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National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
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NMFS Tracking
Number 2003/00717

March 11, 2004

Piper Peterson-Lee
Project Coordinator
U.S. Environmental Protection Agency
Region 10 ECL-111
1200 Sixth Avenue
Seattle, Washington 98101-1128

Re: Biological Opinion and Essential Fish Habitat Consultation for the Thea Foss and Wheeler-Osgood Waterways Superfund Remediation Action, Commencement Bay Nearshore/Tideflats Superfund Site, Tacoma, Washington (HUC 17110019, Puget Sound)

Dear Ms. Peterson-Lee:

In accordance with section 7 of the Endangered Species Act (ESA), as amended (16 U.S.C. 1531 *et seq.*) and the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996, the attached document transmits NOAA's National Marine Fisheries Service (NOAA Fisheries) Biological Opinion (Opinion) and MSA consultation on the Superfund removal action for the Thea Foss and Wheeler-Osgood Waterways in Commencement Bay in Pierce County, Washington. The U.S. Environmental Protection Agency (EPA) had determined that the proposed action may affect, and is likely to adversely affect, the Puget Sound (PS) chinook (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit.

The Opinion reflects the results of a formal ESA consultation and contains an analysis of effects covering PS chinook in Commencement Bay, Washington. The Opinion is based on information provided in the Biological Assessment sent to NOAA Fisheries by the EPA, and additional information transmitted via meetings, telephone conversations, fax and E-mail. A complete administrative record of this consultation is on file at the Washington Habitat Branch Office. NOAA Fisheries concludes that implementation of the proposed project is not likely to jeopardize the continued existence of PS chinook. In your review, please note that the incidental take statement includes Reasonable and Prudent Measures and Terms and Conditions, which were designed to minimize incidental take.

The MSA consultation concluded that the proposed project may adversely impact designated Essential Fish Habitat (EFH) for chinook and other estuarine species. The Reasonable and Prudent Measures of the ESA consultation, and Terms and Conditions identified therein, would address the negative effects from the proposed EPA actions. Therefore, NOAA Fisheries recommends that they be incorporated as EFH conservation measures.

If you have any questions, please contact Robert Clark at (206) 526-4338 (Robert.Clark@noaa.gov).

Sincerely,

For Michael R Crouse

D. Robert Lohn
Regional Administrator

Enclosure

Endangered Species Act - Section 7 Consultation
Biological Opinion

And

Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

Thea Foss and Wheeler-Osgood Waterways Remediation Action
Commencement Bay Nearshore/Tideflats
Superfund Site, Tacoma, Washington

Agency: Environmental Protection Agency

Consultation Conducted By: NOAA's National Marine Fisheries Service
Northwest Region

Date Issued: March 11, 2004

Issued by: For Michael R Crouse

D. Robert Lohn
Regional Administrator

NMFS Tracking No.: 2003/00717

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FIGURE 1. REMEDIAL DESIGN MAP

FIGURE 2. PROJECT AREA AND ACTION AREA MAP

ATTACHMENT No. 1. BA Excerpt

1.0 INTRODUCTION

1.1 Background and Consultation History

On June 5, 2003, NOAA's National Marine Fisheries Service (NOAA Fisheries) received a Biological Assessment (BA; July, 2000), an Addendum (BA Addendum; May 23, 2003), and a request for Endangered Species Act (ESA) section 7 and Essential Fish Habitat (EFH) consultations from the United States Environmental Protection Agency (EPA). NOAA Fisheries responded on September 11, 2003, that the Biological Assessment Addendum did not yet sufficiently describe in-water construction activities to allow NOAA Fisheries to initiate formal consultation. On September 22, the EPA provided an Elements of In-Water Work Schedule (Sept. 19, 2003) and on November 10, 2003, a complete habitat plan was submitted. Formal ESA consultation for the Thea Foss and Wheeler-Osgood Waterways Superfund Remediation action was initiated on November 12, 2003. The EPA concluded that, while it may be difficult to quantify demonstrable impacts to listed resources by this action, the conservative position must be taken that the proposed dredging, capping, replacement of over-water structures, and habitat development activities are likely to adversely affect Puget Sound (PS) chinook in the short-term. Essential Fish Habitat consultation was initiated simultaneously with formal ESA consultation.

The City of Tacoma (City) has agreed to remove and/or cap contaminated sediments in portions of the Thea Foss and Wheeler-Osgood Waterways and dispose of contaminated sediments in the St. Paul Confined Disposal Facility (CDF). Offsetting mitigation for loss of littoral habitat includes creation of intertidal habitats from upland fill to replace loss of use by listed species in the Thea Foss and St. Paul Waterways, removal of overwater structures, slope reconfiguration with fish-friendly substrates, placement of large woody debris, removal of creosote-treated timber piling, and riparian plantings. The purpose of this Comprehensive Environmental Response, Compensation and Liability Act (CERCLA or "Superfund") Remedial Action is to address unacceptable risks to the environment and public health from the contaminated sediments. The EPA's removal order to the City is considered a Federal action for purposes of interagency consultation provisions in the ESA. The proposed action occurs within the geographic range of the PS chinook (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit (ESU) and the marine waters of Water Resources Inventory Area (WRIA) 10.

The contaminated sediments at this Superfund cleanup site are located in various sediment management units from the bottom of the navigational channel of the Thea Foss Waterway at Station 20+00 to the head of the waterway at approximately Station 80+20. Contaminated sediments are found in the littoral zone (defined here as from minus 10 feet to plus 13.8 feet) to heights of plus 16 feet mean lower low water (MLLW) along the shorelines and in portions of the Wheeler-Osgood Waterway (Figure 1). The Thea Foss and Wheeler-Osgood Waterways (site of the proposed contaminated sediment dredging/capping remedial project), the St. Paul Waterway (the proposed disposal site), the Puyallup River Delta (site of the disposal of clean materials dredged from the St. Paul CDF in 2003 and source of capping materials in 2004), and

the Middle Waterway and Puyallup River Side Channel (mitigation sites), are located within the industrial tideflats area of Commencement Bay, Tacoma, Washington (Figure 2). The proposed action will replace highly contaminated intertidal and subtidal sediments with chemically-clean relic deltatic substrates or confining caps. NOAA Fisheries concurs with the EPA's effect determination of Likely to Adversely Affect PS chinook salmon.

The objective of this Biological Opinion (Opinion) is to determine whether the proposed action is likely to jeopardize the continued existence of PS chinook. The standards for determining jeopardy as described in 7(a)(2) of the ESA are further defined in 50 CFR 402.14.

This document also presents NOAA Fisheries' consultation covering EFH, pursuant to 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and implementing regulations for EFH found at 50 CFR 600. In the EFH assessment included in the BA, the EPA concluded the actions will benefit EFH by the long-term removal or capping of contaminated sediments with only minor short-term construction impacts, when their proposed Conservation Measures are applied. The short-term construction impact do temporarily adversely affect EFH.

Both the Opinion and the EFH consultation are based on information provided in the original Commencement Bay Nearshore/Tideflats (CB/NT) Superfund BA (USEPA 2000a), the BA Addendum, project design documents and plans, numerous meetings, mail correspondence, e-mail correspondence, and phone conversations, records of which are contained in the Administrative Record.

While this formal consultation will address remaining remedial activities overseen by the EPA for the Superfund cleanup of the Thea Foss and Wheeler-Osgood Waterway Remedial Action, several earlier informal section 7 and EFH consultations have been conducted so that preliminary activities could be initiated prior to the primary cleanup. These include remedial activities in Areas 1A/1B (NMFS Tracking No.: 2002/01386), Area 3 (NMFS Tracking No.: 2002/01387), Johnny's Seafood (NMFS Tracking No.: 2002/01388), Areas 10, 11 and 13 (NMFS Tracking No.: 2002/01389), Area 14 (NMFS Tracking No.: 2002/01390), St. Paul Piling Removal (NMFS Tracking No.: 2002/01391), St. Paul Surface Dredging (NMFS Tracking No.: 2003/01220), and the Head of Thea Foss Remediation (NMFS Tracking No.: 2003/01224). In this latter activity, the Utilities (PacifiCorp Environmental Remediation Company, Puget Sound Energy, and Advance Ross Sub Company) agreed to place an impermeable cap over the 509 seep area, and other remedial activities such as installing a sheet pile wall and transition zone, limited dredging with upland disposal, and scour protection.

The various remedial elements which occur as part of the proposed action and covered by this Opinion include the preparation of the St. Paul CDF, dredging of contaminated sediments, disposal of contaminated sediments in the CDF, dredging of clean sediments from the Puyallup River delta for thick-layer capping, enhanced natural recovery through thin-layer capping, the relocation of an oil dock on the St. Paul Waterway and log haul out facility to the Middle Waterway, slope rehabilitation, the removal of timber piles, the reconstruction of marina facilities using state-of-the-art materials, the removal of over-water structures, and construction

of littoral habitats and habitat enhancements in the Thea Foss, Wheeler-Osgood, St. Paul, and Middle Waterways and the Puyallup River Side Channel.

