EXHIBIT B

CLEANUP ACTION PLAN

EDDON BOATYARD SITE

Prepared for

City of Gig Harbor

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Declarative Statement

Consistent with the Model Toxics Control Act, Chapter 70.105D Revised Code of Washington, as implemented by the Model Toxics Control Act Cleanup Regulation, Chapter 173-340 Washington Administrative Code, Ecology has determined that the selected cleanup actions are protective of human health and the environment, attain federal and state requirements that are applicable or relevant and appropriate, comply with cleanup standards, provide for compliance monitoring, use permanent solutions to the maximum extent practicable, provide for a reasonable restoration timeframe, and consider public concerns raised during public comment.

1 INTRODUCTION

This *Cleanup Action Plan* (CAP) is Exhibit B to the Agreed Order (AO) and describes the cleanup action proposed by the City of Gig Harbor (City) for the cleanup of upland and sediment contamination at the Eddon Boatyard Site (Site; Figure 1) in Gig Harbor, Washington. The City of Gig Harbor submitted an application under the Washington State Department of Ecology (Ecology) Voluntary Cleanup Program (VCP) in late June 2005. Since then, the City has completed a number of cleanup and investigation activities in both the upland and sediment portions of the Site. These activities have been documented in a series of Technical Memoranda and associated Opinion Letters to assess whether they meet the specific substantive requirements of the Model Toxics Control Act (MTCA) and its implementing regulations (Chapter 70.105D Revised Code of Washington [RCW] and Chapter 173-340 Washington Administrative Code [WAC]). In 2006, the City received a brownfields grant from the U.S. Environmental Protection Agency to assist with cleanup of the Site. In addition, a portion of the costs of removal of the creosote-treated piling will be offset through support from Washington Department of Natural Resources (DNR) Creosote Removal Program.

In early 2007, the City prepared a Sediment Cleanup Study Report and Analysis of Brownfield Cleanup Alternatives (ABCAs) that presented an evaluation of Site cleanup alternatives for sediments and associated upland areas of and adjacent to the Site. Based on this document, the City and Ecology developed a recommended cleanup alternative that was the basis for an application for the required permits (Figure 2). At that time, the City initiated design activities. In November 2007, after completing design activities and preparing contract plans and specifications, the City requested sealed bid proposals for construction of cleanup activities. However, due to delays in getting the final permits, the City decided to delay the project and the bid opening. In March 2008, all necessary permits had been received, and the City issued a new invitation to bidders on March 29, 2008. A contractor has been selected and construction will commence in mid-summer, 2008.

The City and Ecology have decided to enter into an AO for the Site. This CAP was developed using information developed under the VCP process discussed above and has been prepared to satisfy the requirements of the MTCA, RCW 70.105D, administered by Ecology under the MTCA Cleanup Regulation, WAC 173-340.

1.1 Site Description

In 2004, the residents of the City approved the $3.5 million Proposition No. 1 Land Acquisition and Development General Obligation Bond (Proposition No. 1) to preserve a portion of the historic waterfront known as the Eddon Boathouse property (Figure 1). After completing a review of environmental conditions, the City purchased the Site in March 2005.

The Site consists of Pierce County tax parcels 022105-3074 and 02215-3050. It is about 3 acres in size, with roughly two-thirds of the land consisting of tidelands and subtidal lands. The Site is defined as the area where contaminants have come to be located from a release from boatyard activities. The Site includes the Eddon Boat Park property and portions of adjacent properties where contaminants originating from the boatyard activities are found.

Historically, the Site was a boatyard where boats were built from the 1940s until boatyard operations were terminated in 2003. The public recognizes that the Site has unique attributes, such as panoramic views of the harbor and proximity to eating establishments, recreation, and other amenities, which make this an important park acquisition that preserves the historic character of Gig Harbor. The property has not been used as a boatyard since 2005, and there are no plans for the future operation of a boatyard. Park development activities include any necessary environmental cleanup and remediation of the Site, while preserving the boathouse and related structures. The conceptual park design is presented in Figure 3.

1.2 Purpose and Scope

The main state law that governs the cleanup of contaminated sites is MTCA. MTCA regulations define the process for the investigation and cleanup of contaminated sites. When contaminated sediments are involved, the cleanup standards and other procedures are also regulated by the Sediment Management Standards (SMS), WAC 173-204. MTCA regulations specify criteria for the evaluation and conduct of a cleanup action. SMS regulations dictate the standards for sediment cleanup. Under both MTCA and SMS regulations, the cleanup must protect human health and the environment, meet state environmental standards and standards in other laws that apply, and provide for monitoring to confirm compliance with Site cleanup standards.

Though the objective of the VCP process has been to satisfy the requirements of the MTCA, RCW 70.105D, administered by Ecology under the MTCA Cleanup Regulation, WAC 173-340, the purpose of this CAP is to describe Ecology's proposed cleanup action for the Site. Consistent with the requirements of WAC 173-340-380, this document provides the following information:

- Summary of project background and current environmental conditions (Section 2)
- Cleanup requirements applicable to the Site, including cleanup standards and other federal, state, and local laws applicable to the cleanup action (Section 3)
- Summary description of the remedial alternatives evaluated in Technical Memorandum No. 2 (Section 4)
- Rationale for selection of the proposed cleanup alternative (Section 4)
- A description of the cleanup action, consistent with MTCA requirements; Section 5 includes a description of the types, levels, and amounts of hazardous substances that will remain on site as part of the cleanup and the measures that will be used to prevent migration and contact with those substances; also described are compliance monitoring and contingency actions, as well as institutional controls (Section 5)
- Description of the schedule for implementation of the cleanup action (Section 6)

The AO will be signed by the City and by Ecology. The City has completed permitting and design activities and has solicited bids to complete the construction. Construction is expected to begin in early summer 2008 and will take between 2 and 3 months to complete. Long-term monitoring activities will be initiated following completion of construction activities.

2 SITE BACKGROUND

This section summarizes background information relevant to the cleanup of the Site. The City has completed a number of cleanup and investigation activities in both the upland and sediment portions of the Site, much in response to Opinion Letters provided by Ecology that assess whether specific substantive requirements of the MTCA and its implementing regulations (RCW 70.105D and WAC 173-340) are likely going to be met. These activities have been documented in a series of Technical Memoranda (see Exhibit C to the AO).

These Technical Memoranda include:

- Technical Memorandum No. 1 – Confirmation Sampling for UST Removal and Isolated Soil Impacts. September 28, 2005.
- Technical Memorandum No. 2. – Evaluation of Sediment Cleanup Alternatives, January 2006.
- Technical Memorandum No. 2. Revised Technical Memorandum No. 2 – Sediment Cleanup Study Report and Analysis of Brownfields Cleanup Alternatives. February 2007.
- Technical Memorandum – Revised Dredging and Capping Alternative B. March 29, 2007.
- Technical Memorandum No. 3 – Work Plan for Proposed Investigation Activities. June 12, 2006.
- Technical Memorandum No. 4 – Completed Investigation Activities. June 12, 2006.
- Technical Memorandum No. 5 – Sediment Sampling and Analysis Plan – Additional Activities. July 18, 2006.
- Technical Memorandum No. 6 – Results of Additional Sediment Sampling. January 26, 2007.
- Technical Memorandum No. 7 – Upland Data Results. October 23, 2006.
- Technical Memorandum No. 8 – Groundwater Testing Results. February 26, 2008.
- Technical Memorandum No. 9 – Additional Surface Sediment Sampling Testing Results. August 15, 2007.
- Technical Memorandum No 10 – Terrestrial Ecosystem Evaluation. March 17, 2008.

