockpile sampling procedures; and
- Sampling handling procedures and documentation.

Accompanying this FSP are minimum requirements for a site-specific Health and Safety Plan (HASP – Attachment A-1-1) for site sediment sampling activities.

Preparation for Sampling

All field and supervisory personnel will become familiar with requirements of this FSP, HASP, and CQAP before conducting the work. The City's QAO should be contacted with any questions or clarifications.

The City will establish a contract with a chemical testing laboratory well in advance of the start of work. Several weeks prior to sampling event, the

laboratory should be notified and the following should be discussed with the Laboratory Project Manager:

- Planned sampling and delivery dates to the laboratory;
- Analyses to be performed, including required detection limits and laboratory QA/QC as specified in the QAPP (Attachment A-2) to the SAP;
- Number and type of jars needed and time of bottle delivery;
- Date results needed;
- Sample disposal; and
- Other work order issues.

Upon receiving jars from the lab, the City's QAO or designated QA Manager will verify that necessary containers are present. The Contractor's CQA Officer will coordinate requests for sampling glassware through the City's QAO or QA Manager. Pre-sampling tasks include reviewing which jars are required for which analyses and the minimum required sample volumes. Containers will be labeled and organized in coolers. Necessary ice packs and bubble wrap for jar protection and sample preservation will also be prepped at this time.

Additional pre-sampling activities include organization of the requisite field equipment and supplies and establishing/verifying a GPS control point on land. This control point should be readily accessible for the duration of the sampling project. The GPS should be checked at a location with known coordinates beforehand to ensure that the unit is operating within the required level of accuracy (i.e., real-time differential correction is operating).

Sediment Sampling Procedures

This section describes the procedures for collecting samples of the post-excavation sediment surface. As described in CQAP Section 6.0, surface sediment samples will be collected on the exposed tideflat as individual excavation segments are completed in site Areas A through D during the summer of 2002. Sediment material sampled from the excavation segments will subsequently be combined to form composite samples representative of larger grid units of approximately 10,000 square feet each within each site area. One composite sample from each grid area will be collected, resulting in a total of fifteen sediment confirmation samples to be submitted for laboratory analyses, plus two field duplicates. Each composite sample will be formed from a

minimum of 3 separate aliquot locations to be identified and documented during the work. Refer to CQAP Figure 3 for sampling grid areas.

Each composite sediment sample will then be submitted for chemical analyses of the following OVRA chemicals of concern (COCs):

- Metals (total arsenic, copper, lead, mercury, and zinc) – Area A;
- Dioxins – Area B, Area C, and Area D; and
- Polychlorinated biphenyls (PCBs) – Area B.

These parameters are based on the distribution of COCs determined from previous characterization sampling and analysis as presented in the EE/CA.

Samples will be collected using hand tools, with more elaborate sampling methods not expected to be necessary. In addition to the sediment confirmation samples, a minimum of three field duplicates, to be submitted as blind duplicates to the laboratory, will be collected. This represents a minimum duplicate frequency of twenty percent, as discussed in the QAPP (Attachment A-2 to the SAP). A minimum of one rinseate blank samples will be collected (minimum frequency of one per twenty samples).

Surface Sediment Sampling Procedures

Samples of surface sediment (0 to 10 cm) from the final excavation surface will be collected in general accordance with Puget Sound protocols as outlined in the Puget Sound Estuary Program (PSEP) (Tetra Tech 1986) and as specified herein. If there are procedures or protocols specified below that conflict with PSEP, the statements of this document will take precedence.

The general procedure for field personnel to collect surface sediment samples is as follows:

1. Field notebook entries should be made as described below throughout the sampling process to ensure thorough and accurate recordkeeping.
2. At each sampling location, a stainless steel spoon will be used to collect a representative surface sediment sample from 0 to 10 cm depth and to transfer the sample directly to a stainless steel mixing bowl.
3. Where direct access to the sediment surface is limited within sheet pile enclosures of Area B and Area D, samples may be collected using a hand-operated auger, split-spoon, or similar stainless steel collection device affixed to rods/poles to provide sufficient reach. The collected sediment will then

be transferred to the mixing bowl, taking care not to include material in contact with the sampler.

4. The bulk sediment will be homogenized in the mixing bowl until the sediment appears uniform in color and texture. Any foreign objects will be discarded and not included in the homogenized sample.
5. The homogenized sediment will be distributed to appropriate sample containers with sample labels completely filled out and affixed to the containers.
6. The sampling procedure will be repeated, if necessary, until sufficient volume is obtained to satisfy the sampling requirements for each location and assigned analyses. Each successive sample will be collected from a common location.
7. The exterior of sample containers will be wiped clean and the samples will be temporarily stored in a cooled ice chest.
8. All sampling equipment will be thoroughly decontaminated using procedure described below.
9. Field sampling personnel and the City's QA Manager will ensure that sediment descriptions and supporting field notebook entries are complete.
10. Sampling procedures will be repeated at the next sampling location.

Sediment Sample Compositing

Aliquots from each sampling location (e.g., each excavation segment) will be combined to form a composite sample representative of larger grid areas within each site area. For sampling grids located next to Area D, at least one of the sample aliquots in each grid will be located as close as possible to the lateral boundaries of Area D. The compositing procedure will follow the same steps as described above, with an approximate equal-volume aliquot from each sampling location combined in a stainless steel mixing bowl and homogenized for the composite. Each composite sample for laboratory chemical analysis will be combined from at least three aliquots.

Field Equipment Decontamination

Decontamination is necessary for non-disposal sampling equipment that contacts any sample to be used for chemical testing. The decontamination

procedure will include a detergent wash and successive rinses between sampling locations. Sampling equipment will be cleaned at an off-site location, with sufficient pre-cleaned equipment brought to the site for next sampling location(s), as needed.

This decontamination procedure, based on PSEP Protocols (Tetra Tech 1986), is designed to prevent cross-contamination between sample locations, contamination from the field personnel, or contamination from the equipment. Equipment for reuse will be decontaminated between sample locations according to the procedure below before each use:

- Fresh tapwater will be sprayed over equipment to dislodge and remove any remaining sediments from previous sample location;
- Surfaces of equipment contacting sample material will be scrubbed with brushes using an Alconox solution;
- Scrubbed equipment will be rinsed and scrubbed with clean tap water;
- Equipment will be rinsed with hexane solvent; and
- Equipment will undergo a final spray rinse of deionized water to remove tap water impurities.

Water and solvent from decontamination will be disposed of in accordance with the City's standard protocols for management and disposal of investigation residuals. Solids, personal protective equipment, and other expendables will be disposed of off site at a Subtitle D landfill facility.

Location Control and Documentation

This section summarizes the methods of location control utilized for sampling activities. The objective of the sampling location positioning procedure is to accurately (± 5 feet) determine and record the positions of sampling locations. This determination will be achieved by referencing each sampling location to known survey control points using appropriate field survey methods described below.

The following parameters will be documented at each sampling location:

- Location coordinates;
- Estimated post-excavation mudline elevation in feet (pre-backfilling); and
- Time and date.

These parameters will be measured using combinations of differential global positioning, pre-surveyed visual horizontal triangulation to survey control points and/or permanent structures on base maps and aerial photographs, and weighted tape measures.

Differential Global Positioning System. For this study, location control will be performed using Differential Global Positioning System (DGPS) unit. The DGPS unit onboard the vessel will receive radio broadcasts of DGPS signals from satellites. DGPS coordinates for each sampling location will be recorded at the time of sampling.

Visual Horizontal Triangulation Methods. As a backup method, visual horizontal triangulation using pre-surveyed markers and existing structures will be used. Horizontal triangulation methods involve the identification (survey) of proposed sampling locations and confirmation of actual sampling locations based on horizontal distances to survey control points and/or permanent structures identifiable on base maps. Sampling locations will be identified by triangulation using readily identifiable points and/or measuring the horizontal distance from the actual sampling location to a known survey control point and/or permanent structure to the nearest foot using an incremented tape measure. These horizontal measurements can be determined from the base maps prior to sediment sampling to identify proposed sampling locations or used to determine the actual sampling location on the base map and translated to state plane coordinates. A buoy marker may be deployed to mark the sampling location and aid in positioning the vessel for sampling. Vertical elevations will be determined for all locations, as discussed below.

Vertical Control. Field personnel will record the elevation of the sampling location with respect to MLLW based on survey information to be obtained by the Contractor and/or the City for each excavation segment.

Sediment Quality Sample Handling

Field personnel will log each sample and package samples for transport.

Sample Logging in the Field. Samples will be inspected for signs of excessive disturbance and appropriate recovery. After samples are deemed acceptable, the following information will be recorded on the field log sheet:

- Date, time, and name of person logging sample;
- Sample number/designation, excavation segment, and location coordinates;
- Sediment sample elevation; and
- Sample physical description.

Sample Packaging and Temporary Archiving. Samples will be homogenized in a stainless steel bowl and transferred to appropriate containers. The sample containers are then sealed and placed in an insulated ice chest for shipment to:

1. A temporary refrigerated archive storage location controlled by the City if compositing has not been completed; or
2. The analytical laboratory following compositing.

Additional aliquots may be temporarily stored in appropriate sample jars at the City's refrigerated archive storage location if compositing for a given confirmation sampling grid is not complete. Compositing will then be completed prior to shipment of the sample to the receiving laboratory (as described above) when all aliquots have been collected from the sampling grid.

Sample Compositing for Laboratory Analysis. Field personnel or the City's QA Manager will document which aliquots from which excavation segment are combined for each composite sample, along with date of compositing.

Import Capping/Backfill Material Sampling Procedures

The Contractor(s) will collect samples of proposed import sand capping/backfill material to be submitted to the City for laboratory testing. A minimum of one sample and one duplicate sample from each proposed fill source will be submitted. The volume of import sand capping material is estimated to be approximately 14,000 cubic yards. At a minimum, this will therefore result in a total of 14 samples plus one duplicate for chemical analysis if all capping material is obtained from the same source. Samples from additional sources will increase this total. The City may request that additional samples be submitted based on chemical analysis results from the initial sampling. Sample analyses will include dioxins, selected metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), chlorinated pesticides, volatile organic compounds (VOCs), and total organic carbon (TOC). Chemical acceptance criteria for these constituents are discussed in Section 5.3 of the CQAP. Detection limits for constituents to be analyzed are listed and described in the QAPP (Attachment A-2 to the Appendix A SAP).

Sample collection and handling procedures for proposed import fill materials are similar to those described above for sediment samples, with the following differences:

1. Representative samples will be collected from active working faces of quarries for pit-run material, or from stockpiles of processed materials.

2. Each sample will be collected from near-surface material obtained in shallow excavations completed to a depth of at least 1 foot below the surface of the working quarry face or stockpile.
3. Representative samples to be submitted to the City will be combined from a minimum of three individual aliquots at different locations within each quarry or stockpile source. Samples for VOC analyses will be collected from one of the aliquot locations and transferred directly to appropriate sample jars without compositing.
4. Field notebook documentation to be submitted to the City will include:
 - Date, time, and name of person logging sample;
 - Sample number/designation, location coordinates with respect to the OVRA site reference station and a fixed reference station established at the source of the material; and
 - Photographs and a map acceptable to the City identifying the material source and sampling locations.
5. The Contractor will also provide the requisite grain size analysis data to the City as specified in the CQAP.
6. The Contractor's QA Officer will review all field sampling records for accuracy and completeness prior to submittal of samples to the City.
7. The Contractor will use disposable or pre-cleaned sampling equipment to collect the samples (no solvent rinse needed).

Stockpile Sampling

The City will collect samples of stockpiled soil from Area A for laboratory analysis of potentially leachable arsenic and lead using the Toxicity Characteristic Leaching Procedure (TCLP) described in state Dangerous Waste regulations (Chapter 173-303 WAC). Arsenic and lead were detected in sediment samples previously collected in Area A at concentrations above the threshold of 100 mg/kg that could theoretically fail the TCLP criteria for Dangerous Waste. Although review of the previous sampling data indicates that TCLP failure and resulting designation as a Dangerous Waste is unlikely, additional testing of stockpiled Area A sediments is needed for confirmation.

An estimated 2,000 cubic yards of sediment will be excavated from Area A. A minimum of four composite samples will be collected from the stockpiled soils at a frequency of approximately one sample per 500 cubic yards, plus one duplicate sample. Each sample will be collected from stockpiled sediment obtained from a depth of at least 1 foot below the surface of the stockpile. Field notebook documentation will include the date, time, name of person logging sample, and physical description of the sediment sampled.

Chain of Custody and Shipment Records

Prior to shipment, field sampling personnel, the City's QA Manager (sediment confirmation samples), or the Contractor's QA Officer will verify that sample container labels clearly indicate sampling locations, sample number, the project name, sampler's initials, date, and time. Prior to shipping samples to the analytical chemistry laboratory the City's QAO or designee will verify that the sample labels also include the appropriate analyses to be conducted.

After recovery, samples will be maintained in custody until formally transferred to laboratory. A chain of custody record will be initiated at the time of sampling for each sample collected. This record will be signed by the field representative and others who subsequently hold custody of the sample. A copy of the chain of custody with all the appropriate signatures will be returned to the City's QA Manager. For purposes of this work, custody will be defined as follows:

- In plain view of the field representatives;
- Inside a cooler which is in plain view of the field representative; or
- Inside any locked space such as a cooler, locker, car, or truck to which the field representative has the only immediately available key(s).

Prior to shipping, sample containers will be appropriately packed and secured inside a cooler with ice packs. The original signed custody forms will be transported with the cooler. The cooler will be secured and appropriately labeled for shipping and handling. Samples for chemical analyses will be couriered to the laboratory.

References for Attachment A-1

Tetra Tech, 1986 as updated in 1989 and 1993. Recommended Protocols for Measuring Selected Environmental Variables in Puget Sound (PSEP Protocols). Puget Sound Estuary Program.