1.2 Description of the Proposed Action

The EPA has issued an order to the City to proceed, under Superfund authority, with the removal and/or capping of contaminated sediments in the Thea Foss and Wheeler-Osgood Waterways. During the development of the EPA's selected remedy for sediments in these waterways that exceed the Sediment Quality Objectives (SQOs), the waterways were initially organized into 68 discrete Superfund Sediment Management Areas (SSMAs). For constructability, the SSMAs were combined into 24 Remedial Action Areas (RAs); the City will be responsible for remediating RAs 1-22 under this Opinion and the Utilities are remediating RAs 23 and 24 under a previous section 7 consultation (NMFS Tracking No.: 2003/01224) (Figure 1).

The EPA's Superfund remedial action consists of several discrete but integrated elements which are the subject of this Opinion and described in the following sections.

1.2.1 No Action

Portions of the waterways that have chemical constituent concentrations below the SQOs will have no remedial activities. No action occurs in approximately 37.3 acres of the project area, primarily at the mouth and along the shorelines (see Figure 1).

1.2.2 Natural Recovery

For specific portions of the Thea Foss and Wheeler-Osgood Waterways, the EPA's 1989 Record of Decision (EPA 1989) and the 2000 Explanation of Significant Differences (ESD) (EPA 2000b) selected natural recovery as the preferred remedial approach. Natural recovery applies to areas where surface sediments are predicted to recover to SQO concentration levels within 10 years following completion of remedial activities within the waterways.

Portions of the waterways that have chemical constituent concentrations that slightly exceed SQOs, with low enrichment ratios and minor or no adverse effects in bioassay testing, have been designated for natural recovery. Chemical and biological monitoring will be the only remedial activity and will be used to verify the effectiveness of this approach in terms of reducing concentrations of chemical constituents of concern. The EPA proposes natural recovery for approximately 21.2 acres of the project area as shown in Figure 1.

1.2.3 Enhanced Natural Recovery (Thin Cap)

Enhanced natural recovery is the placement of a thin layer (usually six inches) of clean sediment above the existing sediment surface to assist the natural recovery of those sediments with minor exceedances of SQOs. Enhanced natural recovery has been demonstrated to be effective in the intertidal regions of Eagle Harbor (Bainbridge Island, Washington) and is expected to be

similarly effective in Commencement Bay. The objective of thin-layer capping is not to isolate the surface sediments, but to augment the natural sedimentation rate by introducing clean sand. Natural processes, such as bioturbation, will mix the sand with the underlying material, reducing chemical concentrations in the biologically active zone with minimal disruption of the existing benthic community.

The City will thin layer cap at RA 7, which occupies approximately 4.0 acres between the shoreline and the pierhead line. Thin channel cap placed at Foss Waterway Marina (RA 7) will consist of a single thin lift with a minimum thickness of 6 inches placed either hydraulically or by clamshell dredge. If the clamshell is used, the cap material will come from an approved upland source. The City will take before and after hydrographic surveys to confirm the specified depth of cap material has been placed.

1.2.4 Dredging of Sediments

The City will remediate portions of the waterways containing sediments with concentrations above SQOs either by dredging to a specified elevation, leaving a fresh surface still with SQO exceedances followed by capping, or dredging to a specified elevation that will remove all chemical constituents above SQOs. Dredging elevations are based on chemical data from subsurface cores and navigational requirements (authorized navigational project depths and current or anticipated future waterfront development-related required water depths). In areas where dredging removes all occurrences of SQO exceedances, back filling may be necessary to match the area with the surrounding grade for habitat purposes. In areas where dredging does not remove all occurrences of SQO exceedances, capping is necessary to isolate the remaining contaminated sediments from overlying water column and habitat. To access sediments located under existing marinas the City may temporarily remove boats, docks, floats, and pilings, with subsequent replacement.

The City will dredge approximately 590,000 cubic yards of contaminated sediments over 46.6 acres as part of this action. Specific dredging requirements include dredging to a specified elevation and placement of a thick cap in channel areas RAs 17, 18, 21, and 22 and in non-channel areas RAs 19A, 19B, and 20. Dredging to a specified elevation and backfilling to a specified elevation will occur in RAs 2 and 4. All contaminants will be removed to a specified elevation in RAs 1A, 1B and 5.

Channel dredging (430,000 cubic yards) in the Thea Foss Waterway will vary from minus 24 feet MLLW at the southern end to minus 31 feet at the northern limit. In the Wheeler-Osgood Waterway the dredging depth will slope from approximately minus 2 feet to minus 8 feet MLLW at the entrance. The City will sample sediment chemicals in all dredged areas where channel capping will not occur, to confirm that all contaminated sediments have been removed. Additional dredging , capping, or designation for natural recovery may occur if sample results exceed SQOs.

Remedial dredging will be conducted with both an 8- to 12-cubic yards mechanical clamshell dredge and a 26-inch hydraulic dredge depending on dredging conditions and the stage of the CDF construction. Channel dredging will mostly be accomplished with the hydraulic dredge and a floating pipeline will be placed in the Thea Foss Waterway to a point north of the Eleventh Street Bridge where it will come ashore and will be pumped overland along the Eleventh Street right-of-way. At Middle Waterway, it will again transition to a floating pipeline leading to the St. Paul CDF. The pontoons, which draw about 18 inches of water, will ground at the lowest tides. To minimize impacts to Middle Waterway, the City will securely anchor the to the pontoon so it will ground at approximately the same location each time. When the pipeline is removed, the bottom of the Waterway will be inspected. Any indentations in the soft bottom will be restored to surrounding grade with a silty sand material.

Where clamshell dredging is employed, the City will place dredge material in a sealed, bottom-dump scow, and transport it to the CDF for disposal. In confined areas near marinas and other structures and along side slopes, the mechanical dredge may be used. Slope dredging will generally occur in those areas where it is necessary to create a minimum 2-foot horizontal to 1-foot vertical slope from the finished channel depth to the top of the waterway bank where contaminated sediments are to be capped. In general, dredging will proceed from south to north. All dredging activities will conform to the EPA Water Quality Monitoring criteria (Clean Water Act Section 401, and other substantive requirements) or modifications will be made according to established protocols, to dredging rates, bucket size, tidal cycle timing, etc.

1.2.5 Thick Layer Capping

The 2000 ESD (EPA 2000b) requires thick-layer caps to be 3 feet or more in thickness. They are used to isolate problem sediments from the water column and the biologically active sediment zone. Palermo *et al.* (1998) have demonstrated that an isolation cap of clean silty sand at a thickness of 1.5 feet can isolate the majority of benthic organisms from contaminated sediments, prevent the bioaccumulation of contaminants, and effectively prevent contaminant flux over the long-term. Depending on the material's source, seeding of the benthic community and rapid recolonization are possible. In some areas, a thick layer cap will be placed in situ in order to contain and isolate sediments with concentrations exceeding the SQOs. The cap will be thick enough, and armored as necessary, to resist erosion, wave action, or burrowing organisms.

For channel areas, material is anticipated to come from the beneficial reuse of a portion of the previously dredged silty sand from the St. Paul Waterway CDF which had been disposed of on the face of the Puyallup River delta. However, the material taken from the delta may not physically be the same material that was placed on the delta. It will be hydraulically dredged, pumped by a 26-inch floating and overland pipeline to the Thea Foss and Wheeler-Osgood Waterways. The City will place the cap with a diffuser barge to minimize turbidity and to more accurately control its placement. In the Thea Foss Waterway channel, approximately 100,000 cubic yards will be placed in two 18-inch lifts; because 1-foot overplacement is allowed, the thickness may be as much as four feet. If the quantity of material from the delta is insufficient for all channel capping or if delta sampling indicates the material is not suitable for

reuse, other clean off-site sources of capping material can be used (employing a clamshell), so long as it meets the EPA's remedial criteria.

The EPA will allow the City to recover no more than two thirds of the material from the St. Paul Waterway dredging (section 1.2.7) for capping in the Thea Foss and Wheeler-Osgood channels, the St. Paul Beach habitat, and initial capping of the CDF. Prior to removing of any material from the Puyallup River delta, the City will sample the material at the proposed removal site in accordance with Puget Sound Dredge Disposal Analysis (PSDDA) protocols to determine if the material is suitable for beneficial reuse as capping. Material will be hydraulically dredged from the approved site and pumped in the reverse direction through the same pipeline used to deposit contaminated material from the Thea Foss into the CDF. Approximately 100,000 cubic yards of material will be dredged and placed as thick layer capping in the Thea Foss and Wheeler-Osgood Waterways; 25,000 cubic yards for completion of the North Beach Habitat, and up to 100,000 cubic yards for the initial capping of the CDF above 9 feet MLLW.