Other documents referenced in the above Technical Memoranda include:

- Phase I Environmental Site Assessment (Saltbush 1999)

- Phase II Environmental Site Assessment (Krazan 2003)
- Sampling and Analysis Plan (Anchor 2004)
- Data Assessment and Conceptual Cleanup Plan (Anchor 2005)

2.1 Site History

The Site is located along the Gig Harbor shoreline (Figure 1) and consists of two tax parcels with both upland and aquatic lands. The area is a working waterfront, and the Site is adjacent to a number of marinas. The Site is described in detail in Phase I and Phase II Environmental Site Assessments conducted by Saltbush Environmental Services, Inc. (1999) and Krazan and Associates, Inc. (2003), respectively.

Four buildings historically existed on the Site, including the boat repair facility (boathouse and associated structures), a single family residence (former Hoppen house), a former antique shop (Pandora's Building), and a bird feed/gift shop (Wild Birds Unlimited Building). The boat repair facility has occupied the Site since the 1940s and was closed after the City purchased the property.

Today, the Site slopes from Harborview Drive down to the water and currently only includes two buildings. The shoreline consists of both relatively natural embankments and a creosote wood bulkhead. The two sets of haul-out rails, a pier, and a floating dock still remain.

The building, formerly in the middle of the Site and referred to in the project documents as Pandora's, was a concrete block structure with a covered carport that was present on the Site from the 1950s until it was demolished in early 2006. It was previously an antique shop and a City maintenance shop. The building formerly on the southernmost part of the Site, referred to in the project documents as "Wild Birds Unlimited" is believed to have originally been part of a gravel loading operation and was most recently used as a retail shop. There were several concrete retaining walls behind this building that are believed to have been associated with the gravel loading operation. There were also remnants of gravel loading crane assembly adjacent to a bulkhead at the south part of the Site.

The Pandora's building, the Wild Birds Unlimited building, and the concrete retaining walls were demolished in early 2006 (along with brush clearing activities). The single family residence is not currently occupied.

The boat repair facility is composed of historic structures, all of which will remain in place, though the pier and marine railways will be demolished as part of the sediment cleanup (permits have been received for these activities). The pier and marine railway(s) will be re-constructed in the future, though the exact design and timing is undetermined. The future status of the former Hoppen house is still being evaluated.

2.2 Current Site Conditions

Both upland and sediment areas have been subject to multiple sampling and analysis investigations and are well characterized. Between 2005 and 2008, the City submitted several technical memoranda and other documents to Ecology summarizing sampling activities and interim remedial actions that have been taken at the Site (refer to Exhibit C to the AO). Ten areas of concern were identified by Ecology:

1. 500 gallon underground heating oil storage tank near the residence
2. 500 gallon aboveground heating oil storage tank near the boat shop
3. Elevated heavy oil petroleum hydrocarbons and elevated lead in surface soils underneath covered carport of former maintenance shop (Pandora's) building; this area was represented by soil boring AG-8
4. Fruit tree and yard area; Ecology expressed concern about potential for arsenic or lead contamination from the potential historic use of arsenical pesticides, or from the area-wide contamination resulting from aerial deposition from the former Asarco copper smelter in Tacoma
5. An area below the former Pandora's building where a discarded oil storage tank had been found during brush clearing, and later test pits unearthed three used oil filters; this area was known as the "Lower Terrace" area
6. Potential for oil contamination from the former gravel operation's crane area adjacent to the south bulkhead
7. An area on the adjacent property to the north, just outside of the north side door to the boat shed containing elevated carcinogenic polyaromatic hydrocarbons (cPAHs); this area was represented by soil boring AHA-1

8. An area at 8 to 10 feet below ground surface on the central/east part of the Site containing elevated cPAH; this area was represented by soil boring AG-9
9. Site Groundwater.
10. Contaminated sediments throughout the tidelands of the property, with the highest levels of contaminants in the vicinity of the marine railways; some areas of contaminated uplands soils were also identified in areas that could present a source of contamination to sediments

The remainder of this section provides additional detail for each of these areas.

2.2.1 Underground Heating Oil Storage Tank

A 500 gallon underground heating oil storage tank (UST) next to the residence was removed in March 2006. Results were presented to Ecology in a letter of May 3, 2006, and in Technical Memorandum No. 4, June 12, 2006. Samples were obtained from the bottom and sidewalls of the final excavation (after approximately 3 feet of over excavation when initial samples contained hydrocarbons). Water seeping into the excavation was also sampled. No petroleum or polycyclic aromatic hydrocarbons (PAHs) were detected above the MTCA, Method A groundwater cleanup levels, or soil cleanup standards for unrestricted land use. Ecology issued an Opinion Letter through the VCP on June 29, 2006, stating that the UST removal and cleanup met the substantive requirements of MTCA for characterizing and addressing this release. The UST excavation included soils represented by boring AG-5, which contained elevated cPAH (0.417 milligam per kilogram [mg/kg] total toxicity equivalent concentration, compared to the MTCA soil cleanup standard of 0.1 mg/kg).

2.2.2 Aboveground Heating Oil Storage Tank

This 500 gallon aboveground storage tank (AST) was located at the southwest corner of the boat repair shop. It was removed sometime between 1999 and 2005. In August of 2006, a boring was installed close to the former AST to a depth of 6.5 feet. Samples were obtained from the boring at 4 to 5 feet and 5 to 6 feet below ground surface, and from a post-hole excavation directly beneath the former tank at 1 foot depth. Soils were tested for petroleum hydrocarbons and PAHs. All samples were below the MTCA, Method A groundwater cleanup levels, or soil cleanup standards for unrestricted land use. Results

of AST samples are found in Technical Memorandum No. 7. As the City did not request one, no Opinion Letter was provided on Technical Memorandum No. 7.

2.2.3 AG-8 Area

Soil boring results for boring AG-8, presented in the Data Assessment and Conceptual Cleanup Plan (Anchor 2005), showed that the area underneath the covered carport behind the Pandora's building contained elevated total petroleum hydrocarbon (TPH) and lead in the surface soils (2,535 mg/kg TPH and 586 mg/kg lead). The City excavated approximately 2 feet of soil from an approximately 250 square foot area. Samples from the sidewalls and bottom of the excavation confirmed that the hydrocarbon- and lead-containing soils were successfully removed. Ecology issued an Opinion Letter through the VCP on June 29, 2006, stating that AG-8 area remediation met the substantive requirements of MTCA for characterizing and addressing this release.

2.2.4 Fruit Tree and Yard Area

Ecology requested sampling in this area to identify arsenic or lead contamination from the potential historic use of arsenical pesticides, or from the area-wide contamination resulting from aerial deposition from the former Asarco copper smelter in Tacoma. In consultation with Ecology, the City obtained a 5-point composite sample of the orchard area in March 2006. The results were all below the MTCA, Method A groundwater cleanup levels, and soil cleanup standards for unrestricted land use. Ecology issued an Opinion Letter through the VCP on June 29, 2006, stating the sampling and results met the substantive requirements of MTCA for characterizing and addressing this area.

2.2.5 Lower Terrace Area

During brush clearing in the spring of 2006, the City discovered a discarded oil storage tank. The tank was pumped out, cleaned, and recycled. Ecology requested the City to dig test pits in this area to determine if other contaminants were visually present. In one test pit, three used oil filters were discovered. Three additional test pits were installed and samples obtained for volatile organics, PAH, TPH, and metals. All results were below the MTCA, Method A groundwater cleanup levels, and soil cleanup standards for unrestricted land use. In the Ecology June 29, 2006 Opinion Letter, Ecology stated that

sampling in this area met the substantive requirements of MTCA for characterizing and addressing this potential release area.