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**ATTACHMENT A-2
QUALITY ASSURANCE PROJECT PLAN
FOR SEDIMENT QUALITY ANALYSIS CHEMISTRY
OLYMPIC VIEW RESOURCE AREA (OVRA)
CONTAMINATED SEDIMENT NON-TIME-CRITICAL REMOVAL ACTION
TACOMA, WASHINGTON**

**QUALITY ASSURANCE PROJECT PLAN
FOR SEDIMENT QUALITY ANALYSIS CHEMISTRY
OLYMPIC VIEW RESOURCE AREA (OVRA)
CONTAMINATED SEDIMENT NON-TIME-CRITICAL REMOVAL ACTION
TACOMA, WASHINGTON**

January 31, 2002

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Prepared for
City of Tacoma

Document Approval Signatures:

EPA Project Manager

Date

EPA Quality Assurance Representative

Date

City of Tacoma
Project Coordinator/Quality Assurance Official

Date

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**ATTACHMENT A-2
QUALITY ASSURANCE PROJECT PLAN
FOR SEDIMENT QUALITY ANALYSIS CHEMISTRY
OLYMPIC VIEW RESOURCE AREA (OVRA)
CONTAMINATED SEDIMENT NON-TIME-CRITICAL REMOVAL ACTION
TACOMA, WASHINGTON**

The purpose of the Quality Assurance Project Plan (QAPP) presented herein is to give, in specific terms, the objectives, organization, and functional activities, associated with the sampling and analysis activities as set forth in the Sampling and Analysis Plan (SAP) for the Olympic View Resource Area (OVRA). This QAPP describes quality assurance (QA) policies, quality control (QC) procedures, intended data uses, documentation, and analytical methodologies related to analyses of sediment chemical confirmation samples collected of the post-excavation sediment surface (0 to 10 cm). In addition, samples of imported backfill and capping materials will be chemically tested to verify the background concentrations of OVRA Chemicals of Concern (COCs) and other constituents. Samples of stockpiled soil from Area A will also be collected for additional chemical characterization prior to disposal of these sediments. Sampling objectives are presented in the SAP and in Section 6.0 of the Construction Quality Assurance Plan (CQAP) included with this submittal. This QAPP is intended to ensure that data collected are of known and acceptable quality to fulfill the data uses and, ultimately, the overall project objectives.

The outline and format of this QAPP are based on the policies and guidance specified in the U.S. EPA QA/R-5, *EPA Requirements for Quality Assurance Project Plans* (EPA 1999) and U.S. EPA QA/G-5, *EPA Guidance for Quality Assurance Project Plans* (EPA 1998).

This QAPP revises the January 7, 1999, version prepared by the City of Tacoma (City) for sediment characterization sampling and chemical analyses previously conducted at the OVRA site. Draft QAPPs were also submitted for EPA review on October 3 and October 30, 2001, as part of the Prefinal (60 Percent) OVRA Design Submittal.

A4—Project/Task Organization

Overall project and Quality Assurance responsibilities of project personnel are summarized in Table A-2-1. Under EPA oversight, the construction project will be managed by the City and executed by Contractor(s) specializing in pile removal, sediment excavation, and capping/backfilling in intertidal and off-shore areas. Additional technical coordination may be provided (as-needed) by

consultants with expertise in the areas of geotechnical assessment, engineering, environmental evaluation, and water quality monitoring.

A5—Problem Definition/Background

A Non-Time-Critical Removal Action (Removal Action) at the OVRA site has been approved by EPA, as documented in their Action Memorandum dated July 16, 2001 (EPA 2001). The Removal Action will address approximately 2.2 acres of contaminated marine sediments within the 12.4-acre OVRA site. Identified COCs at the OVRA site include polychlorinated dibenzodioxins and dibenzofurans (PCDD/PCDF; hereinafter referred to as dioxins), metals (arsenic, copper, lead, mercury, and zinc), polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs). Scheduled for late spring/summer/early fall 2002, the Removal Action will be conducted by the City pursuant to an Administrative Order on Consent (AOC - Docket No. CERCLA 10-2001-0069, dated July 24, 2001) between the City and the EPA.

A6—Project/Task Description

The Removal Action will involve excavation of contaminated sediments from intertidal locations at the OVRA site. The excavated areas will then be capped or backfilled with clean, import material.

This QAPP documents QA/QC procedures for the collecting and analyzing confirmation sediment samples from the post-excavation surface. Sediment confirmation samples will be collected following sediment removal but prior to capping/backfilling of the excavations. In addition, samples of imported backfill and capping materials will be chemically tested to verify the concentrations of dioxins, metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), chlorinated pesticides, and total organic carbon (TOC).

Additional detail for specific Removal Action tasks is provided in the Design Analysis Report included with the design documents.

A7—Quality Objectives and Criteria

The overall quality assurance objectives for field sampling, field measurements, and laboratory analysis are to produce data of known and appropriate quality to support confirmation of chemical constituent concentrations of the post-excavation sediment surface at the OVRA site. Appropriate procedures and quality control checks will be used so that known and acceptable levels of accuracy and precision are maintained for each data set. The quality objectives and criteria are discussed in Section 6.0 of the CQAP.

A8—Special Training/Certification

Field Personnel

In addition to studying and being familiar with the methods and procedures in the Field Sampling Plan (FSP), each field team member must be experienced or have received proper training on project requirements for sampling, sample handling and chain of custody procedures, and sample documentation procedures.

Laboratory Personnel

Training in analytical procedures typically begins with the reading of the Standard Operating Procedure (SOP) for the method. Hands-on training begins with the observation of an experienced analyst performing the method, followed by the trainee performing the method under close supervision, and culminating with independent performance of the method on quality control samples. Successful completion of the analysis of quality control samples qualifies the analyst to perform the method independently. A periodic demonstration of proficiency is required to maintain continuing qualification.

A9—Documentation and Records

Field Documentation

Field records will be used to document overall field activities and observations and are described in the CQAP and FSP. These documents list specific sample documentation and field notebook records, and chain of custody forms and shipment requirements. In addition, sample containers will be labeled according to the following procedure:

- Each sample will be assigned a unique identifying number. Labels will be filled out using waterproof ink prior to sample collection. Preprinted sample labels may be used, if desired, but the date, time, and sampler identification fields will not be filled in until the sample is collected. Sample labels will include the following information:
 - Sampler's initials;
 - Date and time of sample collection;
 - Sample number; and
 - Analysis to be performed.

Laboratory Documentation

The laboratory data reports will include the following:

- Case narrative identifying the matrix and number of samples included; analyses performed and analytical methods used; description of any problems or exceedence of QC criteria and corrective action taken.
- Copy of chain of custody forms for all samples included in the analytical batch.
- Tabulated sample analytical results with units, data qualifiers, percent solids, sample weight or volume, dilution factor, laboratory batch and sample number, and dates sampled, received, extracted, and analyzed all clearly specified. Surrogate percent recoveries will be included for organic analyses.
- Blank summary results indicating samples associated with each blank.
- Matrix spike/matrix spike duplicates result summaries with calculated percent recovery and relative percent differences.
- Laboratory control sample results, when applicable, with calculated percent recovery.

Data Validation Memoranda

A data validation will be performed by the City of Tacoma Laboratory Quality Assurance Officer for each laboratory data package. The data review will identify potential bias in the data and include an assessment of laboratory performance and overall completeness, representativeness, precision, and accuracy. Data validation qualifier flags will be applied to sample results that fall outside specified quality control limits. The data review memorandum will address whether the quality of the flagged data affects their intended use.

Records Retention

All original documentation and records including field notebooks, sample documentation forms, boring logs, well logs, photographs, laboratory data, etc. will be incorporated into the project file and retained for a minimum of 10 years.

GROUP B—DATA GENERATION AND ACQUISITION

B1—Sampling Process Design (Experimental Design)

The sampling design and rationale are discussed in Section 7.2, Sediment Chemical Confirmation Sampling, of the CQAP.

B2—Sampling Methods

Post-Excavation Sediment Confirmation Samples

As described in CQAP Section 7.0, surface sediment samples will be collected on the exposed tideflat as individual excavation segments are completed in site Areas A through D. Sediment material sampled from the excavation segments will subsequently be combined to form composite samples representative of larger grid units within each site area.

A complete description of sampling methods is presented in the FSP.

Equipment Decontamination

Non-disposable sampling equipment will be cleaned between sampling locations using the procedure described in the FSP.

B3—Sample Handling and Custody Requirements

Sample Handling

Samples shall be collected and handled in a manner that preserves their integrity and prevents any cross contamination or loss of analytes. Sample handling and packaging requirements are discussed in FSP.

Sample Labeling

Sample labeling items are listed in Section 9.0 (Documentation and Reporting) of this QAPP.

Sample Containers, Preservation, and Holding Times

Sample container requirements vary according to analyte and sample matrix. All sediment sample containers will be provided by the City or contract lab. The labs will either clean the sample containers and conduct the certification analyses or purchase precleaned and certified free of contamination sample

containers from environmental sampling supply companies. The analytical results and the certifications will be kept in the laboratory project files.

The containers are precleaned by the laboratory or supplier(s) to either or both of two specifications, depending on the analytical purpose, as described below:

- **Procedure 1.** For organics. The 16-ounce clear glass jars, teflon liners, and caps are washed in hot tap water using laboratory grade non-phosphate detergent. All are then rinsed three times with hot tap water. All are then rinsed once with 1:1 nitric acid (metals-grade HNO₃ and ASTM deionized water) and then rinsed three times with ASTM Type I deionized water. A final rinse is made using pesticide-grade methylene chloride. A hexane rinse will be used for VOC containers. The jars and teflon liners are oven-dried at 125°C, then allowed to cool to room temperature in an enclosed, contaminant-free environment before assembling.
- **Procedure 2.** For metals and miscellaneous inorganic constituents. The 16-ounce jars and caps are washed in hot tap water using laboratory grade non-phosphate detergent, then rinsed three times with hot tap water followed by one rinse with 1:1 nitric acid (metals-grade HNO₃ and ASTM deionized water). All are then rinsed three times with ASTM Type I deionized water, inverted and air-dried in a contaminant-free environment before assembling.

Samples will be preserved according to the requirements of the specific analytical methods to be employed and all samples will be extracted and analyzed within method specified holding times. Required sample containers, preservatives, and holding times are summarized in Table A-2-2.

Shipping Requirements

Shipping and handling of all samples will be done in a manner that protects both the sample integrity and shipment handlers from the potential hazardous nature of samples. All samples will be shipped by next day air courier service to the laboratory. Packaging, marking, labeling, and shipping of samples will comply with all applicable regulations promulgated by the International Air Transport Association (IATA) or the U.S. Department of Transportation (DOT).

Sample Custody Procedures

Sample custody procedures will be followed to provide a documented record that can be used to follow possession and handling of a sample from collection through analysis. A sample is considered to be "in custody" if it meets at least one of the following conditions:

- The sample is in someone's physical possession or view;
- The sample is secured to prevent tampering (i.e., custody seals); and/or
- The sample is secured in an area restricted to authorized personnel.

As discussed in the FSP, a chain of custody form will be completed in the field as each sample is collected. At a minimum, the information on the custody form shall include the sample number, date and time of sample collection, sampler, analyses, and number of containers. An example custody form is presented on Figure A-2-1. Two copies of the custody form will be placed in the cooler prior to sealing for delivery to the laboratory with the respective samples. The other copy will be retained and placed in the project files.

Upon receipt of samples at the laboratory, the sample custodian will verify that the package custody seals are unbroken. The custodian will sign the accompanying custody form upon opening the cooler. The sample custodian will examine all samples to verify the information on the chain of custody form. Any discrepancies, questions, or observations concerning sample integrity will be noted. The laboratory sample custodian will then log samples into the laboratory information management system (LIMS) and secure them in the appropriate storage refrigerators.

B4—Analytical Methods

This section describes analytical methods to be employed for the investigation.

Samples will be analyzed according to EPA methods as described in the May 1997 Update III to *Test Methods for Evaluating Solid Waste; Physical/Chemical Methods, SW-846* (EPA 1986) and the EPA Contract Laboratory Program (CLP) Statements of Work (SOW) OLM03.1 and ILM04.0 for organics and metals, respectively. Analysis for polychlorinated dioxins and furans will be performed according to EPA Office of Science and Technology (OST) Method 1613B. Physical testing parameters will be determined using methods of the American Society for Testing and Materials (ASTM).

Physical Testing

Grain Size

Grain size will be determined by sieving using ASTM Method D 422.

Chemical Analysis

Laboratory practical quantitation limits (PQLs) are presented on Tables A-2-3 through A-2-9. The detection limits listed are less than the following criteria for the various sample types to be analyzed.

Sediment Confirmation Samples

Sediment confirmation samples will be analyzed for OVRA COCs applicable to the site areas to be sampled (see CQAP Section 7.0). Laboratory PQLs for OVRA COCs are less than the site Sediment Quality Criteria (SQC) concentrations presented in Table 3 of the CQAP.

Import Capping Material Samples

Samples of import sand to be used for capping and backfilling will be analyzed for metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc), SVOCs including PAHs, PCBs, VOCs, chlorinated pesticides, and TOC. Laboratory PQLs are generally less than:

- One-half the site SQC concentrations for OVRA COCs (see CQAP Table 3); and
- One-half the Sediment Quality Objective (SQO) concentrations for Commencement Bay (EPA 1989) and the Explanation of Significant Differences (EPA 2000), or one-half the Sediment Quality Standards (SQS) listed in the Sediment Management Standards for the State of Washington (Chapter 173-204 WAC) for constituents for which SQO or SQS criteria have been established (see CQAP Table 3).

Achievable laboratory PQLs are less than the SQC, SQO, or SQS criterion for all analytes. The following compounds, which are problematic to analyze, have PQLs that exceed the one-half screening criteria goal:

Compound	Laboratory PQL in µg/kg	SQO in µg/kg
Dimethylphthalate	100	160
Pentachlorophenol	200	360
Hexachlorobutadiene	10	11
Benzoic acid	500	650
4,4'-DDE	8	9

In addition, the dioxin TEQ quantitation limit, calculated from the method-specified PQLs and toxicity equivalence factors (TEFs) for the seventeen 2,3,7,8-chlorosubstituted dioxin congeners is 12.5 ng/kg. However, since EPA Method 1613 specifies reporting results to the method detection limit for each sample, it is anticipated that the goal of 7 ng/kg dioxin TEQ is achievable for import fill/capping material that is not expected to contain dioxins.