The City will use approximately 76,000 tons of tested and approved upland source slope cap material, quarry spalls, and light riprap for slope capping. These materials will be placed by a clamshell in a 3-foot configuration over contaminated sediments on the slopes of Thea Foss Waterway. Following the slope cap installation, the City will place approximately 6,800 tons of habitat mix uniformly over the cap to dress the surface on top of riprap between minus 10 and plus 13 feet MLLW, to fill the interstices of the larger stones for habitat enhancement. Where habitat mitigation credit is claimed, the habitat mix should be placed to a depth so that one-foot of material remains one week after stabilization. The City will extend existing stormwater outfalls to match the face of the new slope cap, and will construct riprap spill pads to prevent erosion below the outfalls. Mechanical equipment (clamshell bucket) may be used to spread the materials on confined slopes and in marina areas

Three remedial areas, including RAs 1A, 1B, 3, and portions of RA14, were recently capped as part of the 2002 activities (NMFS Tracking Nos.: 2002/01386, 01387, and 01390).

Several of the RAs require some form of capping after dredging. Capping in the Thea Foss and Wheeler-Osgood Waterways will generally follow dredging as soon as it is feasible. Hydrographic survey confirmation of dredge depth and sediment verification sampling will be conducted and the results will have to be in compliance with the Contract Documents prior to capping. Sandy material dredged from the Puyallup Delta will be used to cap the deeper channel areas in accordance with an EPA approved design, based on hydrographic surveys and sediment sampling to be conducted in the early summer of 2004. The City will transport material to the Thea Foss via a hydraulic pipeline following the same alignment as the original disposal pipeline to the CDF. If sampling indicates that the Puyallup Delta material will not meet the SQO's, sandy capping material will be imported from an approved upland source.

Slope capping sections will vary in the Thea Foss Waterway depending on exposure to wave conditions and the ability to access the slope with a variety of equipment. Thick Slope Capping, consisting of an 18-inch layer of filter material over laid with an 18-inch layer of riprap and

25 tons of habitat mix per 1,000 square feet of riprap surface, will be placed at Colonial Fruit Warehouse (RA 7A), RA8, City Marina (RA 15), Alber's Mill Dock (RAs 19A & 19B), and City Dock Marina (RA 20) as shown in EPA approved project plans and specifications.

Quarry spall cap, consisting of an 18-inch deep layer of filter material over laid with an 18-inch layer of quarry spalls will be placed at Martinac (RA 14). A riprap slope key will be placed at the toe of the slope. Habitat mix will be placed at a rate of 25 tons per 1,000 square feet over the quarry spalls between elevations minus 10 and plus 13 feet MLLW. The City will conduct hydrographic surveys after the placement of each lift of material to confirm specified thickness prior to the placement of the next lift. Approximately 83,000 tons of filter material, riprap, quarry spalls and habitat mix will be placed in the Thea Foss Waterway for slope capping.

The EPA will oversee the City hydraulically placing approximately 100,000 cubic yards of suitable and approved channel cap material taken from the Puyallup River Delta in accordance with the EPA approved design to be based upon hydrographic surveys and sediment sampling to be conducted in the early summer of 2004. Thick channel cap will be placed west of the channel line at roughly 59+00 to 70+00 (RAs 18, 20, 21 and 22) consisting of two hydraulically placed lifts of 18 inches each. Cap verification sampling is to be conducted upon the completion of each 18-inch lift and before placement of the next lift.

At the Foss Waterway Marina (RA 7), the EPA will oversee the City placing a thin channel cap consisting of a single lift with a minimum thickness of 6 inches, placed either hydraulically or with a clamshell dredge. If a clamshell is used, the cap material will come from an approved upland source. Before and after hydrographic surveys will confirm the cap meets the specified depth.

The City will backfill dredged excavations in the Wheeler-Osgood (RAs 9 & 12) and near Totem Marine in the Thea Foss (RAs 2 & 4) either by hydraulic dredge or by clamshell. All materials will meet the specified requirements for clean channel cap. These areas are to be backfilled to the elevation of the adjacent waterway bottom.

In order to minimize lateral transport of dense non-aqueous phase liquid contaminants from the south and east uplands, the City will place approximately 6,500 square yards of 6-inch deep grout filled mat over the channel slope surface within portions of RA 19A and B. The Uniform Section Mat (USM) shall be anchored in place and then pumped full of grout to create uniformly capped surface from a minimum upper elevation of minus 1 foot MLLW to a lower elevation of minus 23 feet MLLW. The City will overlay the USM with a 12-inch layer of imported channel cap material. A containment boom will surround the work area until the mat has been completed.

1.2.6 Slope Rehabilitation

The City will rehabilitate the slope in numerous areas around the sides of the Thea Foss and Wheeler-Osgood Waterways to provide shallow subtidal and intertidal slope stability, erosion control, and mitigation site preparation. In many cases, rehabilitation will seamlessly integrate into adjacent remedial capping activities, carrying the rehabilitation to the top of the bank. Several no action and natural recovery areas with sediment concentrations near or below SQOs will require construction to maintain slope stability. These areas, which are adjacent to remedial activities including dredging and capping, will require grading to achieve stable slope angles. Roughly 1,900 linear feet of the Wheeler-Osgood Waterway (RAs 10, 11 and 13) were rehabilitated and restored in 2002 under an informal section 7 NOAA Fisheries consultation (NMFS Tracking No.: 2002/01389).

Slope capping in the Thea Foss Waterway, as described in section 1.2.5, will also rehabilitate approximately 3,730 linear feet of waterway embankment that currently exceed SQOs, in addition to the 1,350 linear feet remediated in the completed 2002 activities. The capping placement will vary in the Thea Foss depending exposure to wave conditions and the ability to access the slope with a variety of equipment. Thick slope capping, consisting of an 18-inch layer of filter material over laid with an 18-inch layer of riprap and 25 tons of habitat mix per 1,000 sq feet of riprap surface, will be placed at Colonial Fruit Warehouse (RA 7A), City Marina (RA 15), Alber's Mill Dock (RAs 19A & 19B), and City Dock Marina (RA 20) as shown in EPA approved project plans and specifications.

1.2.7 Construction and Disposal in the St. Paul CDF

The EPA will oversee placement of contaminated sediments from the Thea Foss and Wheeler-Osgood Waterways in a Confined Disposal Facility (CDF), constructed within the St. Paul Waterway. Approximately 510,000 cubic yards of material will be dredged from the St. Paul Waterway to create the CDF. The dredging will occur in two dredging phases. Prior to these, approximately 105,000 cubic yards was previously (Phase I) removed from the upper five feet by clamshell dredge and transported by bottom dump scow to the Commencement Bay PSDDA openwater disposal site (NMFS Tracking No.: 2003/01120). During both upcoming cycles, a silt curtain is placed across the mouth of the waterway and opened as necessary to allow the passage of dump scows and other floating equipment.

In Phase I dredging, a 760-foot-long offset berm was constructed in the Southeast corner of the St. Paul Waterway to prevent settlement of adjacent, onshore clarifier tanks. Approximately 45,000 cubic yards of select fill and riprap was placed by clamshell bucket, between elevations minus 12 and plus 21 feet MLLW, to construct the berm.

Once the offset berm was completed, it made containment capacity for approximately 465,000 cubic yards of clean material from the CDF that will be dredged to a final depth of approximately minus 60 feet MLLW. This second phase will be accomplished by hydraulically dredging the material and pumping it approximately 0.5 mile through a 26-inch diameter floating

discharge line for disposal on the Puyallup River Delta. This material will augment natural delta forming processes and is expected to enhance desirable delta building processes leading to salmonid recovery (Simenstad 2000). The discharge pipe will be directed onto the expanding neodelta of the river and the previously-deposited bedload sand pumped from the St. Paul Waterway would be deposited on the face of the delta between minus 20 and minus 50 feet MLLW. Discharge at these locations will be by way of a "diffuser" barge or pipe to allow the sands to be placed more accurately in the deeper water. In no case will the material be placed in water deeper than minus 50 feet MLLW. At least once every three days during the period for disposal, the City will take a hydrographic survey from the delta to accurately measure the accretion of disposal material.

At the mouth of the St. Paul Waterway the City will construct a 370-foot-long rock and select fill containment berm to an ultimate elevation of 18 feet MLLW to contain the contaminated sediments removed from the Thea Foss and Wheeler-Osgood Waterways. The City will leave an opening to a depth of approximately minus 4 feet MLLW in the center of the berm to initially allow the passage of dump scows from slope dredging activities in the Thea Foss to dispose of sediments in the CDF.