2.2.6 Crane Area

Ecology requested the City to evaluate the area where the former gravel loading crane was operated, on the terrace above the southernmost bulkhead. After the City cleared the brush from this area, Ecology inspected the area for signs of oil staining or other evidence of contamination that may have resulted from the operation of the crane. After a Site walk on March 20, 2006, Ecology informed the City that no further investigation would be required in this area.

2.2.7 Area AHA-1

Results of samples taken at boring AHA-1 were presented in the Data Assessment and Conceptual Cleanup Plan (Anchor 2005). Samples at the 1.5- to 3-foot depth contained a total toxicity equivalent cPAH concentration of 0.384 mg/kg, compared to the MTCA, Method A groundwater cleanup levels, and soil cleanup standards for unrestricted land use of 0.1 mg/kg. This area is just outside of the north side door to the boat shed. This area is slated to be excavated according to the cleanup action plan that is the subject of this AO.

2.2.8 Area AG-9

An initial boring in this area, presented in the Data Assessment and Conceptual Cleanup Plan (Anchor 2005) found cPAH above the MTCA, Method A groundwater cleanup levels, and soil cleanup standards for unrestricted land use at a depth of 8 to 10 feet at this location (0.378 mg/kg, based on the Toxicity Equivalent Methodology, compared to the MTCA soil cleanup standard of 0.1 mg/kg). In August of 2006, Anchor Environmental, L.L.C. (Anchor), installed a monitoring well at the same location of the AG-9 boring and also installed two soil borings close to the well (approximately 20 feet to the north and to the south of the well). Logs from all three borings show that there is a layer of "charred wood, black, greasy texture" at 8 to 10 feet below ground surface. Carcinogenic PAHs were detected above the MTCA, Method A groundwater cleanup levels, and soil cleanup standards for unrestricted land use (0.1 mg/kg) in this layer at all three borings (GP-2, 0.181 mg/kg; GP-3, 0.252 mg/kg; and MW-3, 0.109 mg/kg). At

boring GP-2, a sample obtained from beneath the layer of charred wood debris, at 13 feet below ground surface, did not exceed the cPAH standard and did not contain evidence of charred wood debris. Results of the August 2006 borings are found in Technical Memorandum No. 7. Groundwater conditions are discussed in the following section.

This approximately 2-foot-thick-fill layer with elevated PAH concentrations is about 8 to 10 feet below the existing grade. Though this area has been the subject to a number of investigations, the lateral extent of this fill layer is not fully defined. As part of the removal of the creosoted wooden bulkhead, as required by the Washington Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA), the bank will be reconfigured. Based on the results of the disproportionality evaluation, portions of this soil layer will be removed as discussed further in Section 4.

2.2.9 Site Groundwater

Three groundwater monitoring wells were installed at the Site in August 2006. The locations of the wells were chosen in consultation with Ecology staff. Locations included MW-1, near the shoreline and also close to the former UST; MW-2, close to and downgradient of the former AST at the southeast side of the boathouse; and MW-3, located in the central area of the Site where a Site boring installed in 2005 had contained elevated levels of cPAH in soils at 8 to 10 feet below ground surface. Details about well installation and rationale for well locations are found in Technical Memorandum No. 7.

Groundwater samples were obtained on August 4, 2006; February 20, 2007; and May 24, 2007. Sample results are summarized in Technical Memorandum No. 8. In MW-2, arsenic was present at levels from 5.9 to 6.8 micrograms per liter (μg/L) (dissolved), slightly above the MTCA, Method A criteria for arsenic in groundwater of 5 micrograms per liter (which is based on background concentrations of arsenic in groundwater). MW-1, closer to the harbor, contained low levels of detectable arsenic, below the MTCA, Method A criteria for groundwater, and also below the Marine Chronic Ambient Water Quality Criteria for protection of marine life of 36 micrograms per liter. In MW-3, where cPAH were identified in soils at the 8 to 10 foot depth, no PAHs were detected above the Ambient Surface Water Quality Criteria for protection of aquatic life (set forth under Section 304 of the Clean Water Act) or for protection of human health from consumption

of organisms (set forth under the National Toxics Rule, 40 Code of Federal Regulations [CFR] 131).

2.2.10 Terrestrial Ecological Evaluation

A Terrestrial Ecological Evaluation (TEE) was prepared for the project in March 2008 (Technical Memorandum No. 10). A simplified TEE was appropriate for this Site based on the criteria in WAC 173-340-7490 through 7493. The simplified TEE compared Site data to the screening levels provided in Table 749-2 of the MTCA. One sample in surface soil exceeded the screening level for copper, and one surface sample exceeded the screening level for chromium. Ecology concurs with the conclusions of the simplified TEE report that these individual exceedances do not represent overall Site conditions and that Site grading that occurred in preparation for park development has very likely diminished the concentrations at the two individual locations significantly.

2.2.11 Sediments

Current surface and subsurface sediment chemistry concentrations have been well characterized and have elevated concentrations of metals, organics, and tributlytin (TBT; Figure 2). These investigations are presented in the following Technical Memoranda:

- Technical Memorandum No. 2. – Evaluation of Sediment Cleanup Alternatives, January 2006.
- Technical Memorandum No. 2. Revised Technical Memorandum No. 2 – Sediment Cleanup Study Report and Analysis of Brownfields Cleanup Alternatives. February 2007.
- Technical Memorandum No. 3 – Work Plan for Proposed Investigation Activities. June 12, 2006.
- Technical Memorandum No. 5 – Sediment Sampling and Analysis Plan – Additional Activities. July 18, 2006.
- Technical Memorandum No. 6 – Results of Additional Sediment Sampling. January 2007.
- Technical Memorandum No. 9 – Additional Surface Sediment Sampling Testing Results. August 15, 2007.

Initial sediment sampling presented in the Data Assessment and Conceptual Cleanup Plan (Anchor 2005) showed that the sediments in the vicinity of the marine haul-out rails and the sediments to the south of the pier contained levels of mercury, copper, lead, phthalates, polychlorinated biphenyls (PCBs), and PAHs above the State of Washington, Sediment Quality Standards (SQS) and Minimum Cleanup Level (MCUL) criteria. These standards are found in the SMS, WAC 173-204. Although there is not a promulgated SQS or MCUL value for TBT, the sediment concentrations of this chemical were above the screening criteria of 0.15 micrograms per liter (ug/l) in sediment porewater, which is used for the Puget Sound Dredged Material Management Program (DMMP). Additional sediment samples were obtained in October of 2006 and in July of 2007.

Sediment sample results are found in the Revised Technical Memorandum No. 2 and in Technical Memorandum No. 9. The primary chemicals of concern (COCs) within the sediments are TBT, mercury, and PCBs (Figure 2). Sample results show that the highest levels of contaminants are found within the marine railway area (SMU 1 and part of SMU 2 on Figure 2). Elevated mercury was detected in all seven samples within the marine railway, with the highest detected level of 3.17 mg/kg, compared to the SQS of 0.41 mg/kg and the MCUL of 0.59 mg/kg. PCBs were detected in three samples within the marine railway area, ranging from 14.3 mg/kg to 99.4 mg/kg, compared to the SQS of 12 mg/kg and the MCUL of 65 mg/kg. (PCB results are expressed as organic carbon normalized concentrations for comparison to the SQS.) Other chemicals detected at elevated levels in the marine railway area included one sample with lead of 870 mg/kg, compared to the SQS of 450 mg/kg; and one sample containing 516 mg/kg copper, compared to the SQS of 390 mg/kg. A few exceedances of the SQS for the semivolatile organic compounds bis (2-ethylhexyl) phthalate, butylbenzylphthalate, dimethylphthalate, benzoflouranthenes, and chrysene were detected in some of the samples within the marine railway, at some of the same sample locations with the higher exceedances for the other COCs. TBT was also detected in all samples within the marine railway, ranging from 140 to 3,200 micrograms per kilogram (ug/kg), measured as the TBT ion in bulk sediment. Results from sediment core samples indicate the elevated contaminants are not found below approximately 1.5 feet deep.