Other SVOCs, VOCs, and chlorinated pesticides for which site SQCs have not been established will be analyzed for the purposes of documenting background concentrations of these constituents in imported fill. The background concentrations of these constituents are expected to be below laboratory PQLs.

Area A Sediment Stockpile Samples

Area A stockpile samples will be analyzed for leachable arsenic and lead using the Toxicity Characteristic Leaching Procedure (TCLP). Laboratory PQLs are less than the TCLP thresholds for designation of leachable arsenic and lead as Dangerous Waste, based on criteria listed in state Dangerous Waste Regulations (Chapter 173-303 WAC).

Total Metals

Sediment metal analyses will be extracted and analyzed according to the EPA Contract Laboratory Program (CLP) Statement of Work ILM04.0 with the following modifications:

- Sediment samples for the analysis of metals may be digested by either microwave or hot plate procedures as specified in the CLP SOW ILM04.0.
- Hot plate sediment digest will be diluted to a final volume of 100 ml instead of 200 ml.
- Samples for lead analysis will be analyzed by either graphite furnace or ICP.

Target analytes and the contract required quantitation limits (CRQLs) are presented in Table A-2-3.

TCLP Metals

Stockpiled soil from Area A will be extracted according to EPA Method 1311, TCLP for analysis of leachable arsenic and lead. Sample extracts will then be analyzed according to the procedures described above for total metals.

CRQLs and TCLP Practical Quantitation Limits (PQLs) for arsenic and lead are presented in Table A-2-4.

Polychlorinated Biphenyls (PCBs)

PCBs will be extracted and analyzed according to the EPA Contract Laboratory Program (CLP) Statement of Work OLM03.1

Target analytes and the contract required quantitation limits (CRQLs) are presented in Table A-2-5.

Total Organic Carbon (TOC)

Sediment samples will be analyzed for total organic carbon by combustion with infrared detection using the Puget Sound Protocol modification of EPA Method 9060. The quantitation limit is 0.1 percent.

PCDD/PCDF

Sediment samples submitted for PCDD/PCDF analysis will be extracted and analyzed according to EPA Method 1613B. Target analytes, PQLs, and method detection limits (MDLs) are presented in Table A-2-6.

Semivolatile Organic Compounds (SVOCs)

Samples for SVOC analysis will be extracted using EPA Method 3550B, ultrasonic extraction. Sediment sample extracts will undergo gel permeation chromatography cleanup and will be analyzed by gas chromatography/mass spectrometry using the EPA CLP Method OLM03.1.

Target analytes and PQLs are presented in Table A-2-7.

Pesticides

Samples for chlorinated pesticide analysis will be extracted using EPA Method 3550B, ultrasonic extraction. Sediment sample extracts will undergo gel permeation chromatography cleanup and will be analyzed by gas chromatography with electron capture detection (GC/ECD) using the EPA CLP Method OLM03.1.

Target analytes and PQLs are presented in Table A-2-8.

Volatile Organic Compounds

Samples for VOC analysis will be extracted and analyzed using the EPA CLP Method OLM03.1.

Target analytes and PQLs are presented in Table A-2-9.

B5—Quality Control

The overall quality assurance objectives for field sampling and laboratory analysis are to produce data of known and appropriate quality to support the site investigation. Appropriate procedures and quality control checks will be used so that known and acceptable levels of accuracy and precision are maintained for each data set.

Quality Control Samples

The following types of field and laboratory quality control samples will be incorporated into the sampling and analysis program to verify the quality of laboratory measurements. Field quality control samples will include “blind” duplicate samples and equipment rinse (decontamination) blanks. Temperature blanks will be included in each sample shipment to the laboratory.

Rinse Blanks

Rinse or decontamination blanks monitor sample cross-contamination and the effectiveness of decontamination procedures. Blanks will be collected by rinsing decontaminated sampling equipment with distilled/deionized water, placing it in the appropriate container, and preserving. Rinse blanks will be assigned unique numbers and will not be identified as blanks to the laboratory.

Temperature Blanks

Temperature blanks are used to accurately monitor sample temperature for preservation. Blanks will consist of deionized water obtained from the laboratory and transported in a sealed container. A temperature blank will be included in each shipping cooler. Upon receipt by the laboratory, the sample custodian will open the cooler and immediately measure the temperature by inserting a thermometer into the temperature blank container. The temperature will be recorded on the chain of custody form.

Field Duplicate Samples

Field duplicate samples are designed to monitor combined sampling and analytical precision. Field duplicates are prepared by filling two identical containers with the homogenized sample.

In total, 15 samples plus two field duplicates from sediment confirmation sampling are planned to be submitted to the laboratory. A minimum of 14 samples plus one field duplicate from import capping material sampling are planned to be submitted to the laboratory. Four samples plus one field duplicate from Area A stockpile sampling are planned to be submitted to the laboratory. Samples will be assigned unique sample identification numbers and will not be identified to the laboratory as duplicates.

Laboratory Quality Control

The quality of analytical data generated is controlled by the frequency and type of internal quality control checks developed for analysis type. The quality of laboratory measurements will be assessed by reviewing results for analysis of method blanks, matrix spikes, duplicate samples, laboratory control samples, surrogate compound recoveries, instrument calibrations, performance evaluation samples, interference checks, etc., as specified in the analytical methods to be used. Analytical quality control requirements are primarily expressed in terms of acceptance criteria for the quality control checks performed. Quality control parameters, frequency, acceptance criteria, and corrective actions for laboratory analyses are presented in Tables A-2-10 through A-2-16.

Precision

Precision is the degree of reproducibility or agreement between independent or repeated measurements. Analytical variability will be expressed as the relative percent difference between field or laboratory replicates and between matrix spike and matrix spike duplicate analyses. RPD will be used to measure precision for this investigation and is defined as follows:

$$RPD = \frac{(D_1 - D_2)}{(D_1 + D_2)/2} \times 100$$

Where,

D_1 = Sample value
 D_2 = Duplicate sample value

Accuracy

Accuracy is the agreement between a measured value and its true or accepted value. While it is not possible to determine absolute accuracy for environmental samples, the analysis of standards and spiked samples provides an indirect assessment of accuracy.

Laboratory accuracy will be assessed as the percent recovery of matrix spikes, matrix spike duplicates, surrogate spiked compounds (for organic analyses), and laboratory control samples. Accuracy will be defined as the percentage recoverable from the true value and is defined as follows:

$$\% \text{Recovery} = \frac{(\text{SSR} - \text{SR})}{\text{SA}} \times 100$$

Where,

SSR = spiked sample result

SR = sample results (not applicable for surrogate recovery)

SA = amount of spike added

Representativeness

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Care will be taken in the design of the sampling program to ensure sample locations are selected properly, sufficient numbers of samples are collected to accurately reflect conditions at the site, and samples are representative of sampling locations. A sufficient volume of sample will be collected at each sampling point to minimize bias or errors associated with sample particle size and heterogeneity.

Comparability

Comparability is a qualitative parameter expressing the confidence with which one data set can be compared to another. To ensure results are comparable, samples will be analyzed using standard EPA methods and protocols. Data will also be reviewed to verify that precision and accuracy criteria have been achieved and, if not, that data have been appropriately qualified.

Completeness

Completeness is the percentage of measurements made that are judged to be valid. Completeness will be calculated separately for each analytical group, e.g., metals or volatile organics. Results must also contain all quality control check analyses required to verify the precision and accuracy of results to be considered complete. Data qualified as estimated during the validation process will be considered complete. Non-valid measurements will be results that are rejected during the validation review or samples for which no analytical results were obtained. Completeness will be calculated for each analysis using the following equation:

$$\text{Completeness} = \frac{\text{valid data points obtained}}{\text{total data points planned}} \times 100$$

The target goal for completeness is a minimum of 90 percent. Completeness will be monitored on an on-going basis so that archived sample extracts can be re-analyzed, if required, without remobilization.

B6—Instrument/Equipment Testing, Inspection, and Maintenance

Field Instrumentation and Equipment

Field instruments and equipment will be inspected prior to project mobilization to ensure it is in good condition and working order. Field instruments shall be maintained as specified by the instrument manufacturer's operations manuals. All routine maintenance will be recorded in instrument log books or directly on the instrument, as appropriate.

Laboratory Instrumentation and Equipment

Preventive maintenance is a crucial element of the laboratory Quality Assurance program. Instruments (e.g., GC/MS systems, atomic absorption spectrometers, analytical balances, gas and liquid chromatographs, etc.) are maintained under commercial service contracts or by qualified, in-house personnel. All instruments are operated and maintained according to the instrument operating manuals. All routine and special maintenance activities pertaining to the instruments are recorded in instrument maintenance logbooks.

Preventive maintenance procedures, frequencies, etc. will be available for each instrument used. They are available in the various SOPS for routine methods performed on an instrument and may also be in the operating or maintenance manuals provided with the equipment at the time of purchase. Responsibility for ensuring that routine maintenance is performed lies with the laboratory section supervisor. The supervisor may perform the maintenance or assign the maintenance task to a qualified bench level analyst. In the case of non-routine repair of capital equipment, the section supervisor is responsible for overseeing the repair, either by performing the repair themselves with manufacturer guidance or by acquiring on-site manufacturer repair. Each laboratory section maintains a critical parts inventory to perform the preventive maintenance procedures. This inventory or "parts list" also includes the items needed to perform any other routine maintenance and certain in-house non-routine repairs such as gas chromatography/mass spectrometry jet separators and electron multipliers and ICPMS nebulizer.

B7—Instrument/Equipment Calibration and Frequency

Field Instruments

Field instruments including water quality meters with dissolved oxygen, turbidity, salinity, and temperature probes will be calibrated and checked in accordance with the CQAP Appendix B Water Quality Monitoring Plan (WQMP) QAPP.

Laboratory Instruments

Equipment and instruments used at laboratories will be operated, maintained, and calibrated according to the manufacturer's guidelines and recommendations, as well as to criteria set forth in the applicable analytical methodology. Operation and calibration are performed by personnel who have been properly trained in these procedures. Documentation of calibration information is maintained in appropriate reference files. Brief descriptions of the calibration procedures for major laboratory equipment and instruments are described below. Records are maintained to provide traceability of reference materials.

Temperature Control Devices

Temperatures are monitored and recorded for our temperature-regulating devices including ovens, incubators and refrigerators. Bound record books are kept which contain daily-recorded temperatures, identification and location of equipment, acceptance criteria, and the initials of the technician who performed the checks. All thermometers have been identified according to serial number, and the calibration of these thermometers is checked annually against a National Institute of Standards and Technology (NIST) certified thermometer. The NIST thermometer is recertified on an annual basis.

Analytical Balances

Analytical balances are serviced on a semi-annual basis. New certificates of calibration for each balance are issued to the laboratory on a semi-annual basis. The calibration of each analytical balance is checked daily with three class S or S-1 weights, which assess the accuracy of the balance at low, mid- and high levels within the working range. The weights are recertified using NIST traceable standards on an annual basis. As needed, the balances are recalibrated using the manufacturer's recommended operating procedures. Bound record books are kept which contain the recorded measurements, identification and location of equipment, acceptance criteria, and the initials of the technician who performed the checks.

Water Purification System

The water purification system is designed to produce deionized water of 18 megohms resistivity or better, meeting specifications for ASTM Type I water. The system is monitored continuously with an on-line meter, which is recorded daily in a bound record book. Deionizers are rotated and replaced when the first unit in the series produces water of 0.5 megohms, which is monitored by a light on the unit. The status of the deionizers is also checked (resistivity reading and light status) and recorded daily in a bound record book. Activated carbon filters are also in series with the demineralizers to produce "organic-free" water. Finally, the water is checked at a point downstream of the original source, typically a spigot in one of the laboratory operating units. This information is also recorded on a weekly basis.

Inductively Coupled Plasma-Atomic Emission Spectrograph (ICP-AES)

Each emission line on the ICP is calibrated daily against a blank and against standards. Analyses of calibration standards, initial and continuing calibration verification standards, and inter-element interference check samples are carried out as specified in the EPA CLP Statement of Work for Inorganic Analysis, SOW No ILM04.0. (EPA 2000).

Gas Chromatographs

Calibration and standardization follow SOP guidelines and/or appropriate USEPA method citations. All GC instruments are calibrated at a minimum of five different concentrations for the analytes of interest (unless specified otherwise). The lowest standard is equivalent to the practical quantitation limit (PQL); additional standards define the working range of the GC detector. Results are used to establish response factors (or calibration curves) and retention-time windows for each analyte. Calibration is verified at a minimum frequency of once every ten samples, unless otherwise specified by the reference method.

GC/MS Systems

All GC/MS instruments are calibrated at a minimum of five different concentrations for the analytes of interest (unless specified otherwise) using procedures outlined in Standard Operating Procedures and/or appropriate USEPA method citations. All reference materials used for this function are "EPA-Certified" and/or "AZLA-Certified" standards. Calibration verification is performed at method-specified intervals following the procedures in the SOP and reference method. Compounds selected as system performance check compounds must show a method-specified response factor for the calibration to

be considered valid. Calibration check compounds (CCCs) must also meet method specifications for percent difference from the multipoint calibration. For isotope dilution procedures, the internal standard response(s) and labeled compound recovery must meet method criteria. Method-specific instrument tuning is regularly checked. Mass spectral peaks for the tuning compounds must conform both in mass numbers and in relative intensity criteria before analyses can proceed.

B8—Inspection/Acceptance of Supplies and Consumables

Field Supplies

Field supplies such as sample containers, gloves, coveralls, etc. will be inspected prior to mobilization to ensure sufficient supplies of the proper type and size are available and they are in good condition.

Laboratory Supplies

All analytical measurements generated are performed using materials and/or processes that are traceable to a Standard Reference Material (SRM). Metrology equipment (analytical balances, thermometers, etc.) is calibrated using SRMs traceable to the National Institute of Standards and Technology (NIST). These primary SRMs are themselves recertified on an annual basis. All sampling containers provided to the client by the laboratory are purchased as precleaned (Level 1) containers, with certificates of analysis available for each bottle type.