Once the slope dredging in the Thea Foss Waterway is complete and the sediments placed in the CDF, the containment berm will be closed and two outfall weirs installed to control the settlement time and effluent discharge rate for the hydraulically dredged channel material from the Thea Foss and Wheeler-Osgood Waterways. Channel dredging will occur 12 hours per day, six days per week. At the conclusion of dredging each day, the sediment laden water will stand for several hours in the CDF until sufficiently settled to discharge into the bay through the outfall structures. The effluent from one day's dredging will be completely discharged and the weirs closed before pumping more contaminated dredged material the next day. Water quality will be sampled; should water quality criteria be exceeded, the EPA will require operational changes (e.g., to dredging and settling rates).

Contaminated dredged material will be deposited in the CDF will reach no higher than elevation 9 feet MLLW. After sediment disposal, the outfall structures will be removed and the confined material will be capped with up to165,000 cubic yards of clean material from several possible sources that include: possible beneficial reuse of material previously deposited on the Puyallup River Delta if available; material excavated from the Middle Waterway Tideflat Habitat construction, if suitable; or an approved source of import material. The material used will be advanced from the south and west sides of the CDF in lifts of sufficient thickness to bridge the underlying wet sediments to allow construction equipment to work on top to complete and grade the cap to a maximum elevation of 20 feet MLLW.

In the event that the contaminated dredge quantity exceeds the capacity of the CDF or some dredging must occur before completion of the CDF, dredged material may be brought ashore and placed directly into a sealed container or sealed truck. The material may also be placed directly into a lined holding cell for dewatering and then hauled to an approved landfill or transferred to the CDF when that facility is completed.

1.2.8 Construction of Habitat

1.2.8.1 North Beach Habitat

The North Beach habitat creation and enhancement will be part of the mitigation to offset losses of marine habitat from the development of the St. Paul Waterway CDF. The habitats will be composed of two contiguous areas, the St. Paul Beach built on the north face of the containment berm and enhanced structures on the Peninsula between the mouth of the St. Paul Waterway and the entrance to Middle Waterway.

The City will place approximately 6,500 cubic yards of blended riprap and select fill material by clamshell to create a habitat berm 375 feet north of the CDF containment berm. The 280-foot long habitat berm will be constructed from an initial elevation of minus 20 feet MLLW to a finished elevation of minus 4 feet MLLW. This berm will provide the base on the north side for the St. Paul Beach habitat fill that the City will place shoreward to the CDF containment berm. After all dredge material has been placed in the CDF, the City will hydraulically place beach fill with material recovered from the delta over the range from minus 5 feet to plus 12 feet MLLW. After placing this dredge material, the City will also place approximately 60,000 tons of light and heavy riprap, quarry spalls, slope cap material, rounded river rock, and habitat mix in accordance with final approved plans to complete the habitat areas. These materials will be placed either from a barge with a clamshell or with land-based equipment during low tides.

The new beach will create 1.65 acres of low-gradient, fine-grained beach and upper intertidal habitat. The beach will slope at a low angle (10 feet horizontal for one-foot of elevation rise, or flatter) to approximately 8 feet MLLW and will be composed of habitat mix. Between 8 and 10 feet MLLW, a steeper slope (3 feet horizontal to one foot rise) will be constructed, above which another shallow-sloped beach will reach the containment berm at about 13.5 feet and contain habitat mix and rounded cobbles like the nearby Olympic View Resource Area beach. The containment berm face and the top 20 feet will be planned with native plants to form a riparian buffer.

The Peninsula will be composed of 5.06 acres of restored littoral habitat including a continuation of the shallow-water habitat contours curving around from the St. Paul Beach. Over 1,900 creosote-treated timber piles have been removed during preliminary remedial activities so that the existing contours can be covered with native sands from 6 inches to several feet in depth. The upper beach will slope to a relatively low pass across the central area of the Peninsula. This pass will allow juvenile salmonids to move across the face of the St. Paul Beach at tides above MLLW to continue their migration in relatively protected shallow water into the entrance of Middle Waterway. North of the pass, the Peninsula habitat will rise to an offshore shoal or protective reef at 12 feet MLLW which will shelter areas to the south and east from waves from the northwest. Several nodes of appropriate native marsh plants will be planted at two saltmarsh elevations on a pilot basis along this habitat.

1.2.8.2 Middle Waterway Corridor Habitat

The Middle Waterway Corridor is 0.85 acres along a narrow shoreline that connects the North Beach habitat area to the north with the broad mudflats and brackish marsh in the southern portion of Middle Waterway. The City will remove approximately 250 feet of existing stacked concrete bulkhead along the east shore of the Middle Waterway and protect the slope with a thick slope cap and habitat mix. The design of the corridor is to provide shallow-water, fish-passable shoreline access to and from the inner Middle Waterway habitats during most tidal conditions. Existing concrete rubble will be removed and replaced with a gradually-sloping, gravel-cobble beach. The City will add large woody debris structures (up to 40-foot trees, with root wads) to the corridor to increase habitat complexity and protective cover for juvenile salmonids. Industrial activities (i.e., Simpson's relocated log haul out) are designed to minimize the over-water shading above minus 10 feet MLLW so as to encourage juvenile salmonid fish passage along the enhanced corridor habitats.

1.2.8.3 Middle Waterway Brackish Marsh

The Middle Waterway Brackish Marsh with its associated mudflats and tidal channel will be constructed of 6.9 acres of excavated uplands and 3.02 acres of existing Tideflats along the remaining 1,450 linear feet of the east shore of the Waterway. This major new habitat built to partially offset the filling of the St. Paul Waterway is immediately to the north of the existing Commencement Bay Natural Resource Damage Assessment (NRDA) Trustees/Simpson Tacoma Kraft Company pilot restoration project site along the southeast side of the waterway and across from the City of Tacoma's NRDA settlement Middle Waterway Restoration Project and Pickleweed Ranch.

The City will excavate the habitat area from an upper elevation of plus 18 feet down to a lower level of zero feet MLLW. A small meandering tidal channel similar to tidal channels on the pre-development Puyallup River tideflats will be excised down to minus 4 feet MLLW at the north end rising to minus 2 feet draining the marsh end. The upper shoreline between 13 and 18 feet MLLW will be enhanced with a minimum of 6 inches of topsoil for riparian plantings.

The marsh site will be buffered from adjacent industrial activities with a 10- to 25-foot riparian habitat planted with native tree and shrub species. The brackish marsh will range from 10 to 60 feet in width in a 9- to 13-foot MLLW contour band and will be supported by a freshwater distribution system following approximately the 12-foot contour. This freshwater will feed the brackish intertidal plant root zone to provide sufficient sediment pore water salinity of less than 10 parts-per-thousand over 50% of the contour between 11 and 12.5 feet MLLW (measured 2 hours after tide has fallen below this elevation). The introduced saltmarsh plants will establish a seed source allowing expansion between the initial nodes. Soil amendments will be used to enhance the initial plantings and to encourage subsequent plant expansion over the site. Extensive long-term adaptive management efforts are specified in the Operations, Maintenance, and Monitoring Plan (OMMP).

1.2.8.4 Puyallup River Side Channel

Another major component of the habitat offset for the filling of the St. Paul Waterway is the construction of the Puyallup River Side Channel which will provide 4.17 acres of off-channel habitat intended for use by juvenile salmonids for rearing and refugia during the outmigration to the estuary. This location will be the last available, downstream, off-channel habitat in the channelized lower Puyallup River, when completed. The project will combine an existing 1.92 acre isolated (non-fish-passable standpipe) mitigation wetland with an adjacent 2.25-acre upland site to be excavated down to minus 2 feet MLLW. The excavated channel and reconfigured wetland will contain water during most tides and be sloped to eliminate fish stranding at extreme low tides. A substantial area between 6 and 13 feet MLLW will develop into a brackish marsh below and riparian assemblages above that provide prey for juvenile salmonids and organic matter for export to the greater Commencement Bay, much like how the Gog-Li-Hi-Te habitat site across the river functions.

The City will excavate approximately 140,000 cubic yards of upland fill to create this new shallow-water estuarine habitat. All work behind the existing levee can be constructed "in the dry" any time of the year. The new levee will be constructed along the full western and northern limit of the habitat area. Once the habitat area and new levee are complete, the City will breach the existing levee to connect it to the Puyallup River. The breach will be armored with approximately 10,500 tons of filter material, riprap, and quarry spalls over laid with approximately 600 tons of habitat mix. The breach can occur only after July 15 and before February 15. Once breached, the old levee will be excavated down to plus 15 feet and the banks above 13 feet MLLW planted with native riparian plants.

1.2.8.5 Pick's Cove Marina Habitat

The slope remediation just north of Pick's Cove Marina is part of the overall Thea Foss Waterway mitigation plan. The remedial action for this area includes dredging and placement of a thick quarry spall cap consisting of an 18-inch deep layer of filter material over laid with an 18-inch deep layer of quarry spalls. Habitat mix will be placed at a rate of 15 tons per 1,000 square feet over the quarry spalls between elevations minus 10 and 13 feet MLLW.