Part of the marine railway area is above the high tide line. Because this area could affect the quality of the intertidal sediments through erosion, it was determined by the City and Ecology for this project that the upper railway area would be managed in conjunction with the sediments. Four soil borings in this area contained elevated levels of metals in the surface soils (highest concentrations included 7,300 mg/kg lead, 1.2 mg/kg mercury, 2,030 mg/kg copper, 2.1 mg/kg cadmium, and 442 mg/kg zinc). One sample from this area contained cPAH in surface soils above the MTCA, Method A groundwater cleanup levels, and soil cleanup standards for unrestricted land use. Soils in this area are slated to be removed as a part of the sediment remediation project that is the subject of this AO.

There is an area on the embankment just south of the pier where it appeared that metallic debris and refuse from the boat shop had been deposited. This material was tested (AG-6) and found to contain elevated copper, lead, mercury, and zinc. The sediment removal project will include removal of this debris and associated soils that could cause sediment contamination to the harbor through erosion.

In general, sediments south of the pier (SMU 3 on Figure 2) were significantly less contaminated than the sediments within the marine railway, with only three of 10 samples containing mercury at levels between 0.47 mg/kg and 0.53 mg/kg(compared to the SQS of 0.41 mg/kg). Three samples within this area contained TBT (SG-5 with 0.13 ug/l in porewater/58 ug/kg in bulk sediment; SG-11 with 0.032 ug/l in porewater and 280 ug/kg in bulk sediment, and AS-15 with 270 ug/kg in bulk sediment). This area is slated to be capped with 12 to 18 inches of clean sand, overlain by 6 to 12 inches of clean gravel. Within this capping area, a subarea of about 600 square feet will be dredged prior to capping to remove a localized area represented by samples SG-4 and AS-4, where TBT concentrations of 2,047 ug/kg in bulk sediment and 0.20 ug/lporewater were detected.

Samples in the vicinity of the floating dock, waterward of the edge of the marine railway and the in deeper water area of the Site (SMU 2 on Figure 2), were contaminated only with TBT, with the highest levels found of 620 ug/kg in bulk sediment at SG-2 0.19 ug/l in porewater at SG-17.

These data have been evaluated against the Washington State SMS (WAC 173-204) chemical criteria (and various TBT benchmarks as discussed in the sediments technical memoranda) to identify the area and volume of sediments that exceed various criteria. Figure 2 presents a summary of sediment quality against SMS chemical criteria and various benchmarks for TBT. With the discontinuation of historical activities that have resulted in elevated sediment chemical concentrations, it is important to note that source control has been demonstrated. Confirmation sampling at the edge of the dredge area in the vicinity of SG-17 is required as a part of this CAP, to ensure that cleanup standards will be met beyond this location that contained TBT above the cleanup standard.

3 CLEANUP REQUIREMENTS

This section describes the cleanup requirements that must be met by the cleanup of the Site. Consistent with MTCA and SMS requirements, this section addresses three types of requirements:

- Cleanup Levels – A "cleanup level" is the concentration of a hazardous substance in soil, water, air, or sediment that is determined to be protective of human health and the environment under specified exposure conditions (WAC 173-340-200)
- Point of Compliance – The "Point of Compliance" defines the point or points on a site where cleanup levels must be met (WAC 173-340-200)
- Applicable Local, State, and Federal Laws – In addition to the requirements of the SMS and the MTCA, other laws apply to the cleanup; Section 3.3 discusses applicable laws and how they will be addressed during implementation of the cleanup action

3.1 Cleanup Levels

Cleanup standards applicable to sediments, soils, and groundwater are described below.

3.1.1 Sediment Cleanup Levels

The SMS, WAC 173-204, govern the identification and cleanup of contaminated sediment sites and establish two sets of numerical chemical criteria against which surface sediment concentrations are evaluated. The more conservative SQS provide a regulatory goal by identifying surface sediments that have no adverse effects on human health or biological resources. The MCUL (equivalent to the Cleanup Screening Level), represents the regulatory level that defines minor adverse effects. The SQS is Ecology's preferred cleanup goal, although Ecology may approve an alternate cleanup level within the range of the SQS and the MCUL if justified by a weighing of environmental benefits, technical feasibility, and cost. Chemical concentrations or confirmatory biological testing data may define compliance with the SQS and MCUL criteria.

The primary cleanup levels (long-term goal) for the Site sediments are defined as the SQS. There are no promulgated SMS criteria for TBT (ion), and there is no well-established relationship between the concentration of TBT (ion) in sediment and porewater to the potential for adverse effects to aquatic resources. Still, for the purposes of evaluating the protectiveness of various Site cleanup alternatives (recognizing that

Gig Harbor is a working harbor and the Site is adjacent to a number of marinas), there are a number of applicable benchmarks, or screening criteria, against which TBT concentrations in sediment and porewater can be evaluated (Figure 2). These are discussed in detail in Revised Technical Memorandum No. 2. Ecology and other sediment management agencies consider an interstitial porewater value of 0.05 ug/l to be equivalent to the "no adverse effects level" goal of the SQS (WAC 173-204-320). This approach is based on a 1996 Technical Information Memorandum that was put forth through the Sediment Management Annual Review Meeting review process in 1996 (Michelsen, et al. 1996). This Technical Information Memorandum also provided a screening guidance criterion for deep water disposal of sediments at dredged sediments disposal sites of 0.15 µg/l. The 0.15 µg/l concentration is considered by Ecology to be a "minor adverse effects" level equivalent to the MCUL. Ecology reviewed the levels of TBT at the Site in relationship to the various benchmarks presented in the Cleanup Study Report (Revised Technical Memorandum No. 2 – Sediment Cleanup Study Report and Analysis of Brownfields Cleanup Alternatives) and in relationship to the proposed cleanup presented in Revised Dredging and Capping Alternative B. Based on this review, Ecology has determined that the 0.15 µg/L porewater is an acceptable cleanup level for TBT at this Site. Sediment cleanup levels are summarized in Table 1.

3.1.2 Soil and Groundwater Cleanup Levels

Soil and groundwater cleanup levels consider reasonable maximum exposure expected under both current and future Site conditions. For the Site, soil cleanup levels have been set at the MTCA, Method A cleanup levels for unrestricted land use. Based on the information generated from the Site soils investigations, TPH (diesel and heavy oil), cPAH, and lead have been identified as the COCs at this Site. Cleanup standards for these contaminants are also presented in Table 1. Site investigations showed that groundwater is not a pathway of concern on this Site for human health risk or for the potential to affect the marine waters. Therefore, no groundwater cleanup standards have been set.

3.2 Point of Compliance

This section summarizes point of compliance for upland and sediment areas.