Consumable SRMs routinely purchased by the laboratories (e.g., analytical standards) are purchased from nationally recognized, reputable vendors. All vendors have fulfilled the requirements for ISO 9001 certification and/or are accredited by AZLA. In addition, consumable primary stock standards are obtained from certified commercial sources or from sources referenced in a specific method. Supelco, Ultra Scientific, AccuStandard, Chem Services, Inc., Aldrich Chemical Co., Baker, Spex, and E. M. Science are examples of the vendors used by the laboratories. All reference materials that are received are recorded by the technical staff in the appropriate notebook(s) and are stored under conditions that provide maximum protection against deterioration and contamination. The notebook entry includes such information as an assigned logbook identification code, the source of the material (i.e., vendor identification), solvent (if applicable) and concentration of analyte(s), reference to the certificate of analysis, and an assigned expiration date. In addition, the date that the standard is received in the laboratory is marked on the container. When the SRM container is used for the first time, the date of usage and the initials of the applicable technician are also recorded on the container. Stock

solutions and/or calibration standard solutions are prepared fresh as often as necessary according to their stability. After preparation, all standard solutions are properly labeled as to analyte concentration, solvent, date, preparer, and expiration date; these entries are also recorded in the appropriate notebook(s). Prior to introduction into the analytical system/process, all reference materials are verified with a second, independent source of the material. Once the reference material has been verified to be accurate, it may then be used for instrument calibration and subsequent quantitative purposes. In addition, the independent source of reference material is also used to check the calibration standards for signs of deterioration.

B9—Non-Direct Measurements

No non-direct measurement data are anticipated to be required for implementation of the sediment confirmation sampling, analysis, and evaluation activities described in the CQAP FSP.

B10—Data Management

Since only a limited number of post-excavation sediment confirmation samples are to be collected and analyzed, data will be managed using either Microsoft Excel™ spreadsheets or an Access™ database. Either of these systems will allow tabular presentations, statistical analysis, and comparison of sediment concentrations to screening or regulatory levels

GROUP C—ASSESSMENT AND OVERSIGHT

C1—Assessments and Response Actions

Laboratory Assessment

No laboratory audits are currently planned. The Laboratory Manager and Project Coordinator will monitor the performance of the laboratory quality assurance program. This will be achieved through regular contact with the field and analytical QA officers.

Field Oversight Assessment

A formal field audit is not planned for this project. However, field sampling personnel will document deviations from the approved procedures. All personnel will be given copies of the SAP FSP to ensure they are familiar with requirements and procedures for all field activities including:

- Availability and proper use of field equipment;
- Adherence to sample collection, identification, handling, shipping, and chain of custody procedures;
- Proper collection, handling, and frequency of QC samples;
- Equipment decontamination procedures; and
- Sample documentation procedures.

C2—Reports

A complete description of required reports and submittals is presented in Section 9.0 of the CQAP. These reports will provide a structure for apprising the Project Coordinator and EPA of deviations from approved field sampling activities and related QA procedures, the impact of these deviations on data quality, and the potential uncertainties in decisions made based on these data. For deviations deemed critical, the project manager will be notified verbally prior to report preparation.

GROUP D—DATA VALIDATION AND USABILITY

D1—Data Review, Verification, and Validation

This section describes the process for verifying (i.e., determining that project data were collected in a manner that meets the specified QC acceptance criteria) and validating (i.e., determining that project results are suitable for use in making the specified decision) project data.

All analytical data generated by laboratories will undergo a data validation review. Data validation results will be documented in memoranda reports submitted to the Project Manager and EPA. Data will be verified by the project QA chemist by reviewing and comparing results entered into the analytical database with validation memoranda prior to subsequent data reduction and evaluation.

D2—Verification and Validation Methods

A data validation review will be performed on all results using quality control summary sheet results provided by the laboratory for each data package. The data validation review is based on the Quality Control Requirements previously described and follows the format of the EPA National Functional Guidelines for Organic (EPA 1994a) and Inorganic (EPA 1994b) Data Review, and the EPA Region 10 SOP for validation of Dioxin Data (EPA 1999) modified to include specific criteria of individual analytical methods. Raw data (instrument tuning,

calibrations, chromatograms, spectra, instrument printouts, bench sheets, and laboratory worksheets) will be reviewed during the data validation process. The following is an outline of the data validation review format:

- Verify sample numbers and analyses match the chain of custody request;
- Verify sample preservation and holding times;
- Verify instrument tuning, calibration, and performance criteria were achieved;
- Verify that field and laboratory blanks were performed at the proper frequency and that no analytes were present in the blanks;
- Verify field and laboratory duplicates, matrix spikes, and laboratory control samples were run at the proper frequency and that control limits were met;
- Verify surrogate compound analyses have been performed and that results met the QC criteria;
- Verify compound identification criteria have been met for all detected analytes; and
- Verify required detection limits have been achieved.

Data validation qualifier flags, beyond any applied by the laboratory, will be added to sample results that fall outside the QC acceptance criteria. An explanation of data qualifiers to be applied during the validation review is provided below:

- **U.** The compound was analyzed for but was not detected. The associated numerical value is the sample reporting limit.
- **J.** The associated numerical value is an estimated quantity because quality control criteria were slightly exceeded or because reported concentrations were less than the practical quantitation limit (lowest calibration standard).
- **UJ.** The compound was analyzed for, but not detected. The associated numerical value is an estimated reporting limit because quality control criteria were not met.
- **R.** Data are not usable because of significant exceedence of quality control criteria. The analyte may or may not be present; resampling and/or re-analysis are necessary for verification.
- **UX.** Ion ratios did not match identification criteria for high resolution dioxin analysis and the analyte is qualified as not detected. The associated numerical value is the estimated sample reporting limit.

D3—Reconciliation with User Requirements

Reconciliation of laboratory results with DQOs will be performed on an on-going basis through the data validation process. The reconciliation process will include comparison of validated data to sediment quality objective (SQO) performance standards. During validation it will be verified that analytical methods meet the performance standards. An overall summary of laboratory data quality discussing precision, accuracy, and completeness will be included in the final report submitted to EPA.

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Table A-2-1 – Personnel Responsible for Quality Assurance Activities

Personnel	Responsibilities
EPA Project Manager Karen Keeley	Oversee project performance and compliance with agency objectives.
Analytical Laboratory Manager Christopher Getchell	Oversee laboratory analytical performance to ensure compliance. Implement necessary action and adjustments to accomplish.
Laboratory QA Officer Lori Zboralski	Ensure the use of proper analytical procedures; review all quality control indicators and compare them to control limits specified; initiate corrective action.
City of Tacoma Project Coordinator and Quality Assurance Official John O'Loughlin	Coordinate City activities to implement required work. Conduct and oversee the Quality Assurance Program during construction.

Table A-2-2 – Sample Containers, Preservation, and Holding Times

Analysis	Matrix	Container	Preservation	Holding Time^a
Total Organic Carbon (TOC)	Soil	1 – 4 oz glass jar	cool to 4°C	28 days
Metals	Sediment and Soil	1 – 4 oz glass jar	cool to 4°C	6 months (mercury – 28 days)
Polychlorinated biphenyls (PCBs)	Sediment and Soil	1 – 8 oz glass jar	cool to 4°C	7 days (extraction) 40 days (analysis)
Chlorinated Pesticides	Soil	1 – 8 oz glass jar	cool to 4°C	7 days (extraction) 40 days (analysis)
Volatile Organic Compounds (VOCs)	Soil	1 – 4 oz glass jar (2 oz jar may have insufficient volume for soils with minor gravel)	cool to 4°C	7 days
Semivolatile Organic Compounds (SVOCs)	Soil	1 – 8 oz glass jar	cool to 4°C	14 days (extraction) 40 days (analysis)
Dioxins/Furans (PCDD/PCDF)	Sediment	1 – 4 oz glass jar	cool to 4°C	6 months

^a Holding times are from date of sample collection.

Table A-2-3 – Contract-Required Metal Quantitation Limits for Sediment

Inorganics Method CLP ILM04.0	Sediment CRQL in mg/kg
Arsenic	1
Cadmium	1
Chromium	5
Copper	2.5
Lead	0.6
Mercury	0.1
Nickel	5
Silver	2
Zinc	2

^a - CRQLs correspond to the lowest calibration standard analysis of clean sample matrices assuming a method-specific sample volume or weight. Actual analyte reporting limits are matrix- and sample-dependent and may be higher depending upon sample weight or volume, moisture content, final extract volume, analytical interferences, and any required sample dilutions.

Table A-2-4 –Contract-Required Metal Quantitation Limits for TCLP

Inorganics Method CLP ILM04.0	Cap TCLP PQL in mg/L
Arsenic	1
Lead	1

^a - CRQLs correspond to the lowest calibration standard analysis of clean sample matrices assuming a method-specific sample volume or weight. Actual analyte reporting limits are matrix- and sample-dependent and may be higher depending upon sample weight or volume, moisture content, final extract volume, analytical interferences, and any required sample dilutions.

Table A-2-5 – Contract-Required PCB Quantitation Limits

PCBs Method CLP OLM03.1	Sediment CRQL In ug/kg
Aroclor 1016	80
Aroclor 1221	80
Aroclor 1242	80
Aroclor 1248	80
Aroclor 1254	80
Aroclor 1260	80

- ^a CRQLs correspond to the lowest calibration standard analysis of clean sample matrices assuming a method-specific sample volume or weight. Actual analyte reporting limits are matrix- and sample-dependent and may be higher depending upon sample weight or volume, moisture content, final extract volume, analytical interferences, and any required sample dilutions.

Table A-2-6 – PCDD/PCDF Analytes, PQLs, and MDLs

PCDD/PCDF (Method 1613B)	Sediment	
	PQL in ng/kg	MDL in ng/kg
2,3,7,8-TCDD	1	0.68
1,2,3,7,8-PeCDD	5	0.46
1,2,3,4,7,8-HxCDD	5	0.73
1,2,3,6,7,8-HxCDD	5	0.71
1,2,3,7,8,9-HxCDD	5	0.80
1,2,3,4,6,7,8-HpCDD	5	0.95
OCDD	10	1.01
2,3,7,8-TCDF	1	0.60
1,2,3,7,8-PeCDF	5	1.12
2,3,4,7,8-PeCDF	5	0.40
1,2,3,4,7,8-HxCDF	5	0.70
1,2,3,6,7,8-HxCDF	5	0.60
2,3,4,6,7,8-HxCDF	5	0.65
1,2,3,7,8,9-HxCDF	5	0.48
1,2,3,4,6,7,8-HpCDF	5	0.78
1,2,3,4,7,8,9-HpCDF	5	0.63
OCDF	10	1.59
TEQ	12	1.9

^a PQLs correspond to the lowest calibration standard analysis of clean sample matrices assuming a method-specific sample volume or weight. Actual analyte reporting limits are matrix- and sample-dependent and may be higher depending upon sample volume, final extract volume, analytical interferences, and any required sample dilutions.

Table A-2-7 - Semivolatile Organic Analytes and Reporting Limit Goals

Commencement Bay SQO Semivolatile Organic Compounds Method CLP OLM03.1	Cap Material
	PQL in µg/kg
PAHs	
2-Methylnaphthalene	100
Naphthalene	100
Acenaphthylene	100
Acenaphthene	100
Fluorene	100
Phenanthrene	100
Anthracene	100
Total LPAH	
Fluoranthene	100
Pyrene	100
Benzo(a)anthracene	100
Chrysene	100
Total Benzofluoranthenes	100
Benzo(a)pyrene	100
Indeno(1,2,3-cd)pyrene	100
Dibenz(a,h)anthracene	100
Benzo(g,h,i)perylene	100
Total HPAH	
Phthalates	
Dimethylphthalate	100
Diethylphthalate	100
Di-n-butylphthalate	100
Butylbenzylphthalate	100
Bis(2-ethylhexyl)phthalate	100
Di-n-octylphthalate	100
Phenols	
Phenol	100
2-Methylphenol	10 (SIM)
4-Methylphenol	100
2,4-Dimethylphenol	10 (SIM)
Pentachlorophenol	200 (SIM)
2-Chlorophenol	100
2-Nitrophenol	100
2,4-Dichlorophenol	100
4-Chloro-3-methylphenol	100
2,4,6-Trichlorophenol	100
2,4,5-Trichlorophenol	100
2,4-Dinitrophenol	500
4-Nitrophenol	500
4,6-Dinitro-2-methylphenol	500

Commencement Bay SQO Semivolatile Organic Compounds Method CLP OLM03.1	Cap Material
	PQL in µg/kg
Miscellaneous SVOCs	
1,2,4-Trichlorobenzene	10 (SIM)
Hexachlorobenzene	10 (SIM)
Hexachlorobutadiene	10 (SIM)
Benzyl alcohol	10 (SIM)
Benzoic acid	500
Dibenzofuran	100
N-Nitrosodiphenylamine	10 (SIM)
bis(2-chloroethyl)ether	100
2,2'-oxybis(1-chloropropane)	100
Hexachloroethane	100
Nitrobenzene	100
Isophorone	100
bis(2-chloroethoxy)methane	100
Hexachlorocyclopentadiene	100
2,4-Dinitrotoulene	100
2,6-Dinitrotoluene	100
4-Chlorophenyl-phenylether	100
4-Bromophenyl-phenylether	100
N-nitroso-di-n-propylamine	100
4-Chloroaniline	100
2-Nitroaniline	100
3-Nitroaniline	100
4-Nitroaniline	100
3,3'-dichlorobenzidine	500
Carbazole	100
1,1'-biphenyl	100
2-chloronaphthalene	100

PQLs correspond to the lowest calibration standard analysis of clean sample matrices assuming a method-specific sample volume or weight. Actual analyte reporting limits are matrix- and sample-dependent and may be higher depending upon sample weight or volume, moisture content, final extract volume, analytical interferences, and any required sample dilutions.