Approximately 1,060 square feet of overwater structure, an old timber access pier and brick foundation, will be demolished and removed from the marine environment. In addition, the City will place six large woody debris structures, between 8 and 20 feet in length, on the beach between elevations 11 and 12 feet MLLW.

1.2.8.6 Foss Waterway Marina Habitat

The slope remediation at the former Steam Plant property, just south of the Foss Waterway Marina, will be part of the overall Thea Foss Waterway mitigation plan. The remedial action for the area includes dredging and placement of a thick slope cap. The thick slope cap consists of an 18-inch deep layer of filter material over laid with an 18-inch deep layer of riprap. Habitat mix

will be placed at a rate of 25 tons per 1,000 square feet over the riprap between elevations minus 10 and 11 feet MLLW.

Approximately 35 treated timber piling, a 12- by 14- foot concrete vault, and anthropogenic debris along the shoreline will be removed prior to dredging and capping of the area. A 2-step log (10- to 12-inch diameter) transition will be constructed between elevation 11 and 13 feet MLLW, where a small 3-foot bench will be constructed using 18-inches of filter material over laid with an 18-inch deep layer of quarry spalls. Habitat mix will be placed at a rate of 15 tons per 1,000 square feet over the quarry spalls.

1.2.8.7 Alber's Mill Marina Habitat

The slope remediation at the Alber's Mill Marina is part of the overall Thea Foss Waterway mitigation plan. The remedial action for this area includes dredging and placement of a thick slope cap consisting of an 18-inch deep layer of filter material over laid with an 18-inch deep layer of riprap. Habitat mix will be placed at a rate of 25 tons per 1,000 square feet over the riprap between elevations minus 10 and 13 feet MLLW. In addition, approximately 200 feet of old timber bulkhead along the shoreline will be removed and properly disposed.

1.2.8.8 Head of Thea Foss Waterway

The remedy for the head of the Thea Foss Waterway, south of Station 70+10, will be completed by the Utilities. As part of the overall Thea Foss Waterway mitigation plan, approximately 0.03 acre along the eastern shoreline will be cut back to create aquatic habitat below the ordinary high water level. An 8-foot by 175-foot cut will be made at the Berg Scaffolding site. At the Standard Chemical site on the western side of the waterway, six large woody debris structures will be anchored on the slope between elevation 11 and 12 feet MLLW.

1.2.8.9 Johnny's Seafood Habitat

The slope remediation south of Johnny's Seafood is part of the overall Thea Foss Waterway mitigation plan. The remedial action for the area includes dredging and placement of a thick slope cap to elevation zero feet MLLW and placement of a thick quarry spall cap from elevation zero to 15 feet MLLW. Habitat mix will be placed at a rate of 25 tons and 15 tons per 1,000 square feet over the riprap and quarry spalls, respectively, between elevations minus 10 and 13 feet MLLW. In addition, six large woody debris structures, between 8 and 20 feet in length, will be placed on the sloped beach between elevations 11 and 12 feet MLLW.

1.2.8.10 Remaining Habitat Deficit

The pre-existing project and mitigation areas encompass 82.76 acres of aquatic habitat. The post construction condition has 82.18 acres of aquatic habitat. Therefore there is, currently, a net loss of 0.58 acres of aquatic habitat as a result of the overall project. The City of Tacoma, in a letter to the EPA (October 24, 2003) committed to "no net loss of aquatic habitat" as part of the Thea

Foss and Wheeler-Osgood remediation plan. While the City's anticipated method of meeting this no net loss requirement is not yet ascertained, the requirement is mandatory element of EPA's remediation order.

1.2.9 Removal and Reinstallation of Pilings

Before dredging and capping operations can occur, the City must temporarily remove and store all or portions of the Johnny's Dock Marina, Pick's Cove, City Marina, and the Foss Waterway Marina, starting systematically at the south end of the waterway. These marinas will be replaced as remedial operations progress to the north. Overall, roughly 180 creosote-treated timber piling will be removed during temporary relocation of existing marinas on the Thea Foss. All treated timber piles will be disposed of in accordance with state regulations. The contractor plans to use a 50-ton crane barge with a vibratory extractor. When the marinas are reinstalled, all timber piling will be replaced with either steel or concrete guide piling. If hollow steel piling are used and are driven with an impact hammer, an approved air bubble curtain will be employed around each pile during the full time of driving.

1.2.10 Removal and Reconstruction of Over-Water Structures

To satisfy the Superfund remedial requirements, many marina structures must temporarily removed and replaced following cleanup; hence, these activities are conducted under the auspices of the EPA's CERCLA authority and are covered by this Opinion. Three new marinas (some are replacements for marinas decommissioned several years ago during the development of the Thea Foss Esplanade) are to be constructed using precast concrete float units. The Alber's Wharf, City View, and 17th Street Marinas will provide moorage for approximately 75 boats, as well as initially providing the temporary storage for the existing eastside marinas during remedial dredging. The marinas will use a total of 73 steel piles 18 inches in diameter.

At Alber's Wharf, an existing timber and concrete deck wharf was demolished and removed in a previous project. In this project, approximately 180 creosote-treated timber piles were removed along the moorage floats from a prior marina on the site. The proposed project will replace the previous wharf with a new concrete wharf approximately half the size supported on 36 new 20 inch diameter concrete piling. A new marina at this location will require the installation of new concrete moorage floats and the driving of 49 new 18-inch diameter steel pipe guide piling. If the steel piles are driven with an impact hammer, an approved air bubble curtain will be employed full time during driving.

At 17th Street, 13 new 20-inch diameter concrete piling will be driven for a new marina access pier. The installation of the new marina will include new concrete moorage floats and driving 24 new 18-inch diameter steel pipe guide piling. If the steel piles are driven with an impact hammer, an approved air bubble curtain will be employed full time during driving.

At Martinac Shipyard, and possibly at the timber portion of the waterfront Esplanade at the Foss Marina, some over-water creosote-treated timber structures may need to be temporarily removed

so the existing waste stockpiles beneath the structures can be extracted and then to place surface capping material. If this occurs, the area will be completely enclosed with a floating containment berm to capture any wood debris resulting from the demolition or reconstruction of those structures.

Two sheetpile walls are to be installed at Johnny's Dock Marina to allow dredging and capping along the contaminated shoreline. The wall on the south side of Johnny's Dock Restaurant is to be 265 feet long and the wall north of the restaurant will be 290 feet long. Approximately 120 feet of the north wall will be buttressed with 45 steel piles, 18 inches in diameter. If any of the wall is driven with an impact hammer, a bubble curtain will be employed in the area around the pile.

On the Middle Waterway, the City will permanently remove numerous existing creosote-treated timber dolphins along with the remains of an old timber pier. Approximately 600 timber piles are being removed from the St. Paul Peninsula. In all cases, the work area is enclosed with a floating containment boom to collect any floating debris or creosote sheen that may result from the operation. All floating debris will be removed daily and properly disposed of.

Outside the mouth of the St. Paul Waterway, the City will modify an existing creosote-treated timber fuel dock owned by the Simpson Paper Company. The work includes removing a portion of the existing timber fuel dock, timber walkway structure, and three timber dolphins, consisting of 35 creosote-treated timber and eight steel piles. These will be replaced with an expanded pier and three new dolphins, constructed with nine steel and 27 concrete 24-inch piles below elevations of minus 10 feet MLLW. The reconstruction will move the fuel dock farther offshore and provide separation of the berthing area from the St. Paul Beach. The impacts of increasing over-water shading by 0.03 acres is partially offset by the removal of timber piles and by moving the structure beyond minus 10 feet MLLW contour.

A new log haul-out ramp will be constructed for the Simpson Timber Company's sawmill on the east shore of the Middle Waterway. This will replace a similar structure to be demolished at the head of the St. Paul Waterway prior to CDF construction. A paved log transfer road will also be necessary to transfer logs from the haul-out location to the sawmill. The design will minimize impact to nearshore habitat (the Middle Waterway Corridor Habitat) with as much of the structure placed over the subtidal (deeper than minus 10 feet MLLW) as practical. Log rafts will be positioned offshore at similar water depths to assure they will not ground out on low tides. The easy lift type equipment minimizes damage to logs, usually still bundled, thereby reducing bark loss in accordance with Best Management Practices (BMPs). Simpson Timber Company has agreed to BMPs, monitoring, and an adaptive management/contingency plan in Appendix Z of the Final Thea Foss Round 3 Data Evaluation and Pre-Remedial Design Evaluation (Parametrix 2000).