3.2.1 Soil

The soil cleanup standard consists of a concentration (cleanup level) and the point of compliance at any specified soil location. The point of compliance for soils is for the soils throughout the Site. Remedial investigations indicate that only two remaining areas are above the soil cleanup standard. These areas will be remediated and confirmation sampling at the edges of the excavations will be completed to confirm that the contaminants have been removed or isolated (see Section 5) and that cleanup standards are met.

3.2.2 Sediments

Consistent with the SMS regulations, sediment cleanup levels apply to the sediment bioactive zone (upper 10 cm of the sediment column). The cleanup levels do not directly apply to subsurface sediments, but the SMS require that the potential risks of the current and/or future exposure of deeper sediments be considered and be minimized through the implementation of the cleanup action. Areas where soils are excavated just above the high-water line (e.g., AG-6 area) will also need to meet sediment cleanup levels to address any potential for soil erosion to adjacent sediments.

3.3 Applicable Local, State, and Federal Laws

Cleanup actions must comply with applicable local, state, and federal laws. In certain cases, a permit is required. In other cases, the cleanup action must comply with the substantive requirements of the law but are exempt from the procedural requirements of the law (RCW 70.105D.090 and WAC 173-340-710). Prior the decision to perform the work under an AO, the City applied for and has received the following permits and approvals:

- Mitigated Determination of Non-significance
- City of Gig Harbor Shoreline Management Substantial Development – October 25, 2007
- HPA
- 401 Water Quality Certification
- 404/10 Permit U.S. Army Corps of Engineers (Corps) and Section 106 Concurrence
- Land Clearing and Grading Permit

4 DESCRIPTION OF AND BASIS FOR SELECTED REMEDIAL ALTERNATIVES

This section describes the cleanup alternatives considered for upland and sediment cleanup, and the rational for choosing the preferred alternative.

4.1 Upland Areas

As discussed in Section 2, only two upland areas require cleanup:

- Area AHA-1 – This area is just outside of the north side door to the boat shed. This area will be excavated to a depth of 3 feet over a small area of approximately 100 square feet. After confirmation samples confirm that cleanup levels have been met, the area will be backfilled to grade with clean soil. Because removal is a permanent alternative, no further evaluation is required.
- Area AG-9 – This approximately 2-foot-thick layer of fill containing charred wood, with elevated cPAH concentrations, is about 8 to 10 feet below the existing grade and overlain by clean soil. Though this area has been the subject to a number of investigations, the lateral extent of this fill layer has not been completely defined. However, groundwater in this area has been demonstrated to meet cleanup levels.

Removal of two wooden bulkheads to improve habitat at the park is an integral component of this cleanup action. WDFW incorporated the bulkhead removal and creation of new beach habitat as a requirement of the HPA. Once the bulkheads are removed, the land behind the bulkheads will be reconfigured to a gentle slope down to the beach and the new beach will be covered with a habitat gravel mix. This regrading requires excavation in the area of the lens of charred wood and could result in exposure of the material where it would intersect the new slope. This layer will be at an increasing distance below the surface as the distance from the former bulkheads increases (Figures 4 and 5). Groundwater monitoring has determined that the lens of soils with elevated cPAHs is not impacting groundwater or surface water quality.

For the purposes of evaluating alternatives for addressing the remnants of the charred wood layer that remains buried in the area requiring regrading for the new slope, the following section presents a disproportionate cost analysis.

4.1.1 MTCA Disproportionate Cost Analysis – Area AG-9

The MTCA analysis of disproportionate costs (WAC 173-340-360(2)(b) and 173-340-360(3)(e) is used to evaluate which cleanup alternatives, among those that otherwise meet threshold requirements, are permanent to the maximum extent practicable Seven criteria are used to evaluate and compare each cleanup action alternative in the disproportionate cost analysis as specified in WAC 173-340-360(3)(f):

- Protectiveness
- Permanence
- Costs
- Long-term effectiveness
- Short-term risk management
- Implementability
- Considerations of public concerns

The analysis compares the relative benefits of each alternative against those provided by the most permanent alternative. A majority of these benefits are environmentally based while others are related but non-environmental, such as "implementability."

The comparison of costs and benefits may be quantitative, but is often qualitative, or subjective. Costs are disproportionate to benefits if the incremental costs of the more permanent alternative exceed the incremental degree of benefits achieved by the other lower-cost alternative (WAC 173-340-360(e)(i)). Where two or more alternatives are equal in benefits, the department shall select the less costly alternative (WAC 173-340-360(e)(ii)(c)).

At this Site, quantitative data is available regarding the estimated amount of clean soil that would need to be removed to access the lens of soil with charred wood and elevated cPAHs (Figure 5 and Table 2). These data were used to help inform a qualitative analysis of the protectiveness, permanency, and long-term effectiveness of each alternative (Table 2). The MTCA regulation allows Ecology to use best professional judgment to assess benefits qualitatively and to use its discretion to favor or disfavor qualitative benefits (WAC 173-340-360(3)(e)(ii)(c)).

Table 2 presents four alternatives for addressing the charred wood layer near the regraded shoreline. The alternatives are shown graphically on Figure 5.

- Excavation Alternative 1 represents the project design grade for the beach regrading after bulkhead removal that is required for the HPA. The project design calls for removal of the bulkheads and shaping the land behind the bulkhead to a gradual slope (approximately 3:1 slope). The regraded area overlaps the location of the borings where the charred wood layer was identified, and it is possible that the lens will be intersected by the new slope. This alternative represents the "no-action" alternative because it does not include removal or capping of the lens that contains cPAHs.
- Excavation Alternative 2 involves overexcavating the slope to at least an additional 3 feet beyond that required for the design grade, and backfilling to design grade with clean soils. This will require removal of additional clean overburden as well as removal of part of the charred wood lens (if it is encountered). Backfilling with clean material on the slope will result in at least 3 feet of clean material between the layer containing cPAH and the land surface at the shoreline.
- Excavation Alternative 3 is similar to Alternative 2, with an additional 3 feet of overexcavation and backfill to design grade (for a total of 6 feet of clean cover material).
- Excavation Alternative 4 would involve excavation of a large amount of clean overburden soils in an effort to unearth and remove the cPAH-containing lens as far back as 60 feet from the shore and 15 feet below ground surface. This represents the most permanent alternative.

Alternative 2 and 3 provide similar levels of protectiveness, effectiveness, and permanence. Alternative 2 is less costly, and more easily implementable than Alternative 3. Both alternatives present similar short-term risks, which can be addressed through appropriate construction management practices. Alternative 4 does not provide significant additional environmental benefits over Alternative 2 or 3, and is significantly more costly and more difficult to implement.

Based on a review of the alternatives, costs, implementability, and environmental benefits, Ecology has determined that Alternative 2 is an acceptable alternative for

addressing area AG-9. Ecology has also agreed that the City may install test pits prior to implementing Alternative 2 to confirm that the layer of charred wood would remain at least 3 feet beneath the design grade, without the additional excavation required for Alternative 2. If the City confirms the extent of the lens through test pits, they may, in consultation with and approval from Ecology, elect to construct the project to design grade (Alternative 1) without further excavation.

4.2 Sediment Areas

The selection of the Revised Dredging and Capping Alternative B was based on an evaluation of cleanup action alternatives in terms of net environmental benefits, community acceptance, cost, engineering feasibility, and implementability. This evaluation is detailed in the following Technical Memoranda and summarized in Table 3.

- Technical Memorandum No. 2. – Evaluation of Sediment Cleanup Alternatives, January 2006.
- Technical Memorandum No. 2. Revised Technical Memorandum No. 2 – Sediment Cleanup Study Report and Analysis of Brownfields Cleanup Alternatives. February 2007.
- Technical Memorandum. Revised Dredging and Capping Alternative B. March 29, 2007.