Table A-2-8 - Chlorinated Pesticides Analytes and Reporting Limit Goals

Commencement Bay SQO Chlorinated Pesticides Method CLP OLM03.1	Cap Material
	PQL in $\mu\text{g}/\text{kg}$
alpha-BHC	8
beta-BHC	8
delta-BHC	8
Aldrin	8
Alpha-Chlordane	8
Gamma-Chlordane	8
4,4'-DDD	8
4,4'-DDE	8
4,4'-DDT	8
Dieldrin	8
Endosulfan I	8
Endosulfan II	8
Endosulfan sulfate	8
Endrin	8
Endrin Aldehyde	8
Endrin Ketone	8
Heptachlor	8
Heptachlor epoxide	8
Lindane (gamma-BHC)	8
Methoxychlor	40
Toxaphene	200

PQLs correspond to the lowest calibration standard analysis of clean sample matrices assuming a method-specific sample volume or weight. Actual analyte reporting limits are matrix- and sample-dependent and may be higher depending upon sample weight or volume, moisture content, final extract volume, analytical interferences, and any required sample dilutions.

Table A-2-9 - Volatile Organic Analytes and Reporting Limit Goals

Volatile Organic Compounds Method CLP OLM03.1	Cap Material
	PQL in µg/kg
Chloromethane	5
Bromomethane	5
Vinyl chloride	5
Chloroethane	5
Methylene chloride	5
Acetone	50
Carbon disulfide	5
1,1-Dichloroethene	5
1,1-Dichloroethane	5
cis-1,2-Dichloroethene	5
trans-1,2-Dichloroethene	5
Chloroform	5
1,2-Dichloroethane	5
2-Butanone	50
1,1,1-Trichloroethane	5
Carbon tetrachloride	5
Bromodichloromethane	5
1,2-Dichloropropane	5
Cis-1,3-Dichloropropene	5
Trichloroethene	5
Dibromochloromethane	5
1,1,2-Trichloroethane	5
Benzene	5
Trans-1,3-Dichloropropene	5
Bromoform	5
4-Methyl-2-pentanone	50
2-Hexanone	50
Tetrachloroethene	5
1,1,2,2-Tetrachloroethane	5
Toluene	5
Chlorobenzene	5
Ethylbenzene	5
Styrene	5
o-Xylene	5
m-Xylene	5
p-Xylene	5
1,3-Dichlorobenzene	5
1,4-Dichlorobenzene	5
1,2-Dichlorobenzene	5

PQLs correspond to the lowest calibration standard analysis of clean sample matrices assuming a method-specific sample volume or weight. Actual analyte reporting limits are matrix- and sample-dependent and may be higher depending upon sample weight or volume, moisture content, final extract volume, analytical interferences, and any required sample dilutions.

Table A-2-10 – Summary of Quality Control Procedures, Criteria, and Corrective Actions for Total Organic Carbon

EPA 9060 PSEP modification			
Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Field Quality Control			
Temperature blank	1 in every cooler shipped	Temperature = 4° C ± 2° C	Evaluate data for usability
Field duplicate	2 samples	≤ 50% RPD	Evaluate data for usability
Laboratory Quality Control			
Initial calibration	Daily or each time instrument is set up		
Continuing calibration verification	Every 10 analytical samples or every 2 hours and at the beginning and end of each run	90 to 110% of initial calibration	Recalibrate instrument and re-analyze affected samples
Method blank	1 per batch of every 20 or fewer samples	All analytes < reporting limit	Re-extract and re-analyze associated samples unless concentrations are > 5 times the blank level
Matrix spike or LCS	1 per batch of every 20 or fewer samples	50 to 150% recovery	Evaluate data for usability
Laboratory duplicate	1 per batch of every 20 or fewer samples	≤ 20% RPD	Evaluate data for usability

Table A-2-11 – Summary of Quality Control Procedures, Criteria, and Corrective Actions for Inorganic Analysis

Inorganics EPA CLP SOW ILM04.0			
Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Field Quality Control			
Rinse blank	1 every 20 or fewer field samples collected with non-dedicated equipment	All analytes < reporting limit	Evaluate data for usability
Field duplicate	2 samples	≤ 50% RPD	Evaluate data for usability
Laboratory Quality Control			
Initial calibration	Daily or each time instrument is set up		
Initial calibration verification	Following each instrument calibration	90 to 110% of initial calibration	Recalibrate instrument
Initial calibration blank	Following each instrument calibration	All analytes < reporting limit	Correct source of contamination
Continuing calibration verification	Every 10 analytical samples or every 2 hours and at the beginning and end of each run	90 to 110% of initial calibration	Recalibrate instrument and re-analyze affected samples
Continuing calibration blank	Following each continuing calibration verification	All analytes < reporting limit	Correct source of contamination
Method blank	1 per batch of every 20 or fewer samples	All analytes < reporting limit	Re-extract and reanalyze associated samples unless concentrations are > 5 x blank level
Matrix spike	1 per batch of every 20 or fewer samples	75 to 125% recovery (arsenic – 60 to 128%)	Evaluate data for usability
Laboratory duplicate	1 per batch of every 20 or fewer samples	≤ 35% RPD	Evaluate data for usability
Laboratory control sample	1 per batch of every 20 or fewer samples	80 to 120% recovery	Evaluate data for usability
Instrument detection limits	Quarterly		
Interlelement corrections	Annually (ICP only)		
Linear range	Quarterly (ICP only)		

Table A-2-12 – Summary of Quality Control Procedures, Criteria, and Corrective Actions for PCB Analysis

PCBs EPA CLP SOW OLM03.1, GC/ECD		
Quality Control Check	Frequency	Acceptance Criteria
Field Quality Control		
Temperature blank	1 in every cooler shipped	Temperature = 4° C ± 2° C
Rinse blank	1 every 20 or fewer field samples collected with non-dedicated equipment	All analytes < reporting limit
Field duplicate	2 samples	≤ 50% RPD
Laboratory Quality Control		
Method blank	1 per batch of every 20 or fewer samples	All analytes < reporting limit
Initial calibration	5-point external calibration prior to analysis of samples	%RSD < 25%
Continuing calibration	Every 10 samples with mid-range standard	% Difference ≤ 20% of initial calibration
System monitoring compounds (surrogates)	Every lab and field sample TCMX and DCB	30 to 150% recovery
Retention time windows	All samples and continuing calibration checks	±0.06 relative retention time units (sample and standard)
Matrix spike (A-1254)	1 per batch of every 20 or fewer samples	33 to 128% recovery
Matrix spike duplicate	1 per batch of every 20 or fewer samples	RPD < 35%
		Re-extract and reanalyze associated samples unless concentrations are > 5 times the blank level
		Recalibrate instrument
		Recalibrate instrument and re-analyze affected samples
		Evaluate data for usability
		Reanalyze affected samples
		Evaluate data for usability
		Evaluate data for usability

Table A-2-13 – Summary of Quality Control Procedures, Criteria, and Corrective Actions for PCDD/PCDF Analysis

PCDD/PCDF – EPA Method 1613B High Resolution GC/MS		
Quality Control Check	Frequency	Acceptance Criteria
Field Quality Control		
Temperature blank	1 in every cooler shipped	Temperature = 4° C ± 2° C
Rinse blank	1 every 20 or fewer field samples collected with non-dedicated equipment	All analytes < reporting limit
Field duplicate	2 samples	≤ 50% RPD
Laboratory Quality Control		
Method blank	1 per batch of every 20 or fewer samples	All analytes < reporting limit
Initial calibration	5-point calibration prior to analysis of samples	Method 1613B, Section 10.1; %RSD < 20%
Continuing calibration	Every 12 hours with mid-range standard	Method 1613B, Section 15.3, Table 6
Instrument performance	PFK lock mass	Method 1613B, Section 10.1, Table 8
Recovery standards (¹³ C ₁₂ -1,2,3,4-TCDD) (¹³ C ₁₂ -1,2,3,7,8,9-HxCDD)	Every sample and calibration standard mix	Method 1613B, Section 17, Table 4
Labeled spiking compounds See Method 1613B, Table 1	Every lab and field sample	Method 1613B, Section 15.3, Table 7
Retention time windows	All samples and continuing calibration checks	Method 1613B, Section 16, Table 2
Qualitative identification (ion intensity ratios)	All samples	Method 1613B, Section 17, Table 9
Cleanup standard (³⁷ Cl-2,3,7,8-TCDD)	All sample extracts prior to cleanup	Method 1613B, Section 15.3, Table 6
Ongoing Precision and Recovery (OPR) analysis	1 per batch of every 20 or fewer samples	Method 1613B, Section 15.3, Table 6
		Re-extract and reanalyze associated samples unless concentrations are > 5 times the blank level
		Recalibrate instrument
		Recalibrate instrument and reanalyze affected samples
		Retune and recalibrate instrument; reanalyze affected samples
		Reanalyze affected samples
		Evaluate data for usability
		Reanalyze affected samples
		Evaluate data for usability
		Re-extract and reanalyze associated samples
		Correct problem. Re-prepare, extract, and clean-up the sample batch

Table A-2-14 - Summary of Quality Control Procedures, Criteria, and Corrective Actions for Volatile Organic Analysis

Volatile Organics – CLP OLC03.1 GC/MS			
Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Field Quality Control			
Transport blank	1 in every shipping container to laboratory	All analytes < reporting limit	Evaluate data for useability
Rinse blank	1 every 20 or fewer field samples (water only) collected with non-dedicated equipment	All analytes < reporting limit	Evaluate data for useability
Duplicate	1 every 20 or fewer field samples	≤ 35% RPD	Evaluate data for useability
Laboratory Quality Control			
Method blank	1 per batch of every 20 or fewer samples	All analytes < reporting limit	Re-extract and reanalyze associated samples unless concentrations are > 5 times the blank level
Initial calibration	5-point calibration prior to analysis of samples	Average RRF > 0.05 %RSD < 20.5%	Recalibrate instrument
Continuing calibration	Every 12 hours with mid-range standard	% Difference ≤ 25% of initial calibration	Recalibrate instrument and re-analyze affected samples
Instrument performance check (tuning)	BFB; Daily prior to sample analysis or each 12-hour period, whichever is more frequent	CLP OLC03.1	Retune and recalibrate instrument; reanalyze affected samples
Internal standards	Every sample and calibration standard mix	Areas within -50% to +100% of initial calibration	Reanalyze affected samples
System monitoring compounds (surrogates)	Every lab and field sample	CLP OLC03.1	Evaluate data for useability
Retention time windows	All samples and continuing calibration checks	±0.06 relative retention time units (sample and standard)	Reanalyze affected samples
Qualitative identification (ion intensity ratios)	All samples	CLP OLC03.1	Evaluate data for useability
Matrix spike	1 per batch of every 20 or fewer samples	CLP OLC03.1	Evaluate data for useability
Matrix spike duplicate	1 per batch of every 20 or fewer samples	CLP OLC03.1	Evaluate data for useability
Laboratory control sample	1 per batch of every 20 or fewer samples	CLP OLC03.1	Evaluate data for useability

Table A-2-15 - Summary of Quality Control Procedures, Criteria, and Corrective Actions for Semivolatile Organic Analysis

Semivolatile Organics CLP OLC03.1 GC/MS			
Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Field Quality Control			
Rinse blank	1 every 20 or fewer field samples (water only) collected with non-dedicated equipment	All analytes < reporting limit	Evaluate data for useability
Duplicate	1 every 20 or fewer field samples	≤ 35% RPD	Evaluate data for useability
Laboratory Quality Control			
Method blank	1 per batch of every 20 or fewer samples DAILY	All analytes < reporting limit	Re-extract and reanalyze associated samples unless concentrations are > 5 times the blank level
Initial calibration 20.5%	Calibration prior to analysis of samples	CLP OLC03.1	Recalibrate instrument
Continuing calibration	Every 12 hours with mid-range standard	% Difference ≤ 25% of initial calibration	Recalibrate instrument and re-analyze affected samples
Instrument performance check (tuning)	DFTPP; Daily prior to sample analysis or each 12-hour period, whichever is more frequent	CLP OLC03.1	Retune and recalibrate instrument; reanalyze affected samples
Internal standards	Every sample and calibration standard mix	Areas within -50% to +100% of initial calibration	Reanalyze affected samples
System monitoring compounds (surrogates)	Every lab and field sample	CLP OLC03.1	Evaluate data for useability
Retention time windows	All samples and continuing calibration checks	±0.06 relative retention time units (sample and standard)	Reanalyze affected samples
Qualitative identification (ion intensity ratios)	All samples	CLP OLC03.1	Evaluate data for useability
Matrix spike	1 per batch of every 20 or fewer samples	CLP OLC03.1	Evaluate data for useability
Matrix spike duplicate	1 per batch of every 20 or fewer samples	CLP OLC03.1	Evaluate data for useability
Laboratory control sample	1 per batch of every 20 or fewer samples	CLP OLC03.1	Evaluate data for useability

Table A-2-16 - Summary of Quality Control Procedures, Criteria, and Corrective Actions for Chlorinated Pesticide Analysis

Chlorinated Pesticides – CLP OLC03.1 GC/ECD			
Quality Control Check	Frequency	Acceptance Criteria	Corrective Action
Field Quality Control			
Rinse blank	1 every 20 or fewer field samples (water only) collected with non-dedicated equipment	All analytes < reporting limit	Evaluate data for useability
Duplicate	1 every 20 or fewer field samples	Water - \leq 35% RPD	Evaluate data for useability
Laboratory Quality Control			
Method blank	1 per batch of every 20 or fewer samples DAILY	All analytes < reporting limit	Re-extract and reanalyze associated samples unless concentrations are > 5 times the blank level
Initial calibration	5-point external calibration prior to analysis of samples	%RSD < 20%	Recalibrate instrument
Continuing calibration	Every 10 samples with mid-range standard	% Difference \leq 15% of initial calibration	Recalibrate instrument and re-analyze affected samples
System monitoring compounds (surrogates)	Every lab and field sample	CLP OLC03.1	Evaluate data for useability
Retention time windows	All samples and continuing calibration checks	\pm 0.07 min from cal std	Reanalyze affected samples
Matrix spike	1 per batch of every 20 or fewer samples	CLP OLC03.1	Evaluate data for useability
Matrix spike duplicate	1 per batch of every 20 or fewer samples	CLP OLC03.1	Evaluate data for useability
Laboratory control sample	1 per batch of every 20 or fewer samples	CLP OLC03.1	Evaluate data for useability

**ATTACHMENT A-3
HEALTH AND SAFETY PLAN
FOR SEDIMENT CONFIRMATION SAMPLING
OLYMPIC VIEW RESOURCE AREA (OVRA)
CONTAMINATED SEDIMENT NON-TIME-CRITICAL REMOVAL ACTION
TACOMA, WASHINGTON**

**ATTACHMENT A-3
HEALTH AND SAFETY PLAN
FOR SEDIMENT CONFIRMATION SAMPLING
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CONTAMINATED SEDIMENT NON-TIME-CRITICAL REMOVAL ACTION
TACOMA, WASHINGTON**

The attached health and safety plan (HASP) was previously prepared for site characterization sampling conducted by the City of Tacoma for the OVRA project in 1998 and 1999. The HASP was approved by the EPA as part of the City's document submittals for Phase I sampling, and is applicable to surface sediment confirmation sampling to be conducted for the current OVRA Removal Action.