Intertidal impacts from the log haul-out include the installation of a 36-inch diameter concrete stormwater outfall at minus 4 feet MLLW with a check valve and a riprap splash pad. The ramp is supported by two 24-inch hollow steel pipes which will be driven with an impact hammer and

employing a protective air bubble curtain. The log raft area and floating walkway includes the installation of 22 16-inch hollow steel piles for the gangway access ramp and 300-foot by 5-foot floating walkway as well as 23 steel piles to hold and guide the floating log booms along the shoreline.

1.2.11 Duration and Timing of Construction Activities

The in-water elements of EPA's selected remedy will occur between the Fall of 2003 and Winter of 2005. To protect juvenile salmonids, NOAA Fisheries, U.S. Fish and Wildlife Service (USFWS), and the Washington Department of Fish and Wildlife have specified in-water construction windows for Commencement Bay. In-water construction in the waterways will be allowed July 16 through February 14, except for dredging or disposing of contaminated sediments, which will not start until August 16. In-water construction during the first construction season will temporarily cease before February 15, 2004. In the second construction season, in-water work will begin again on July 16, 2004 for marina construction and capping (contaminated dredging can not start until August 16 of any year) and all in-water work will temporarily cease before February 15, 2005. In the third construction season, in-water work for marina construction and capping will began again on July 16, 2005 and will be completed by December 2005. Should unforeseen circumstances require, any of the project elements could be delayed for one year under this Opinion.

A project of this magnitude requires careful sequencing of activities in order to complete the remedial activities in a timely and cost-effective manner, all subject to the above discussion of in-water construction windows. The City will start habitat construction on the Puyallup River Side Channel behind the existing dike, which will not be breached until the first in-water construction window occurs after real estate negotiations are completed with the U.S. Army Corps of Engineers for the new dike. Simpson's log haul-out structure and support facilities including a log road, stormwater drainage, and lighting must be operational before dredging of the St. Paul can be completed. The Middle Waterway Corridor Habitat north of the log haul out will be completed before the end of the first dredging season. Then the St. Paul CDF will be constructed with clean material being hydraulically dredged to the mouth of the Puyallup River delta. Approximately 90,000 cubic yards of materials will be dredged from the slopes of the Thea Foss Waterway and placed in the CDF by barge before berm closure. When the shoreline and marina areas are remediated, some of the smaller habitat sites can be constructed and planted. Once the berm is closed, the St. Paul Beach Habitat can be constructed in phases, and hydraulic dredging of the channel areas can occur with disposal in the CDF, followed by hydraulic capping using materials from the Puyallup River Delta. The Middle Waterway Tideflat Habitat will be completed later in the sequence since some of the excavated material will be used for surface capping of the CDF.

1.3 Description of the Action Area

The Action Area for the proposed action includes all portions of the Commencement Bay shoreline from midway between Brown's Point and Hylebos Waterway to the southern boundary of the ASARCO site at depths shallower than minus 60 feet MLLW and the Puyallup River downstream from the I-5 bridge. The Action Area corresponds to that which was used in the BA prepared for remediation of the entire CB/NT Superfund Site (USEPA 2000a). Section 4 of the CB/NT BA includes a detailed description of the historic and current conditions in the Action Area and should be referenced for this information. The Project Area is defined as those specific locations within the Action Area where the remedial and construction activities occur (Figure 2).

2.0 ENDANGERED SPECIES ACT BIOLOGICAL OPINION

The purpose of consultation under ESA is to ensure that any action authorized, funded, or carried out by a Federal agency is not likely to jeopardize the continued existence of threatened or endangered species, or to destroy or adversely modify designated critical habitat. Formal consultation concludes with the issuance of a Biological Opinion under section 7(b)(3) of the ESA.

2.1 Evaluating Proposed Actions

The standards for determining jeopardy as set forth in section 7(a)(2) of the ESA are defined by 50 CFR Part 402 (the consultation regulations). NOAA Fisheries must determine whether the action is likely to jeopardize the listed species and/or whether the action is likely to destroy or adversely modify habitat. No critical habitat is currently designated for PS chinook, thus that portion of the analysis will not be included. The jeopardy analysis involves the initial steps of:
(1) defining the biological requirements and current status of the listed species; and
(2) evaluating the relevance of the environmental baseline to the species' current status.

NOAA Fisheries then evaluates whether the action is likely to jeopardize the listed species by determining if the species can be expected to survive with an adequate potential for recovery. In making this determination, NOAA Fisheries must consider the estimated level of injury and mortality attributable to: (1) collective effects of the proposed or continuing action; (2) the environmental baseline; and (3) any cumulative effects. This evaluation must take into account measures for survival and recovery specific to the listed species' life stages that occur beyond the Action Area. A finding of jeopardy is appropriate if the effects of the action, together with the baseline conditions and cumulative effects, appreciably reduce the species' likelihood of survival or recovery by reducing the numbers, distribution, or reproduction of the species. If NOAA Fisheries finds that the action is likely to jeopardize, NOAA Fisheries must identify reasonable and prudent alternatives for the action.

For this specific action, NOAA Fisheries' analysis considers the extent to which the proposed action impairs or improves the function of habitat elements necessary for rearing, refugia, and migration of PS chinook salmon. An ESU is considered a distinct population segment that can be identified for protection under the ESA. The proposed project affects several waterways located within the industrial area of the Puyallup River delta of Commencement Bay, which is in the geographic range of the PS chinook ESU.

2.1.1 Biological Requirements

The first step NOAA Fisheries uses when conducting the ESA section 7(a)(2) analysis is to define the species' biological requirements within the Action Area. Biological requirements are those conditions necessary for the listed ESU's to survive and recover to naturally reproducing population sizes, at which time protection under the ESA would become unnecessary. This will occur when populations are large enough to safeguard the genetic diversity of the listed ESUs, enhance their capacity to adapt to various environmental conditions, and allow them to become self-sustaining in the natural environment.

The biological requirements for PS chinook include adequate food (energy) source, flow regime, water quality, habitat structure, passage conditions (migratory access to and from potential spawning and rearing areas), and biotic interactions (Spence *et al.* 1996). The specific biological requirements for PS chinook that are influenced by the action considered in this Opinion include food, water quality, habitat structure, and biotic interactions.

2.1.2 Environmental Baseline

The environmental baseline represents the current conditions to which the effects of the proposed action would be added. The term "environmental baseline" means "the past and present impacts of all Federal, state, or private actions and other human activities in the Action Area, the anticipated impacts of all proposed Federal projects in the Action Area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process" (50 CFR 402.02).

Numerous activities affect the present environmental baseline conditions in the Action Area including expanding urban development, railroads, shipping, logging, agriculture, and other industries. The present port area of Tacoma was created during the late 1800s and early part of the 1900s by filling the tidal marsh that had developed on the shelf of the Puyallup River delta. Continuing habitat alterations such as dredging, relocation and diking of the Puyallup River, dredging/construction of the waterways for purposes of navigation and commerce, steepening and hardening formerly sloping and/or soft shorelines with a variety of materials, and the ongoing development of the Port of Tacoma and other entities has resulted in substantial habitat loss (Sherwood *et al.* 1990, Simenstad *et al.* 1993).

Historically, this area comprised the estuarine delta of the Puyallup River. With the growth and development of Tacoma, its port, and the surrounding region, the delta has been subjected to

dramatic environmental changes, primarily from dredging and filling to create the waterways. Past and ongoing development activities along the shorelines of Commencement Bay have affected the habitat and the fish that use it (Duker *et al.* 1989). It has been estimated that of the original 2,100 acres of historical intertidal mudflat, approximately 180 acres remain today (COE *et al.* 1993). Fifty-five acres of the 180 acres of low gradient habitat are located near the mouth of the Puyallup River, twenty acres are the Milwaukee habitat area, 18 acres are located bayward of the East Eleventh Street Bridge in the Hylebos Waterway, 54 acres are located in the rest of the Hylebos Waterway, 46 acres are present along the shoreline from the mouth of the Hylebos to Browns Point, and 8 acres are located in the Blair Waterway (Pacific International Engineering 2001b). Graeber (1999) states that 70% of Commencement Bay estuarine wetlands and over 98% of the historic Puyallup River estuary wetlands have been lost over the past 125years.

The historical migration routes of anadromous salmonids into off-channel distributary channels and sloughs have largely been eliminated and historical saltwater transition zones are lacking (Kerwin 1999). Additionally, the chemical contamination of sediments, in certain areas of the Bay, has compromised the effectiveness of the habitat (COE *et al.* 1993, USFWS and NOAA 1997).

In 1981, the EPA listed Commencement Bay as a Federal Superfund site. As a result of this, the clean up of contaminants has been a high priority and has resulted in 63 of 70 sites remediated (Kerwin 1999). In 1993-1995, the entire Blair Waterway navigation channel was dredged as part of the Sitcum Waterway Remediation Project. Contaminated sediments were removed and capped in the Milwaukee Waterway nearshore confined disposal site. After the completion of the dredging, the EPA deleted the Blair Waterway and all lands that drain to the Blair Waterway from the National Priorities List (Pacific International Engineering 2001a).