5 DESCRIPTION OF THE PROPOSED CLEANUP ACTION

5.1 Sediment Remediation

The Eddon Boatyard Sediment Remediation Project includes areas of dredging and backfill, dredging without backfill, and capping. These have been identified on Figure 2 as Sediment Management Units (SMUs) 1, 2, and 3.

- SMU 1: Dredge and backfill – The area around the upper part of the marine haul-out railway and pier, above the approximately +2 feet mean lower low water tide level (+2 MLLW), will be dredged to a depth of 2 feet. This area will be backfilled with clean sand and covered with a 6-inch-thick layer of habitat gravel mix. The marine railways and pier will be removed to accomplish the dredging and will be replaced in a future phase of park development. This cleanup area includes excavation of upland soils above the high tide level within the boat shed building, and excavation of a discrete area of debris/soils within the embankment to the south of the dock (sample location AG-6). Performance sampling will be required to ensure the debris/metals contamination on the embankment near the pier has been sufficiently removed. Performance sampling is not required elsewhere within this area because sediment cores in this area confirmed that sediments below 18 inches deep meet the SQS.
- SMU 2: Dredge without backfill – This area is waterward of SMU in the vicinity of the outer edge of the marine haulout rails and pier, and includes the subtidal area under the gangway and floating dock. This area will be dredged to a depth of 2 feet. No backfill will be required in this area as it is not necessary to bring it back to existing grade to accommodate replacement of structures. Confirmation sampling will be required to confirm the bottom of the dredge area meets the sediment cleanup levels, and to confirm that the dredged area removes the full footprint of contaminated sediments.
- SMU 3: Sand cap – The area to the south of the pier will receive a 12-inch sand cap covered by a 6-inch habitat gravel mix layer. A subarea within this unit (as shown on Figure 2) will first be dredged to 2 feet deep, then backfilled to match the surrounding grade.

5.2 Upland Remediation

Upland soil cleanup includes the following:

- Soil within a small area of approximately 100 square feet at AHA-1 will be removed to a depth of 3 feet and disposed of off site. Confirmation samples will be obtained from the bottom and sidewalls of the excavation.
- The layer of charred wood that contains elevated cPAH in the area of the bulkhead removal/slope regrading (AG-9) will be addressed as described in Section 4.1.1. The new shoreline bank will receive a surface layer of 12 inches of habitat gravel mixture below the high tide level and will be hydroseeded above the high tide level.

5.3 Compliance Monitoring

Water Quality Certification – Order No. 5228 and Corps Public Notice No. NWS-2007 785-NO (Water Quality Certification) was issued on November 19, 2007, and addresses water quality and sediment monitoring activities during construction. The Water Quality Certification requires approval by Ecology of a water and sediment monitoring plan before construction begins. The Water, Soil, and Sediment Monitoring Plan (Monitoring Plan) required under this AO will serve to comply with the requirements of the Water Quality Certification and will also include additional monitoring elements needed to confirm the areas remediated under this CAP meet applicable cleanup standards. . As required by the Water Quality Certification and the AO (Table 1), Ecology's written approval of this Monitoring Plan is required prior to beginning the work. The Monitoring Plan will include:

- Water quality monitoring during construction
- "Z" surface (upper 10 centimeters) at newly dredged surfaces that are not slated to be capped (SMU 2 and at new beach area in bulkhead removal vicinity)
- Confirmation sampling at northeast edge of SMU 2
- Confirmation sampling at landward edge of debris removal area around AG-6
- Confirmation sampling for soil removal area at AHA-1

5.4 Institutional Controls

In conjunction with compliance monitoring, institutional controls will be applied to limit or prohibit activities that could interfere with the integrity of the cleanup action. Environmental covenants will be recorded for all sediment cap areas and for soils left at depth near AG-9. Institutional controls will include deed restrictions (limited to City

property), information in Parks maintenance and operations manuals, and signage that clearly identify aquatic cap areas to avoid/restrict future disturbance of the isolated sediments. Further, any activities associated with the future operation of a demonstration boatyard will be required to be in full compliance with the General National Pollutant Discharge Elimination System (NPDES) Boatyard permit. These elements will be presented in the Institutional Control Plan (see Table 1 of the AO).

5.5 Sediment Area Long-term Monitoring Plan

The elements discussed below will be presented in a Long-term Monitoring Plan (see Table 1 of the AO). The focus of long-term monitoring is focused on confirming that the cap integrity is maintained. The City will visually inspect the cap areas annually for 5 years during low tide conditions to determine whether the cap material has remained in place and has not been significantly disturbed. If the cap material is present, there will be no action and it will be assumed that the cap work is achieving performance standards. If fine-grained material is present, rather than the original cap material, additional sampling using hand-held digging equipment ("hand cores") will be conducted to determine if material is moving on top of and covering the cap or the cap material has eroded away from the original cap area. The condition of the cap will be documented (photographs) and summarized annually (the Long-term Monitoring Plan will provide a schedule of submittals) in a brief memorandum to Ecology. If significant disturbance is observed, any additional actions will be discussed with Ecology.

The Long-term Monitoring Plan will also identify two locations where the surface sediments (upper 10 centimeters) will be sampled during Year 3 and Year 5. Sediments at these two locations will be submitted for total PCBs, total mercury, total organic carbon, total solids, and TBT porewater. Following each of the two sampling events, the results will be provided to Ecology in the annual memoranda.

6 IMPLEMENTATION OF THE CLEANUP ACTION

All permits for both the upland and sediment cleanup elements (and rebuilding of the pier and marine railways) were received on March 20, 2008. The City has requested sealed bid proposals for construction of the first phase of the Eddon Boatyard Sediment Remediation Project. Contract documents included Contract Plans, Contract Provisions, Contract Specifications, and Addenda. Sealed bid proposals were received on April 30, 2008, and the contractor selection was completed in May 2008. The project Notice to Proceed is expected to be issued following Public Comment on the AO. Mobilization and construction preparations can begin immediately after the Notice to Proceed is issued and the contractor has provided all the required submittals. The Site cleanup actions described in this CAP shall be completed within 90 working days after the Notice to Proceed is issued. This phase of the project is scheduled to be completed by November 10, 2008. This constitutes a reasonable restoration timeframe as required under WAC 173-340-360.

The second phase of the park development project, which includes rebuilding the pier and marine rails on their historical footprints, and reinstalling the existing gangway and floating dock, will be performed in subsequent construction seasons.

7 REFERENCES

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Anchor. 2005. Data Assessment and Conceptual Cleanup Plan, Eddon Boatyard Property. Prepared for the City of Gig Harbor. August.

Krazan and Associates, Inc. 2003. Geotechnical Engineering-Phase II Environmental Investigation. Proposed Harbor Cove Development, 3711 and 3805 Harborview Drive, Gig Harbor, Washington. Poulsbo, Washington.

Michelsen, Dr. Teresa (Washington Department of Ecology), Travis C. Shaw (U.S. Army Corps of Engineers [Corps]), and Stephanie Stirling (Corps) for the PSDDA/SMS agencies. 1996. Testing, Reporting, and Evaluation of TBT Data in PSDDA and SMS Programs. October.

Saltbush Environmental Services, Inc. 1999. Phase I Environmental Site Assessment. The Harborview Drive Project, Gig Harbor, Pierce County, Washington. Tacoma, Washington.