The Phase I HASP is attached with the following modifications:

- **Site Health and Safety Plan Summary** has been updated to reflect the planned project dates for 2002 and surface sample collection (references to van Veen grab samplers and impact coring have been deleted).
- **2.3 Chain of Command** has been updated to identify Chris Getchell or designate as Field Safety Manager.
- **2.4 Site Work Activities** have been updated to reflect surface sediment sampling only.
- **2.5 Site Description** has been updated to describe cleanup areas for the Removal Action.
- **3.1 Toxicity of Chemicals and Concern** has been modified to include updated health risk information for dioxins, metals, PCBs, and PAHs.
- **3.4 Other Physical Hazards** has been modified to include hearing protection.
- **3.5 Sediment Sampling, 4.0 Protective Equipment, 5.0 Safety Equipment List, 6.0 Exclusion Area, 8.0 Decontamination, 10.0 Site Security and Control, 12.1 Plan Content and Review, and 12.4 Fires** have been modified to eliminate previous references to sampling from vessels, related protective equipment, and underwater cables. Vessels will not be used for sediment confirmation sampling during the OVRA Removal Action.

- The previous figure for **Deck Layout for Work Operations** on sampling vessels has been deleted.

Pagination and table numbering have also been revised for consistency with inclusion of this HASP as Attachment A-3 to Appendix A of the CQAP. Text has been underlined where added for the above revisions.

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OLYMPIC VIEW
RESOURCE AREA

ATTACHMENT A-3

HEALTH AND SAFETY PLAN

CITY OF TACOMA

Revised December 10, 2001, for OVRA Removal Action

HEALTH AND SAFETY PLAN

EMERGENCY CONTINGENCY INFORMATION

SITE LOCATION	Olympic View Resource Area Tacoma, Washington
NEAREST HOSPITAL	Tacoma General Hospital 315 South K Street Tacoma, Washington (253) 594-1050 The route from the facility to the hospital is depicted on Figure 1 (Page A-3-3)
EMERGENCY RESPONDERS	Police Department 911 Fire Department 911 Ambulance 911 U.S. Coast Guard Emergency (206) 217-6000 General Information (206) 220-7021 UHF Channel 16 National Response Center (800) 424-8802 EPA (800) 424-4372
EMERGENCY CONTACTS	City of Tacoma, Public Works Department John O'Loughlin (253) 502-2108 Christopher L. Getchell (253) 502-2130
IN EMERGENCY, CALL FOR HELP AS SOON AS POSSIBLE	Give the following information: ⌘ Where you are (address, cross streets, or landmarks) ☎ Phone Number you are calling from ☹ What happened - type or injury, accident # How many persons need help Rx What is being done for the victim/s !! You hang up last - let whomever you called hang up first

Emergency Route to Hospital Map Figure 1

Emergency Route to Hospital Map



1.0 Site Health and Safety Plan Summary

SITE NAME: Olympic View Resource Area (Former Puget Sound Plywood).

LOCATION: Tacoma Washington.

PROPOSED DATES OF ACTIVITIES: 2002.

PLAN UPDATED: December 2001

TYPE OF FACILITY: Abandoned plywood manufacturing facility.

LAND USE OF AREA SURROUNDING FACILITY: Industrial, State Aquatic Lands.

SITE ACTIVITIES: Intertidal sediment sampling using hand-collection methods.

POTENTIAL SITE CONTAMINANTS: Heavy metals, PAHs, PCBs, hydrogen sulfide and dioxins.

ROUTES OF ENTRY: Skin contact with sediment or water and incidental ingestion of sediment.

ADMINISTRATIVE AND ENGINEERING CONTROLS: Limit number of people to those required for conducting sampling. Stand upwind if hydrogen sulfide suspected. Note, however, that EPA, Corps, Ecology, Trustee or agency consultant personnel may be present during sampling. Their presence will not be limited as an administrative control.

PROTECTIVE MEASURES: Safety glasses, gloves, hard hat, work boots and protective clothing as specified in this plan.

MONITORING EQUIPMENT: None.

2.0 Introduction

2.1 Purpose and Regulatory Compliance

This site-specific Health and Safety Plan (HSP) addresses procedures to minimize the risk of chemical exposures, physical accidents to on-site worker and environmental contamination. The HSP covers each of the 11 required plan elements as specified in 29 CFR 1910.120 or equivalent Washington State Department of Labor and Industries regulations. Table 1 lists the sections of this plan which apply to each of these required elements. This site-specific plan meets all applicable regulatory requirements.

Table 1 – Required Health and Safety Plan Elements in This Site-Specific HSP

Required Health & Safety Plan Element	Section in this Health and Safety Plan
Confined Space entry	<u>3.5</u> Other Physical Hazards
Decontamination	<u>8.0</u> Decontamination
Emergency response plan	<u>12.0</u> Emergency Response Plan
Medical surveillance	<u>15.0</u> Medical Surveillance
Names of key personnel	<u>2.3</u> Chain of Command
Personal protective equipment	<u>4.0</u> Protective Equipment and <u>5.0</u> Safety Equipment List
Safety and hazard analysis	<u>3.0</u> Hazard Evaluation and Control Measures
Site Control	<u>6.0</u> Exclusion Areas and <u>10.0</u> Site Security
Spill Containment	<u>11.0</u> Spill Containment
Training	<u>13.0</u> Training Requirements

2.2 Distribution and Approval

This HSP will be made available to all field personnel and subcontractors involved in field work on this project. For subcontractors, this HSP represents minimum safety procedures and subcontractors are responsible for their own safety while present on site or conducting work for this project. Subcontractor work may involve safety and health procedures not addressed in the HSP. By signing the documentation form provided with this plan (Table 3 located at the end of the HSP) project workers also certify their approval and agreement to comply with the plan.

2.3 Chain of Command

The chain of command for health and safety on this project involves the following individuals:

Project Manager and Project H&S Manager: John O’Loughlin. The Project Manager has overall responsibility for the successful outcome of the project. The Project manager may delegate this authority and responsibility to the Field H&S (Health & Safety) Managers. The Project H&S Manager has overall responsibility for health and safety on this project. This individual ensures that everyone working on this project understands this HSP.

Field H&S Manager: Christopher L. Getchell or Designate. The Field H&S Managers are responsible for implementing the HSP in the field. These individuals also observe subcontractors to verify that they are following these procedures, at a minimum. The field H&S Managers will also assure that proper protective equipment is available and used in the correct manner, decontamination activities are carried out properly and that employees have knowledge of the local emergency medical system should it be necessary.

2.4 Site Work Activities

Planned surface sediment sampling activities are described in Section 6.0 of the CQAP and Field Sampling Plan (FSP) Attachment A-1 to the SAP. Sampling will involve collection of sediment material from the exposed tideflat after sediment removal has been completed in a given intertidal excavation area. The sampling is intended to evaluate the effectiveness of sediment removal activities at the site.

The samples will be collected by hand using a sampling spoon. The samples are planned to be collected immediately after excavation equipment has completed removal of the overlying sediment, and before import fill material is placed to backfill the excavation segment. Sheet pile enclosures are planned to facilitate sediment removal and capping in Area B and Area D. Sediment samples are therefore planned to be collected from Area B and Area D using a hand auger or other sampling device affixed to the end of a reach pole or connecting rods.

The expected time frame of this project is June through September 2002.

2.5 Site Description

The OVRA Removal Action involves excavation of approximately 6,000 cubic yards of intertidal sediment with dioxins and other chemical contaminants. Sediment removal will be accomplished using shovel and blade construction equipment in Area A and Area C, and using a crane-mounted clamshell bucket in Area B and Area D. Access to the site is limited and includes ingress/egress from the “F” Street on the southeastern part of the site, and the Cascade Capital yard on the southwestern part of the site (Figure 1). The Construction Quality Assurance Plan (CQAP) provides additional detail on site remediation and the sequence of construction.

3.0 Hazard Evaluation and Control Measures

This section discusses the toxicity of chemicals of concern, potential exposure routes, symptoms of heat stress and hypothermia and other physical hazards. Table 2 Activity Hazard Analysis lists the potential hazards associated with each site activity and the recommended site control to be used to minimize each potential hazard.

Table 2 Activity Hazard Analysis

ACTIVITY	HAZARD	CONTROL
Surveying sampling locations	Slipping on wet or oily surfaces.	Wear appropriate slip-resistant boots.
	Skin or clothing contamination from surficial contamination	Avoid touching or stepping on surfaces with visibly contaminated soils, puddles or stains. Appropriate PPE will be worn. Follow heat stress precautions in Section 3.4.
Decontamination of equipment	Inhalation or eye contact with airborne mists or vapors.	Wear safety glasses and respirators if necessary.
	Skin contact with contaminated liquids.	Wear modified Level D personal protections (PPE). Tape openings in garment. Follow heat stress precautions in Section 3.4.
	Accidental ingestion of contaminants.	Decontaminate clothing and skin prior to eating, drinking, smoking or other hand to mouth contacts.
Sediment sampling from vessels	Skin contact with contaminated sediments.	Wear disposable protective clothing (tyvek), eye protection (as necessary) and chemical-resistant gloves.
Sampling handling, packaging and processing	Skin contact with contaminated sediments.	Wear modified Level D PPE.
Sediment sampling by hand along banks	Skin contact with contaminated sediments.	Wear modified Level D PPE, or at minimum chemical-resistant safety boots, and nitrile inner gloves.
	Tripping or falling over equipment.	Walk carefully, don't take chances, organize and store equipment properly

3.1 Toxicity of Chemicals of Concern

Based on previous site information and knowledge of the types of activities conducted at this location, the following chemicals may be present at this site: heavy metals, PAHs, PCBs, hydrogen sulfide and dioxins. Human health hazards of these chemicals are discussed below. This information covers potential toxic effects which might occur if relatively significant acute and/or chronic exposure were to happen. This information does not mean that such effects will occur from the planned site activities. In general, the chemicals which may be encountered at this site are not expected to be present at concentrations which could produce significant exposures. The types of planned work activities and use of monitoring procedures and protective measures will limit potential exposures at this site.

These standards are presented using the following abbreviations:

PEL Permissible exposure limit.

TWA Time-weighted average exposure limit for any 8-hour work shift.

STEL Short-term exposure limit expressed as a 15-minute time-weighted average and not to be exceeded at any time during a work day.

Dioxins. Dioxins, such as 2,3,7,8-Tetrachlorodibenzo-p-Dioxin (TCDD) (CAS Registry Number 1746-01-6), can affect you when inhaled and by passing through your skin. Exposure to dioxins can cause a burning sensation in the eyes, nose, and throat. Headache, dizziness, blurred vision, muscle and joint pain, impaired muscle coordination, asthenia, nausea, vomiting, emotional disorders, nervousness, irritability, and intolerance to cold may all occur. Chloracne, an acne-like eruption of the skin, commonly occurs. Symptoms (itching, swelling, redness) may occur weeks or months before the eruptions appear and may last a few months or up to 15 years. Dioxin exposure can cause immune system dysfunction, ulcers, peripheral neuropathy, and abnormalities of the liver, pancreas, and circulatory and respiratory systems. TCDD is a probable human carcinogen. It has been most strongly linked with soft tissue sarcomas. More limited evidence suggests associations with several other cancers. In a new EPA re-assessment, the upper limit for overall cancer risk for the general population may be as high as 1:1000. Finally, dioxins may be human teratogens, specifically for ectodermal dysplasia and CNS, cardiac and skeletal defects.

Arsenic Health Effects. Arsenic is toxic by inhalation and ingestion of dusts and fumes or by inhalation of arsine gas. Trivalent arsenic compounds are the most toxic to humans, with significant corrosive effects on the skin, eyes, and mucous membranes. Dermatitis also frequently occurs, and skin sensitization and contact dermatitis may result from arsenic trioxide or pentoxide. Trivalent arsenic interacts with a number of sulfhydryl proteins and enzymes, altering their normal biological function. Ingestion of arsenic can result in fever, anorexia, cardiac abnormalities, and neurological damage. Liver injury can accompany chronic exposure. Skin and inhalation exposure to arsenic has been associated with cancer in humans, particularly among workers in the arsenical-pesticide industry or copper smelters. The EPA currently classifies arsenic as a Class A, or confirmed, human carcinogen. Arsine is a highly toxic gaseous arsenical, causing nausea, vomiting, and destruction of red blood cells. The current PEL-TWA for organic forms of arsenic is 0.2 mg/m³; and for inorganic forms of arsenic is 0.01 mg/m³.

Copper Health Effects. Copper exposure can occur via inhalation of dust or fume, ingestion, or skin and eye contact. Copper salts can act as skin irritants, causing itching and dermatitis. Eye contact can result in severe damage, including corneal damage. Contact with metallic copper can result in skin thickening, but is not associated with dermatitis in industrial settings. Fumes and dusts can irritate the respiratory tract and result in metal fume fever in severe exposures. Ingestion can result in irritation, but industrial exposure seldom results in damage because copper salts normally induce vomiting. Extensive exposure can damage the lungs, kidneys, skin,

and liver. The current PEL-TWA for copper as dust and mists is 1.0 mg/m³, while the PEL for copper as fume is 0.1 mg/m³.