The shorelines of Commencement Bay have been highly altered by the use of riprap and other materials to provide bank protection. Bulkheads cover 71% of the length of the Commencement Bay shoreline. Based on shoreline surveys and aerial photo interpretation of the area, approximately five miles, or 20% of the Commencement Bay shoreline, is covered by wide over-water structures (Kerwin 1999). These highly modified habitats generally provide poor habitat for juvenile salmon (Spence *et al.* 1996).

From 1917 to 1927, most of the habitat alteration (162 acres of mudflat, 72 acres of marsh) resulted from dredging the various waterways and from filling to build uplands for piers, wharves, and warehouses (USFWS and NOAA 1996). Currently natural aquatic habitats are highly fragmented and dispersed across the delta and Bay with few natural corridors linking them. Fish preferentially occupy shallow water areas, and have been documented in mitigation and restoration sites (Miyamoto *et al.* 1980, Duker *et al.* 1989, Pacific International Engineering 1999) both north and south of the river mouth, although perhaps tending more to the north (Simenstad 2000). Commencement Bay is a documented rearing and migration corridor for chinook salmon (Simenstad *et al.* 1982, Duker *et al.* 1989, WDFW and WWTIT 1994, Pacific International Engineering 1999, Simenstad 2000). Some modified and relic habitats and most

mitigation habitats along the delta front and in the waterways still support juvenile salmon by providing attributes such as food and refuge. However, negative impacts to salmon from their migration through and residence in the delta-Bay system has not been quantified (Simenstad 2000).

The environmental baseline is substantially degraded. Ninety-eight percent of historically available intertidal marsh and mudflat habitat, necessary for estuarine life stage (smoltification) of juvenile salmonids, has been lost due to the above described human activities. The remaining two percent of estuarine habitat is seriously degraded by the presence of toxic and hazardous contaminants in the sediments, which is the habitat for the prey organisms of juvenile salmonids. The baseline conditions of the Action Area are believed to be a major factor in the current depressed status of PS chinook in WRIA 10.

At present, salmonid habitat within Commencement Bay shorelines is gradually increasing in acreage because of habitat restoration projects and natural processes. A preliminary Thea Foss and Wheeler-Osgood Waterways Superfund remedial activity (St. Paul Waterway Surface Dredging, NMFS Tracking No.: 2003/01220) actually improved over the baseline conditions in the St. Paul Waterway by removing the top 5 feet of sediments which contained extensive wood debris (*i.e.*, bark, sunken logs, metal bands) contributed by historical log handling operations. However, the subsequent construction of the St. Paul CDF removed this short-lived improvement and increased the habitat offset needed for minimization measures. Approximately 50 acres of intertidal and shallow subtidal habitat have been created through previous restoration actions.

2.1.3 Status of the Species

NOAA Fisheries considers the current status of the listed species taking into account species information, e.g., population size, trends, distribution, and genetic diversity. To assess the current status of the listed species NOAA Fisheries starts with the determinations made in its decision to list for ESA protection the ESUs considered in this Opinion and also considers any new data that are relevant to the determination.

Puget Sound chinook salmon were listed on March 24, 1999 (64 FR 14308). The species status review identified the high level of hatchery production (which masks severe population depression in the ESU), severe degradation of spawning and rearing habitats, and restriction or elimination of migratory access, as causes for the range-wide decline in PS chinook salmon stocks (NMFS 1998a, and 1998b). Within the Puyallup basin, virtually all salmon spawn in the Puyallup River, upstream of Commencement Bay. The naturally spawning chinook population in the Puyallup River is comprised of an unknown mixture of natural and hatchery origin fish.

Juvenile chinook migrating through the Puyallup River delta and Commencement Bay originate from three basic stocks (WDFW and WWTIT 1994): White (Puyallup) River spring; White River summer/fall; and Puyallup River fall. Juvenile salmon use estuaries for physiological adaption, foraging, and refuge. As described by Simenstad (2000), some aspects of the early life

history of juveniles in estuaries are obligatory, such as the physiological requirement to adapt from freshwater to saltwater. Generalized habitat requirements of juvenile chinook in estuaries include shallow water, typically low gradient habitats with fine unconsolidated substrates and aquatic, emergent vegetation; areas of low current and wave energy; and concentrations of small epibenthic invertebrates (Simenstad *et al.* 1985).

Artificial propagation programs likely provide most of the numbers of chinook in the Puyallup River. The White River spring chinook population which is considered critical by state and tribal fisheries managers depends largely on artificial production (WDFW and WWTIT 1994). The White River spring chinook have lately experienced a tenuous rebound as escapement gradually has increased from the historic lows of the 1980s. In 2000, non-tagged returns of adults was 1,732 individuals, the largest return in 30 years. This increase is consistent with larger numbers of chinook in the Columbia River during 2000, indicating good ocean survival (NMFS 2001).

The White River summer/fall chinook stock is considered wild and classified by the co-managers as distinct based on geographic distribution. The glacial melt waters, typical of the Puyallup River, cause poor visibility during spawning season. Due to this, the stock status is unknown (WDFW and WWTIT 1994).

Numbers of Puyallup fall chinook have recently been compiled by the Puyallup Tribe of Indians for the Washington State Shared Strategy indicating the current number of spawners at 2,400. The Washington Shared Strategy is a voluntary and collaborative effort that is developing goals for recovery planning ranges and targets building on existing efforts of local governments, watershed groups, and various state, Federal, and tribal entities to produce a viable recovery plan. Targets relating the quality and capacity of chinook habitat to population response associated with recovered habitat indicated a range of 5,300 to 18,000 spawners necessary for a recovered system (Puyallup Tribe 2002).

Field observations of PS chinook in the action area revealed that habitat use differed between the mouth and the head of waterways and also between the locations of the waterways in relation to the Puyallup River. The Puyallup Tribe of Indians conducted beach seine sampling between the years 1980-1995 (however, no data were available in 1988, 1989, and 1990). Duker *et al.* (1989) conducted an extensive beach seine juvenile sampling effort in 1983 at many of the same beach seine sampling locations as the tribe's efforts plus tow net sampling to investigate distribution in the open water habitats of Commencement Bay. In addition, sampling of salmonid distribution has been conducted at a number of sites during the course of impact assessment and/or mitigation site planning. Some general conclusions from these studies indicated that: juvenile chinook are present in low numbers in March, peak in late May or early June and drop to low numbers again by July 1; the progeny of naturally spawned chinook arrive in the estuary throughout this period at a variety of lengths; offshore catches of chinook peak about two weeks later than shoreline catches; and all shorelines are used but catches are typically higher near the mouths of the waterways than near the heads (Kerwin 1999). Hooper (in USFWS 2001) compiled catch per unit effort of chinook salmon at sites close to and further away from the

Puyallup River. This data found that the catch per unit effort averaged 20.4 in the Milwaukee Waterway, 2.93 in the Blair Waterway and 1.99 in the Hylebos Waterway. The catch per unit was higher in the waterways closest to the river (USFWS 2001).

2.2 Effects of the Proposed Action

NOAA Fisheries must consider the estimated level of injury and mortality from the effects of the proposed action. ESA implementing regulations define "effects of the action" as "the direct and indirect effects of an action on the species or habitat together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline" (50 CFR 402.02).

2.2.1 Direct Effects

Direct effects are the immediate effects of the proposed action on the species or its habitat. Direct effects result from the agency action and include the effects of interrelated and interdependent actions. Future Federal actions that are not a direct, interdependent, or interrelated, effect of the action under consideration (and not included in the environmental baseline or treated as indirect effects) are not evaluated (50 CFR 402.02).

The direct effects of the proposed action derive from the nature, extent, and duration of the construction activities in the water and whether the fish are migrating and rearing at that time. Direct effects of the proposed action also include immediate habitat modifications resulting from the remedial and construction activities. In the proposed action, immediate positive effects include the removal of highly contaminated materials from the intertidal area which juvenile salmonids use. The construction of enhanced intertidal structures along the shorelines of the Thea Foss and Middle Waterways and the Puyallup River will provide direct long-term beneficial effects. Negative effects may occur during various construction activities, including the dredging of highly contaminated sediments, capping, and the disposal of the sediments. These effects will likely be limited in duration.

2.2.1.1 Dredging

The dredging element area encompasses approximately 46.6 acres of approximately 110 acres of the project area. Dredging will remove about 513,000 cubic yards of contaminated sediments exceeding SQO criteria in the Thea Foss and Wheeler-Osgood Waterways, exposing native sediment that were not subject to historical contamination or allow for subsequent clean, chemically-confining capping.