TABLES

Table 1
Soil and Sediment Cleanup Levels

Parameter	Matrix	Cleanup Level
Soils – MTCA, Method A, unrestricted land use		
TPH – diesel range organics	Soil	2,000 mg/kg
cPAH	Soil	0.1 mg/kg (Toxicity Equivalency Methodology)
Lead	Soil	250 mg/kg
Sediments		
SMS chemicals	Sediment	Sediment Quality Standards (Table 1, 173-204 WAC)
Tributyltin	Porewater	0.15 µg/L

Notes:
µg/L = micrograms per liter
cPAH = carcinogenic polyaromatic hydrocarbon
mg/kg = milligram per kilogram
SMS = Sediment Management Standards
TPH = total petroleum hydrocarbon

Table 2
Evaluation of Permanence Using MTCA Disproportionate Cost Analysis (WAC 173-340-360(2)(b)(i) and WAC 173-340-360(3)(f))

AG-9 AREA	Excavation Scenario 1 – "No Action"	Excavation Scenario 2 – 3-foot overexcavation	Excavation Scenario 3 – 6-foot overexcavation	Excavation Scenario 4 – 20-foot overexcavation
Description	Regrade slope after bulkhead removal according to Hydraulic Project Approval and Park design grade. This requires removal of 1,300 cubic yards of soil and regrading slope to approximately 3:1 slope.	Overexcavate beyond design grade and backfill to design grade with clean soils, such that the charred wood layer containing cPAH would be overlain by at least 3 feet of clean soils. Re-use clean overburden on site.	Overexcavate beyond design grade and backfill to design grade with clean soils, such that the charred wood layer containing cPAH would be overlain by at least 6 feet of clean soils. Re-use clean overburden on site.	Overexcavate beyond design grade and backfill to design grade with clean soils, such that the charred wood layer containing cPAH would be overlain by at least 15 feet of clean soils. Re-use clean overburden on site.
Additional soil volume required to be removed	Not applicable	800 cubic yards	1,200 cubic yards	2,500 cubic yards
Scenario Cost	$114,000	$150,000	$185,000	$276,000
Increased cost over no-action alternative	Not applicable	$36,000	$71,000	$162,000
Overall Protectiveness	Not reliably protective because of possible intersection of charred wood layer with new embankment slope, or only slightly beneath new slope. Higher on the slope, protectiveness increases because fill layer will be buried deeper beneath the final grade.	This alternative is protective because it will isolate the layer containing charred wood and cPAH to at least three feet below ground surface. Soils at this depth will not be accessible by park visitors. Institutional controls will be applied to prevent future exposure of the soils in the event of later design changes to the park, and to prevent park visitors from digging into the soil. This alternative will also be protective because groundwater samples from the fill lens indicate the cPAH do not leach to groundwater at levels that may pose a threat to adjacent surface waters.	This alternative is as protective as Alternative 2, because it will isolate the layer containing charred wood and cPAH to at least six feet below ground surface. Since any soils below the ground surface will not be accessible by park visitors, the additional three feet of clean soil cover will not provide additional protectiveness. This alternative is equally as protective as Alternative 2 because groundwater samples from the fill lens indicate the cPAH do not leach to groundwater at levels that may pose a threat to adjacent surface waters.	This alternative is as protective as Alternative 2 and 3, because it will isolate the layer containing charred wood and cPAH to well below ground surface. Since all soils below the ground surface will not be accessible by park visitors, the additional thickness of clean soil cover will not provide additional protectiveness. This alternative is equally as protective as the other alternatives because groundwater samples from the fill lens indicate the cPAH do not leach to groundwater at levels that may pose a threat to adjacent surface waters.
Permanence	Not permanent unless cPAH layer is well below the surface and is not intersected by new slope. Does not permanently remove hazardous substances from the environment.	With the application of institutional controls, this alternative will permanently reduce the mobility of the hazardous substances. This alternative will permanently remove a portion of the hazardous substances from the environment.	With the application of institutional controls, this alternative will permanently reduce the mobility of the hazardous substances. This alternative will permanently remove a greater portion of the hazardous substances from the environment, compared to Alternative 2.	This alternative would provide the most permanent remedy, and could include removal of the entire lens of charred material.
Long-term Effectiveness	Not reliably effective, unless cPAH layer is well below the surface and is not intersected by new slope.	This alternative is effective for the long-term because institutional controls will prevent future exposure of the cPAH layer. The gentle slope and cover with vegetation will prevent erosion through the cap.	This alternative is effective for the long-term because institutional controls will prevent future exposure of the cPAH layer. The gentle slope and cover with vegetation will prevent erosion through the cap.	This alternative is slightly more effective for the long term because any remaining cPAH-contaminated soils would be well below any level that may need to be disturbed for future park maintenance or development.
Short-term Risk Management	Short-term risk will be minimized by implementing construction practices to contain the lens and protect surrounding soils and workers from exposure.	Short-term risk will be minimized by implementing construction practices to contain the lens and protect surrounding soils and workers from exposure.	Short-term risk will be minimized by implementing construction practices to contain the lens and protect surrounding soils and workers from exposure. Overall project risks in the form of worker safety may increase with the need to excavate a larger volume of soils.	Short-term risk will be minimized by implementing construction practices to contain the lens and protect surrounding soils and workers from exposure. Overall project risks in the form of worker safety may increase with the need to excavate a larger volume of soils.
Implementability	Easily implementable with conventional construction equipment.	Somewhat increased complexity due to need to overexcavate from design grade and backfill to design grade with unconsolidated materials. If lens is encountered would also increase complexity for segregation of clean from contaminated soils and care with handling cPAH-contaminated fill layer. Slope stability not expected to be a problem due to gradual slope (3:1).	Increasing complexity as excavation is expanded further inland. This complexity is driven by removal of overlaying material to get at the lens, segregation of material, and backfilling to design elevations.	Greatly increased complexity as excavation is expanded further inland. This complexity is driven by removal of large amounts of overlaying material to get at the lens, segregation of material, and backfilling to design elevations.
Consideration of Public Concerns	Community concerns will be evaluated during the public comment period on the Cleanup Action Plan, and the selected cleanup alternative may be modified if needed to address community concerns.	Community concerns will be evaluated during the public comment period on the Cleanup Action Plan, and the selected cleanup alternative may be modified if needed to address community concerns.	Community concerns will be evaluated during the public comment period on the Cleanup Action Plan, and the selected cleanup alternative may be modified if needed to address community concerns.	Community concerns will be evaluated during the public comment period on the Cleanup Action Plan, and the selected cleanup alternative may be modified if needed to address community concerns.