Inorganic Lead Health Effects. Inorganic lead exposure can occur via inhalation of dusts or metal fumes, ingestion of dusts, and skin and eye contact. The principal target organs of lead toxicity include the nervous system, kidneys, blood, gastrointestinal, and reproductive systems. Generalized symptoms of lead exposure include decreased physical fitness, fatigue, sleep disturbances, headaches, bone and muscle pain, constipation, abdominal pain, and decreased appetite. More severe exposure can result in anemia, severe gastrointestinal disturbance, a "lead-line" on the gums, neurological symptoms, convulsions, and death.

Neurological effects are among the most severe of inorganic lead's toxic effects and vary depending on the age of individual exposed. Effects observed in adults occur primarily in the peripheral nervous system, resulting in nerve destruction and degeneration. Wrist-drop and foot-drop are two characteristic manifestations of this toxicity.

The EPA also currently lists inorganic lead as a Group B2 probable human carcinogen via the oral route. This conclusion is based on feeding studies conducted in laboratory animals. The current PEL-TWA for inorganic lead is 0.05 mg/m³. Occupational exposure to lead is also specifically regulated under WAC 296-62-07521, with an action level established at 0.03 mg/m³ that triggers monitoring and other requirements.

Mercury Health Effects. The health effects of mercury exposure are dependent on the chemical form of mercury involved. Elemental mercury is toxic by inhalation, skin absorption, eye, and skin contact. Symptoms of exposure include coughing, chest pains, headache, fatigue, salivation, weight loss, and skin and eye irritation. The primary target organ of elemental mercury is the central nervous system, resulting in damage to sensory systems. The PEL-TWA for exposure to mercury vapor is 0.05 mg/m³.

Inorganic mercury compounds are toxic by inhalation, ingestion, and skin and eye contact. Acute poisoning results in lung damage. Chronic poisoning typically produces four classical symptoms: gingivitis, salivation, increased irritability, and muscular tremors. Delirium and other psychological abnormalities can also result from chronic exposures. Inorganic mercurials also have a corrosive effect on the alimentary tract, and kidney damage can result from exposure. The current PEL-C (Ceiling) limit for inorganic mercury is 0.1 mg/m³. Organomercury compounds include the methyl mercuries and aryl mercuries, many of which are used as herbicides or pesticides. Methyl mercury is toxic by inhalation, resulting in central nervous system damage manifested in tremors and sensory disturbances. Infants exposed to high methyl mercury before birth can exhibit severe central nervous system damage. The current PEL-TWA for organo-alkyl compounds as Hg is 0.01 mg/m³ with an STEL of 0.03 mg/m³, and the PEL-C (Ceiling) for aryl mercury compounds as Hg is 0.1 mg/m³.

Zinc Health Effects. Zinc compounds can be hazardous by inhalation of dust and fumes, ingestion, and skin and eye contact. Zinc chloride is corrosive to skin and mucous membranes, and sensitization can occur resulting in dermatitis. Eye contact can produce inflammation and corneal ulceration. Ingestion can result in corrosive damage to the digestive tract. The current

PEL-TWA for exposure to zinc chloride fume is 1 mg/m³. Zinc chromate exhibits potential carcinogenic effects and is currently limited with a PEL-TWA of 0.05 mg/m³. Zinc oxide is toxic via inhalation of fumes and dusts and may cause dermatitis. The current PEL-TWA for zinc oxide is 10 mg/m³ as total dust and 5 mg/m³ as the respirable fraction and fume.

PCB Health Effects. Polychlorinated biphenyls (PCBs) are a group of manufactured organic chemicals that contain 209 individual chlorinated chemicals (known as congeners). PCBs are either oily liquids or solids and are colorless to light yellow in color. They have no known smell or taste. There are no known natural sources of PCBs. Some commercial PCB mixtures are known in the United States by their industrial trade name, Aroclor. These Aroclors can impose acute and chronic effects as discussed below:

- **Acute Effects.** Animals that breathed very high concentrations of PCBs had liver and kidney damage, while animals that ate food with large amounts of PCBs had mild liver damage.
- **Chronic Effects.** People exposed to airborne PCBs for a long time have experienced irritation of the nose and lungs, and skin irritations, such as acne and rashes.
- It is not known whether PCBs may cause birth defects or reproductive problems in people. Some studies have shown that babies born to women who consumed PCB-contaminated fish had problems with their nervous systems at birth. However, it is not known whether these problems were definitely the result of PCBs or other chemicals.
- Animals that ate food with smaller amounts of PCBs had liver, stomach, and thyroid gland injuries, and anemia, acne, and problems with their reproductive systems. Skin exposure to PCBs in animals resulted in liver, kidney, and skin damage.
- It is not known whether PCBs cause cancer in people. In a long-term (365 days or longer) study, PCBs caused cancer of the liver in rats that ate certain PCB mixtures. The Department of Health and Human Services (DHHS) has determined that PCBs may reasonably be anticipated to be carcinogens.

PAHs Health Effects. Exposure to PAHs can occur via inhalation of vapors, ingestion, and skin and eye contact. Skin contact can result in reddening or corrosion. Ingestion can cause nausea, vomiting, blood pressure fall, abdominal pain, convulsions, and coma. Damage to the central nervous system can also occur. The DHHS (1989) has classified 15 PAHs compounds as having sufficient evidence for carcinogenicity, while the EPA (1990) has classified at least five of the identified PAHs as human carcinogens. There are currently no assigned PEL-TWA for PAHs, but the closely related material coal tar is listed as coal tar pitch volatiles with a PEL-TWA of 0.2 mg/m³.

Hydrogen Sulfide. Hydrogen sulfide is a gas which is toxic via inhalation, ingestion, and skin and eye contact. Inhalation can result in respiratory irritation, rhinitis, and edema of the lungs. Eye irritation results from exposure to hydrogen sulfide, and symptoms include photophobia and

lacrimation. Subacute exposures to hydrogen sulfide may result in headache, dizziness, staggering gait, and agitation. Tremors, weakness, nausea, and diarrhea may also occur, but recovery is usually complete from such exposures. Acute exposure at higher concentrations may result in immediate coma, and death can follow rapidly as a consequence of respiratory failure. The mode of toxic action involved in this reaction is believed to be inhibition of the respiratory enzyme cytochrome oxidase, which effectively disrupts the process of respiration. The current PEL-WA for hydrogen sulfide is 10 ppm, with an STEL of 15 ppm.

3.2 Potential Exposure Routes

Inhalation. Exposure via this route could occur if volatile chemicals were present and became airborne during site activities, especially upon exposure to open air, warm temperatures and sunlight. However, this is not likely to occur.

Skin Contact. Exposure via this route could occur if contaminated sediment or water contacts the skin or clothing. Protective clothing and decontamination activities specified in this plan will minimize the potential for skin contact with the contaminants.

Ingestion. Exposure via this route could occur if individuals eat, drink or perform other hand-to-mouth contact in the contaminated (exclusion) zones. Decontamination procedures established in this plan will minimize the inadvertent ingestion of contaminants.

3.3 Heat and Cold Stress

Heat Stress. Use of impermeable clothing reduces the cooling ability of the body to evaporation reduction. This may lead to heat stress. If such conditions occur during site activities, we will maintain appropriate work-rest cycles and drink water or electrolyte-rich (Gatorade® or equivalent) to minimized heat stress effects. If ambient temperatures exceed 85° F, we will conduct monitoring of employee pulse rates at the discretion of the field H&S manager.

Each employee will check his or her own pulse rate at the beginning of each break period. Take the pulse at the wrist for 6 seconds and multiply by 10. If the pulse rate exceeds 110 beats per minute, then reduce the length of the next work period by one third.

Example: After a one-hour work period at 85 degrees, a worker has a pulse rate of 120 beats per minute. The worker must therefore shorten the next work period by one third, resulting in a work period of 40 minutes until the next break.

Hypothermia. Hypothermia can result from abnormal cooling of the core body temperature. It is caused by exposure to a cold environment and wind-chill as well as wetness or water immersion can play a significant role. The following section discusses signs and symptoms as well as treatment for hypothermia. However, these conditions are not anticipated for these sampling activities.

Signs of Hypothermia. Typical warning signs of hypothermia include fatigue, weakness, lack of coordination, apathy and drowsiness. A confused state is a key symptom of hypothermia.

Shivering and pallor are usually absent and the face may appear puffy and pink. Body temperatures below 90° F require immediate treatment to restore temperature to normal.

Treatment of Hypothermia. Current medical practice recommends slow rewarming as treatment for hypothermia, followed by professional medical care. This can be accomplished by moving the person into a sheltered area and wrapping with blankets in a warm room. In emergency situations where body temperature falls below 90° F and heated shelter is not available, use a sleeping bag, blankets and/or body heat from another individual to help restore normal body temperature.

3.4 Other Physical Hazards

Trips/Falls. As with all field work sites, caution will be exercised to prevent slips on rain slick surfaces, stepping on sharp objects, etc. Work will not be performed on elevated platforms without fall protections.

As with any offshore work, there is a possibility of falling overboard. When possible, personnel will stand well in from the edges of the deck. Personal flotation devices will be worn at all times when on the vessel. At least one person trained in First Aid and CPR will be on site at all times.

Machinery/Moving Parts. The sampling vessel will be equipped with various winches, motors, booms and other machines. These present a general physical hazard from moving parts.

Personnel will stand clear of machinery at all times unless specific instructions are given by the vessel skipper or other person in authority. Rubber boots will be worn at all times when on the vessel and steel toe boots will be worn when overhead hazards are present. When possible, appropriate guards will be in place during equipment use.

Confined Spaces. Confined space entry is not anticipated for this project.

Noise. Appropriate hearing protection (ear muffs or ear plugs with a noise reduction rating of at least 25 dB) will be used for individuals working near high-noise generating equipment.

4.0 Protective Equipment

Work for this project will be conducted in Level D and modified Level D. Levels A, B and C are not anticipated for this project. Administrative controls (standing upwind or ceasing work) will be used if excessive levels of hydrogen sulfide are encountered.

4.1 Level D Activities

Workers performing site activities where skin contact with highly contaminated materials is possible but not expected will wear regular work clothes, eye protection, hard hats, optional

inner gloves and required nitrile outer gloves (whenever handling samples), and chemical-resistant safety boots and/or chemical-resistant boot covers. Also, use rain suits on windy, rainy days to prevent hypothermia. Also, polyethylene-coated or uncoated tyvek will be worn in exclusion areas when contaminated sediments are present.

Workers performing site activities in the designated support zone where skin contact with contaminated materials is unlikely will wear regular work clothes, safety boots and hard hat. Hard hats must be worn when overhead hazards exist.

4.2 Modified Level D Activities

Workers performing site activities where skin contact with free product or heavily contaminated materials is possible will wear chemical-resistant gloves (nitrile, neoprene or other appropriate outer gloves, nitrile inner gloves) and Tyvek® or other chemical-resistant suits (i.e., polycoated if high splash potential to contaminate liquids) or rain gear. Make sure the protective clothing and gloves are suitable for the types of chemicals which may be encountered on site. Use face shields or goggles as necessary to avoid splashes in the eyes or face.

A summary of Modified Level D protection includes the following:

- Hard hats, if overhead hazard exists;
- Rain gear or uncoated Tyvek®;
- Eye protection (as necessary);
- Steel-toed, chemical resistant boots;
- Nitrile inner gloves (optional); and
- Nitrile, neoprene or equivalent outer gloves.

5.0 Safety Equipment List

The following Safety Equipment must be available on site:

- First aid kit;
- Eye wash kit;
- Mobile telephone;
- Steel-toed and/or chemical-resistant safety boots;
- Chemical-resistant inner and nitrile outer gloves;
- Safety glasses;
- Hardhat (when overhead hazards are present); and
- Fire extinguishers.

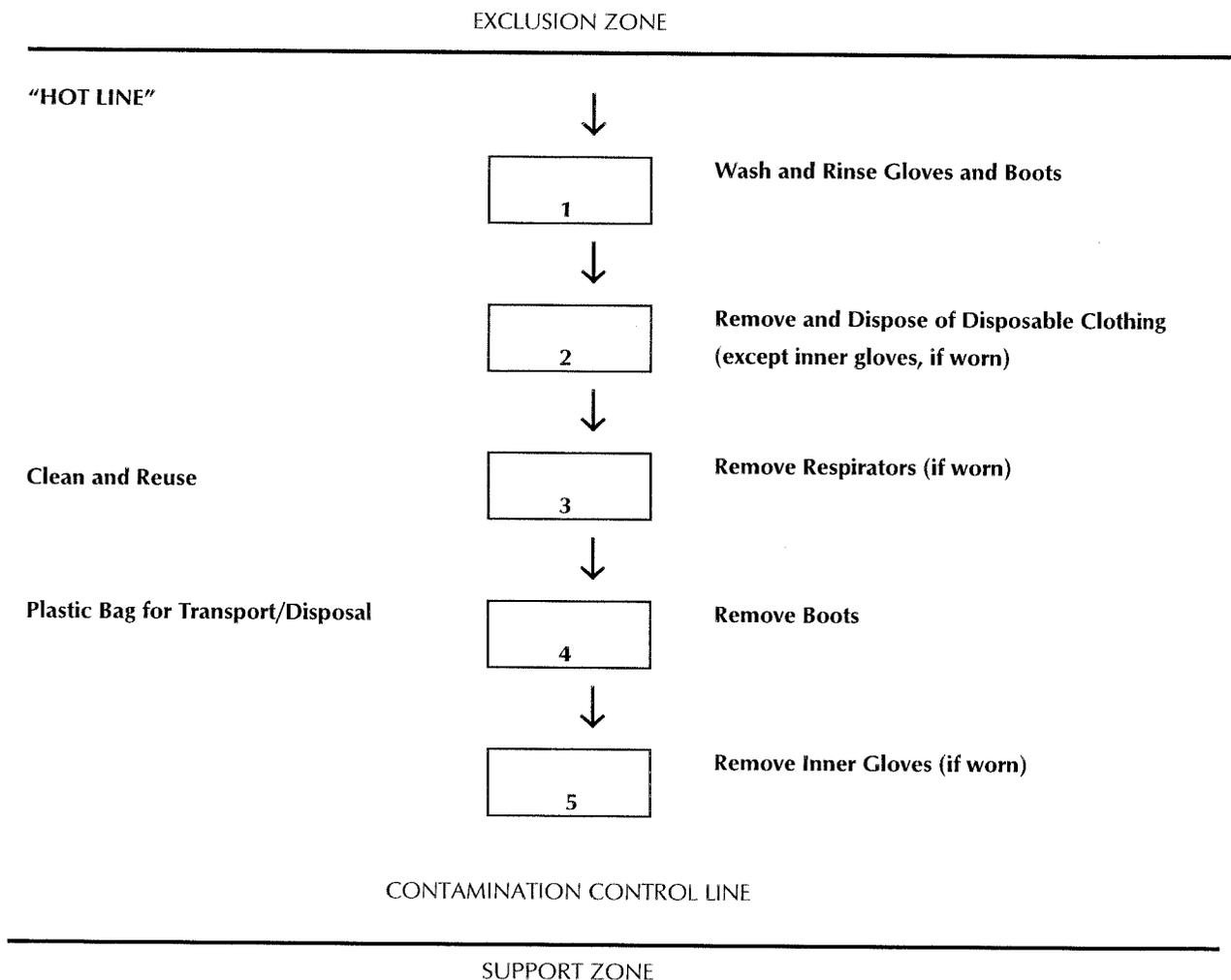
6.0 Exclusion Areas

If migration of chemicals from the work is a possibility, or as otherwise required by regulations or specifications, site control will be maintained by establishing clearly identified work zones.

These will include the exclusion zone, contaminant reduction zone and support zone, as discussed below and shown on Figure 2.

Figure 2 Decontamination Layout

City of Tacoma



6.1 Exclusion Zone

Exclusion zones will be established around each hazardous waste activity location. Only persons with appropriate training and authorization from the Field H&S Manager will enter this perimeter while work is being conducted there. Barrier tapes and warning signs will be used as necessary to establish the zone boundary. Warning signs will be posted in plain view of approach. On boats or barges such areas will be designated around contaminated sample handling locations.

6.2 Contamination Reduction Zone

A contamination reduction zone will be established just outside each temporary exclusion zone to decontaminate equipment and personnel as discussed below. This zone will be clearly delineated from the exclusion zone and support zone using the means noted above. Care will be taken to prevent the spread of contamination from this area. Separate buckets will be filled with spent decontamination fluids on a daily basis. The buckets, after labeling, will be moved to central storage location(s) pending disposal decisions.

6.3 Support Zone

A support zone will be established outside the contamination reduction area to stage clean equipment, don protective clothing, take rest breaks, etc. This zone will be clearly delineated from the contaminant reduction zone using the means noted above.

7.0 Minimization of Contamination

To make the work zone procedure function effectively, the amount of equipment and number of personnel allowed in contaminated areas must be minimized. In addition, the amounts of sediment collected should not exceed what is needed for laboratory analysis and record samples. Do not perform any practice that increases the probability of hand-to-mouth transfer of contaminated materials. Use plastic drop cloths and equipment covers where appropriate. Eating, drinking, chewing gum, smoking or using smokeless tobacco are forbidden in the exclusion zone.

8.0 Decontamination

Decontamination is necessary to limit the migration of contaminants from the work zone(s) into the surrounding environment. Figure 3 presents a layout for conducting decontamination within the site zones previously discussed.

Equipment and personnel decontamination are discussed in the following sections and the following types of equipment will be available to perform these activities:

- Boot and glove wash bucket and rinse bucket
- Scrub brushes – long handled
- Spray rinse applicator

- Plastic garbage bags
- alkaline decontamination solution

Detergent-bearing liquid wastes from decontamination of personnel protection will be stored in 5-gallon containers for later disposal to sanitary sewer drains.

8.1 Equipment Decontamination

Proper decon procedures will be employed to ensure that contaminated materials do not contact individuals and are not spread from the site. These procedures will also ensure that contaminated materials generated during site operations and during decontamination are managed appropriately.

All non-disposable equipment will be decontaminated in the contamination reduction zone.

8.2 Personnel Decontamination

Personnel working in exclusion zones will perform the appropriate decontamination in the contamination reduction zone prior to taking rest breaks, drinking liquids, etc. They will also decontaminate fully before eating lunch or leaving the site. The following describes the procedures for full decon activities.

Decontamination Procedure

1. In the contamination reduction zone, wash and rinse outer gloves and boots in portable buckets.
2. Remove outer gloves and protective suit and deposit in labeled container for disposable clothing.
3. Remove work boots without touching exposed surfaces, and put on street shoes. Put boots in individual plastic bag for later reuse.
4. Remove work boots without touching exposed surfaces, and put on street shoes. Put boots in individual plastic bag for later reuse.
5. Immediately wash hands and face using clean water and soap.
6. Shower as soon after work shift as possible.

9.0 Disposal of Contaminated Materials

All disposable sampling equipment and personal protective equipment (PPE) will be placed inside of a 10 mil polyethylene bag or other appropriate containers. Disposable supplies will be removed from the site and disposed of accordingly.

Decontamination liquids generated during site decon procedures will be collected and stored in 5-gallon carboys for future disposal into sanitary sewer drains or other appropriate method.

10.0 Site Security and Control

Site security and control will be the responsibility of the Field H&S Manager. Significant security problems are not and public access is not likely to be an issue of concern.

11.0 Spill Plan

Sources of bulk chemicals subject to spillage are not expected to be encountered in this project. Accordingly, a spill containment plan is not required for this project.

12.0 Emergency Response Plan

The Emergency Response Plan outlines the steps necessary for appropriate response to emergency situations. The following paragraphs summarize the key Emergency Response Plan procedures for this project. City of Tacoma personnel, and subcontractors will be responsible for identifying an emergency situation, notifying the appropriate personnel or agency, evacuating the hazardous area, and attempting to control only very small hazards that could present an emergency situation. Personnel will not be responsible for handling the emergency.

12.1 Plan Content and Review

The principal hazards addressed by the Emergency Response Plan include the following: fire or explosion, medical emergencies, uncontrolled contaminant release, and situations such as the presence of chemicals above exposure guidelines or inadequate protective equipment for the hazards present. However, in order to help anticipate potential emergency situations, field personnel shall always exercise caution and look for signs of potentially hazardous situations, including the following as examples:

- Visible or odorous chemical contaminants;
- Drums or other containers;
- General physical hazards (traffic, moving equipment, sharp or hot surfaces, slippery or uneven surfaces, etc.); and
- Live electrical wires or equipment.

These and other potential problems should be anticipated and steps taken to avert problems before they occur.

The Emergency Response Plan shall be reviewed and rehearsed, as necessary, during the on-site health and safety briefing. This ensures that all personnel will know what their duties shall be if an actual emergency occurs.

12.2 Plan Implementation

The Field H&S Manager shall act as the lead individual in the event of an emergency situation and evaluate the situation. He/she will determine the need to implement the emergency procedures, in concert with other resource personnel including (client representatives) City of Tacoma personnel and the Project Manager. Other on-site field personnel will assist the Manager as required during the emergency.

In the event that the Emergency Response Plan is implemented, the Field H&S Manager or designee is responsible for alerting all personnel at the affected area by use of a signal device (such as a hand-held air horn) or visual or shouted instructions, as appropriate.

Emergency evacuation routes and safe assembly areas shall be identified and discussed in the on-site health and safety briefing, as appropriate. The buddy-system will be employed during evacuation to ensure safe escape, and the Field H&S Manager shall be responsible for roll-call to account for all personnel.

12.3 Emergency Response Contacts

Site personnel must know whom to notify in the event of Emergency Response Plan implementation. The following information will be readily available at the site in a location known to all workers.

- Emergency Telephone Numbers: see list at the beginning of this plan;
- Route to Nearest Hospital: see list and route map at the beginning of this plan;
- Site Descriptions: see the description at the beginning of this plan; and
- If a significant environmental release of contaminants occurs, the federal, state, and local agencies noted in this plan must be notified within 24 hours. Contact the Project Manager as soon as possible and he/she will be responsible for notifying agencies listed on page A-3-2. If the release to the environment includes navigable waters also notify the National Response Center.

In the event of an emergency situation requiring implementation of the Emergency Response Plan (fire or explosion, serious injury, tank leak or other material spill, presence of chemicals above exposure guidelines, inadequate personnel protection equipment for the hazards present, etc.), cease all work immediately. Offer whatever assistance is required, but do not enter work areas without proper protective equipment. Workers not needed for immediate assistance will decontaminate per normal procedures (if possible) and leave the work area, pending approval by

the Field Safety Manager for re-start of work. The following general emergency response safety procedures should be followed.

12.4 Fires

City of Tacoma personnel will attempt to control only very small fires. If a large fire occurs or an explosion appears likely, evaluate the area immediately. If a fire occurs which cannot be controlled with a 10-pound ABC fire extinguisher, then immediate intervention by the local fire department or other appropriate agency is imperative.

12.5 Medical Emergencies

Contact the agency listed in the site-specific plan if a medical emergency occurs. If a worker needs to leave the site to seek medical attention, the vessel will return to shore and another worker will accompany the patient to the hospital. When in doubt about the severity of an accident or exposure, always seek medical attention as a conservative approach. Notify the Project Manager of the outcome of the medical evaluation as soon as possible. For minor cuts and bruises, an on-board first aid kit will be available.

- If a worker is seriously injured or becomes ill or unconscious, immediately request assistance from the emergency contact sources noted in the site-specific plan.
- In the event that a seriously injured person is also heavily contaminated, use clean plastic sheeting to prevent contamination of the inside of the emergency vehicle. Less severely injured individuals may also have their protective clothing carefully removed or cut off before transport to the hospital. If it is deemed appropriate to transport the victim to the hospital, follow the route map on Figure 1.
- The City of Tacoma Fire Station located below the 11th Avenue bridge on the east side of the Thea Foss Waterway is designated as a landfall for the sampling vessel to meet emergency vehicles (see Figure 1).

12.6 Plan Documentation and Review

The Field H&S Manager will notify the Project H&S Manager as soon as possible after the emergency situation has been stabilized. The Project Manager or H&S Manager will notify the appropriate regulatory agencies, if applicable. If an individual is injured, the Field H&S Manager or designate will file a detailed Accident Report within 24 hours.

The Project Manager and the Field and Project Managers will critique the emergency response action following the event. The results of the critique will be used in follow-up training exercises to improve the Emergency Response Plan.

13.0 Training Requirements

City of Tacoma employees, subcontractors, EPA personnel, and EPA contractor personnel who perform site work must understand potential health and safety hazards and if potentially exposed to hazardous substances, health hazards, or safety hazards will have completed at least 24 hours of off-site initial hazardous materials health and safety training or will possess equivalent training by past experience. (Note that 40-hour training is required for workers spending 30 days or more per year on hazardous waste sites or for those required to wear respiratory protection.) They will also have a minimum of three days of actual field experience under the direct supervision of a trained supervisor. All employees will have in their possession evidence of completing this training. Employees will also complete annual refresher, supervisor, and other training as required by applicable regulations.

John O'Loughlin, the designated Site Health and Safety Manager, has completed 40-hour initial health and safety, 8-hour refresher, supervisor, current first-aid, and CPR training courses.

Prior to the start of each work day, the Field H&S Manager will review applicable health and safety issues with all employees and subcontractors working on the site, as appropriate. These briefings will also review the work to be accomplished, with an opportunity for questions to be asked.

14.0 Reporting, Reports, and Documentation

The Field Health and Safety report (Figure 3) will be completed weekly by the Field Health and Safety Manager or designated individual. In the event that accidents or injuries occur during site work, the Project Manager will be informed. City of Tacoma staff and subcontractors on this site will sign the Record of H&S Communication document (Table 3), which will be kept on site during work activities and recorded in the project files.

15.0 Medical Surveillance

All City personnel are given a pre-employment medical exam. Additional medical surveillance will be performed as necessary. In particular, if there is an exposure above the permissible exposure limit, then additional medical monitoring will be instituted in conformance with the policies of the City of Tacoma.

APPENDIX B
MOCK UP OF PUBLIC INFORMATION SIGN
CITY OF TACOMA

Olympic View Restoration Area

City of Tacoma Environmental Services



Eel grass beds are home to a wide variety of animals and plants

Eel grass beds are home to many animal and plant species. The eel grass bed just off-shore of this restored site is one of the last remaining in Commencement Bay.

Throughout the 1900s, industrialization of the Commencement Bay area took a toll on the quality of the water and habitat.

Sediment was dredged from areas of the Bay to create waterways and was deposited to create additional upland. These deposits covered the aquatic habitat.

In 1942 this land was developed by Puget Sound Plywood Co. and a mill was built. The mill was supported by offshore pilings, which prevented sunlight from reaching the already fragile aquatic ecosystem. The mill also used the water for log storage and continued to operate into the 1980s.

In May 2002, the City of Tacoma, the Natural Resource Trustees*, and the U.S. Environmental Protection Agency began cleanup and restoration work to return the Olympic View upland and aquatic

areas to their natural condition.

More than 600 pilings and 11 tons of contaminated sediment were removed and replaced with 22 tons of clean sediment.

At the water's edge, native plants such as dunegrass, saltgrass and hairgrass were planted. On the upland restoration area, native plants, such as oceanspray, salal, Douglas fir, bigleaf maple, Nootka rose and others were reintroduced.

Work was completed in October 2002. The City of Tacoma will monitor the Olympic View Restoration Area until at least 2007.

*Natural Resource Trustees: National Oceanic and Atmospheric Administration, U.S. Fish and Wildlife Service; Washington State Departments of Ecology, Fish & Wildlife, and Natural Resources; Puyallup Tribe of Indians; and Muckleshoot Indian Tribe.