Table 3
Summary of Comparison of Sediment Cleanup Alternatives

Comparative Criteria[1]	Cleanup Alternatives: No Action	Capping	Dredging/Capping Alternative A	Dredging/Capping Alternative B (Technical Memorandum No. 2, February 2007)	Revised Dredging/Capping Alternative B (Technical Memorandum, March 29, 2007)	Full Dredging
Overall Protectiveness of Human Health and Environment[2]	**Low:** No construction-related impacts, but does not reduce chemical concentrations in the biologically active zone or meet any SMS cleanup criteria in an acceptable time frame. ***(Score=1)***	**Moderate to High:** Relatively low impacts during construction, immediately reduces chemical concentrations in the biologically active zone, but does not remove any chemicals from the aquatic environment. Less effective in the long-term due to the potential of mixing with sediments at depth. ***(Score=4)***	**Moderate to High:** Localized impacts during dredging and highest SMS chemical concentrations removed. Immediately reduces chemical concentrations in the biologically active zone. All TBT benchmarks met through dredging and capping. ***(Score=4)***	**Moderate to High:** Localized impacts during dredging and highest SMS chemical concentrations removed (more extensive than Alternative A). Immediately reduces chemical concentrations in the biologically active zone. All TBT benchmarks met through dredging and capping. ***(Score=4)***	**Moderate to High:** Localized impacts during dredging and highest SMS chemical concentrations removed (more extensive than Alternative A). Immediately reduces chemical concentrations in the biologically active zone. All TBT benchmarks met through dredging and capping. ***(Score=4)***	**Moderate to High:** Widespread impacts during dredging; removes all sediments above the SMS and all sediments that exceed various TBT benchmarks. Residuals addressed through backfilling. Immediately reduces chemical concentrations in the biologically active zone. ***(Score=4)***
Attainment of Cleanup Standards	**Low:** Does not address sediments that exceed the SQS, CSL, or TBT benchmarks. (***Score=1)***	**Moderate:** Addresses all SQS and CSL exceedances through isolation (capping). ***(Score=3)***	**High:** Removes all sediments that exceed the CSL, except SC-5, and the highest TBT bulk sediment concentrations. Sediments that are above the CSL, SQS, and various TBT benchmarks are addressed through capping. ***(Score=5)***	**High:** Removes all sediments that exceed CSL and the highest TBT bulk sediment concentrations. Sediments that are above the SQS and various TBT benchmarks are addressed through capping. ***(Score=5)***	**High:** Removes all sediments that exceed CSL and the highest TBT bulk sediment concentrations. Sediments that are above the SQS and various TBT benchmarks are addressed through capping. ***(Score=5)***	**High:** Removes all sediments that exceed the SQS or CSL and removes all sediments above the TBT benchmarks. ***(Score=5)***
Short-term Effectiveness[3]	**Low:** No immediate improvement or impacts. ***(Score=1)***	**Moderate to High** Capping has less short-term impacts than dredging. Benthic community will recover quickly. ***(Score=4)***	**Moderate:** Dredging has significant short-term impacts (water quality impacts and destruction of benthic community) and potential for other manageable issues to arise (transport, rehandling, and residuals). Capping has less short-term impacts than dredging. Benthic community will recover quickly. ***(Score=3)***	**Moderate to Low:** Increased amount of dredging (relative to dredging/capping alternative A) has increased level of short-term impacts (water quality impacts and destruction of benthic community) and potential for other manageable issues to arise (transport, rehandling, and residuals). Capping has less short-term impacts than dredging. Benthic community will recover quickly. ***(Score=2)***	**Moderate to Low:** Increased amount of dredging (relative to dredging/capping alternative A) has increased level of short-term impacts (water quality impacts and destruction of benthic community) and potential for other manageable issues to arise (transport, rehandling, and residuals). Capping has less short-term impacts than dredging. Benthic community will recover quickly. ***(Score=2)***	**Low:** Site-wide dredging has significant short-term impacts (water quality impacts and destruction of benthic community) and potential for other manageable issues to arise (transport, rehandling, and residuals) - more so than any of the other alternatives considered. ***(Score=1)***
Long-term Effectiveness and Permanence	**Low:** No significant reduction in chemical concentrations expected over time. ***(Score=1)***	**Moderate:** Capping establishes a clean Biologically Active Zone (BAZ). The cap will be designed to include a BAZ, an isolation zone, and a mixing zone. Monitoring will be required to confirm that concentrations do not approach SQS or various benchmarks. ***(Score=3)***	**Moderate to High:** Removal of the highest concentrations minimizes potential source areas and potential for recontamination. Capping establishes a clean Biologically Active Zone (BAZ). The cap will be designed to include a BAZ, an isolation zone, and a mixing zone. Monitoring will be required to confirm that concentrations do not approach SQS or various benchmarks over time. ***(Score=4)***	**Moderate to High:** Removal of the highest concentrations minimizes potential source areas and potential for recontamination. Capping establishes a clean Biologically Active Zone (BAZ). The cap will be designed to include a BAZ, an isolation zone, and a mixing zone. Monitoring will be required to confirm that concentrations do not approach SQS or various benchmarks over time. ***(Score=4)***	**Moderate to High:** Removal of the highest concentrations minimizes potential source areas and potential for recontamination. Capping establishes a clean Biologically Active Zone (BAZ). The cap will be designed to include a BAZ, an isolation zone, and a mixing zone. Monitoring will be required to confirm that concentrations do not approach SQS or various benchmarks over time. ***(Score=4)***	**High:** Removal of the highest concentrations minimizes potential source areas. ***(Score=5)***
Ability to be Implemented	**High:** No action required. ***(Score=5)***	**High** All alternatives can be implemented. Each alternative requires the contractor to consider access and equipment for shoreline areas, intertidal areas, and deeper water areas. ***(Score=5)***				
Addresses Community Concerns	**Low:** Does not meet the public's expectations that the Site will be cleaned up to support park elements. ***(Score=1)***	**Moderate to Low:** Meets the public's expectations that the Site will be cleaned up but the changes in elevation are inconsistent with the expectation that the rails will be functional (use of non-profit demonstration boatyard). ***(Score=2)***	**Moderate to High:** Meets the public's expectations that the Site will be cleaned up and that the rails will be functional (to support non-profit demonstration boatyard). Removal of material via truck (use of City streets) may be an issue. Float area use will be limited by lack of water depth. Construction will need to consider public concerns (noise, lights). ***(Score=4)***	**High:** Meets the public's expectations that the Site will be cleaned up and that the rails will be functional (to support non-profit demonstration boatyard). Removal of material via truck (use of City streets) may be an issue. Additional off-site offloading area will also need to be established. Float area use will meet water depth needs. Construction will need to consider public concerns (noise, lights). ***(Score=5)***	**High:** Meets the public's expectations that the Site will be cleaned up and that the rails will be functional (to support non-profit demonstration boatyard). Removal of material via truck (use of City streets) may be an issue. Additional off-site offloading area will also need to be established. Float area use will meet water depth needs. Construction will need to consider public concerns (noise, lights). ***(Score=5)***	**Moderate:** Meets the public's expectations that the Site will be cleaned up and that the rails will be functional (to support the non-profit demonstration boatyard). Removal of material via truck (use of City streets) may be an issue. Additional off-site offloading area will also need to be established. Float area use limitations due to water depths will be similar to today (unless area is not backfilled). Construction will need to consider public concerns (noise, lights). ***(Score=3)***
Cost[4]	**Nominal** ***(Score=5)***	**$1,470,000** ***(Score=4)***	**$1,700,000** ***(Score=3)***	**$1,650,000** ***(Score=2)***	**$1,600,000** ***(Score=4)***	**$2,390,000** ***(Score=1)***
Overall Score[5]	**15**	**25**	**28**	**29**	**29**	**24**
Rank	**5**	**3**	**2**	**1**	**1**	**4**

Notes:

1 = Criteria are from Ecology's Sediment Management Standards for Cleanup Study Report (WAC 173-204-560 and -570).

2 = TBT bench marks are discussed in Section 5.3 of Technical Memorandum No. 2.

3 = Considers environmental protectiveness during construction and implementation.

4 = Includes placeholder $500,000 plus 8.8% sales tax for pier and marine railway replacement. All costs are estimated and not based on discussions with or bids from contractors.

5 = Scores based on low=1, moderate to low=2, moderate=3, moderate to high=4, and high=5. Costs were ranked where the lowest cost was equal to 5 and highest was equal to 1 (scaled). Total score = 35.

FIGURES