Sediment plumes are often associated with dredging. Dredging activities disturb and suspend sediment creating discoloration of the water, reducing light penetration and visibility, and changing the chemical characteristics of the water. The size of the sediment particles and tidal currents are typically correlated with the duration of sediment suspension in the water column. Larger particles, such as sand and gravel, settle rapidly, but silt and very fine sediment may be

suspended for several hours. LaSalle (1990) described a downstream plume that extended 900 feet at the surface and 1,500 feet at the bottom. LaSalle (1990) also noted an increase in sediment levels upwards of 70% from the effect of the pressure wave created by the dredge bucket as it descended through the water.

The potential mechanisms by which dredging and its associated increase in turbidity could affect salmonids include direct mortality, injury by entrainment, sublethal effects (stress, gill damage, and increased susceptibility to disease), and behavioral responses (disruptions to feeding or migration) (Pacific International Engineering 2001b). Long-term ecosystem effects of dredging generally include changes in the volume and area of habitat, periodic changes to primary and secondary production (food web effects), and changes in hydrodynamics and sedimentology (Nightingale and Simenstad 2001).

Biological effects on PS chinook salmon that may result from dredging are: 1) temporary reduction in water quality and increased noise disturbance associated with dredging that potentially could exclude salmonids from their estuarine sediment substrates; 2) seasonal loss of benthic organisms and other prey due to disturbance of the sediment substrates; 3) short-term alteration of nearshore habitats; and 4) potential exposure to contaminated sediments or water.

Water quality effects (suspended sediments and chemical composition) from dredging can be detrimental to salmonids. Suspended sediments can have an adverse effect on migratory and social behavior as well as foraging opportunities (Bisson and Bilby 1982; Sigler *et al.* 1984; Berg and Northcote 1985). Servizi (1990) observed an increase in sensitive biochemical stress indicators and an increase in gill flaring when salmonids were exposed to high levels of turbidity (gill flaring allows the fish to create sudden changes in buccal cavity pressure, which acts similar to a cough).

Dredging also affects chemical composition of the water with suspended sediments. Estuarine sediments are typically anaerobic (anoxic) and create an oxygen demand when suspended in the water column, and in turn would decrease Dissolved Oxygen (DO) levels (Hicks *et al.* 1991; Morton 1976). A review of the processes associated with DO reduction (Lunz and LaSalle 1986; Lunz *et al.* 1988) suggested that DO demand of suspended sediment is a function of the amount of material placed into the water, the oxygen demand of the sediment, and the duration of suspension. Dissolved Oxygen reductions appear to be most severe lower in the water column and usually the condition reverses with adequate tidal flushing (LaSalle 1990). Most of the research reported to date indicated that dredging-induced DO reductions are a short-term phenomena and do not cause problems in most estuarine systems (Slotta *et al.* 1974; Smith *et al.* 1976; Markey and Putnam 1976). Dissolved Oxygen will be monitored during dredging; operational changes will be implemented as necessary to comply with water quality criteria at the mixing zone boundary.

Decreases in dissolved oxygen levels have been shown to affect swimming performance levels in salmonids (Bjornn and Reiser 1991). The decrease of swimming performance could reduce the chinook salmon's ability to escape predation or their ability to forage on motile fish. Smith *et al.*

(1976) found dissolved oxygen levels up to 2.9 milligrams per liter (mg/L) during dredging activities in Grays Harbor. Hicks (1999) observed salmon avoidance reactions when dissolved oxygen levels dropped below 5.5 mg/L. Dredging fine sediments such as those found in the Thea Foss Waterway could create a sediment plume that may not disperse rapidly because of tidal fluctuations, especially during incoming tides. This could create poor water quality (i.e., decreased dissolved oxygen levels) that might impede chinook salmon from immigrating into the Middle Waterway to gain access to foraging, rearing, and/or refugia habitats.

Based on the EPA's (2000a) analysis of the effects of increased suspended sediment concentrations on salmonid species (see section 7.1 of the CB/NT BA) and the results of dredged material modeling in the BA Addendum, the proposed dredging would not produce suspended sediment concentrations dangerous to salmonids. In addition, the contractor will be responsible for submitting a Construction Control Plan, which will present the system through which the contractor assures compliance with the Water Quality Standards. Further, turbidity will be monitored in the vicinity of dredging operations during, and for specific times before and after, construction. If Water Quality Criteria are exceeded at the compliance boundary, the contractor will be required to modify the operations. Such modifications may include slowing the dredging rate.

Disruption of the channel bottom and entrainment by dredging adversely affects benthic biota and forage fish. Filter feeding benthic organisms can suffer from clogged feeding structures, reduced feeding efficiency, and increased stress levels (Hynes 1970). Dredging may also suppress the ability of some benthic species to colonize in the dredged area, thus creating a loss of benthic diversity and food source for the chinook salmon prey species. Dredging will temporarily eliminate littoral and shallow subtidal habitat for chinook salmon and will likely reduce foraging opportunities, which may cause them to migrate into deeper waters where there is greater vulnerability to predation and less foraging opportunity. Due to the level of contamination and the physical quality of the existing substrate, the subtidal benthic community in the project area is already seriously depressed. Therefore, the normal short-term reduction in benthic habitat and prey from this type of dredging will probably not be measurable in the action area.

In some areas of the inner waterway, the existing sediments and prey base contain chemical contaminant concentrations that are harmful to benthic feeders and to animals that have direct contact with the sediments. In these areas, removal of sediments exceeding the SQOs and benthos will have an immediate positive effect: species not finding adequate prey for feeding in these areas may be forced to move to other areas where they may face increased competition for food, but they will be consuming uncontaminated prey and will be in contact with uncontaminated sediments.

Most of Thea Foss Waterway sediments would be dredged using a hydraulic dredge; however, portions of the sides and bottom of the Wheeler-Osgood may be dredged with a clamshell bucket. Clamshell dredges have a bucket of hinged steel with a "clamshell" shape that is suspended from a crane. The bucket, with its jaws open, is lowered to the bottom surface. When

the force of the bucket weight hits the bottom, the clamp grabs a section of sediments (Nightingale and Simenstad 2001). Because the jaws are open during descent, a clamshell is less likely to entrap or contain fish (Pacific International Engineering 2001a). Dredging with a mechanical clamshell bucket would increase suspended sediment concentrations throughout the entire depth of the water column at the point of dredging. Resuspension of sediment would occur during clamshell impact, closure, withdrawal, and lift to the haul barge. Clamshell dredging causes very limited, short-term and localized turbidity; no long-term effects should result from this turbidity.

Hydraulic dredging in shallow-water habitats in Puget Sound has been shown to entrain those fish with a propensity to burrow into the sediments, such as snake prickleback (Pentec 1990, unpubl. data). Hydraulic dredging has a low capacity for entrainment of pelagic fish, as shown by monitoring surf smelt in the La Conner Marina (Kyte and Houghton 1994). Because of pelagic habitats used by salmonids in the project area and because of their innate escape responses, there is little risk of a direct take by entrainment or injury of salmonids during hydraulic dredging, although some entrainment of demersal fish and epibenthic invertebrates (e.g., crabs) may occur. Hydraulically dredged areas will recover in the same manner and time frame as mechanically-dredged or freshly capped areas.

Where recolonization sources are nearby, newly placed or newly exposed sediments are expected to be quickly recolonized by infauna and epifauna (McCauley *et al.* 1977; Richardson *et al.* 1977; Romberg *et al.* 1995). However, the subtidal benthic community could experience reduced productivity for periods lasting up to two to three years following placement of materials (Wilson and Romberg 1996). Dredging and capping in littoral areas will eliminate non-mobile benthic and epibenthic species over the bottom of these area, resulting in a temporary reduction in abundance and diversity of benthic organisms. Substantial areas (over 60 acres) of the waterways that do not require remediation will provide local larval sources for recolonization. Based on the construction schedule (temporary cessation of in-water construction by mid-February of each year) and the expected rapid recolonization by epibenthic prey, littoral habitat would not experience a significant loss of function that would affect juvenile salmonids. However, it is acknowledged that minor temporal lags (months) in recovery of productivity of disturbed littoral habitat could temporarily reduce feeding opportunities for small numbers of early migrating juvenile chinook salmon.

In summary, the EPA will minimize the adverse effects of dredging on listed species while providing long-term increase in ecological functions by working under timing restrictions to minimize fish presence and by employing appropriate BMPs, as described in section 7 of the BA. The EPA will also monitor the chemical constituents, turbidity, dissolved oxygen and other in-water parameters, and will modify the dredging practices if any of the parameters exceed Clean Water Act water quality criteria.

2.2.1.2 Capping

Thick layer and thin layer (enhanced natural recovery) capping techniques will all be used in various RAs (Figure 1). Approximately 136,000 cubic yards of clean, fine sands, probably hydraulically dredged from the Puyallup River Delta, will be placed over 19.7 acres of channel areas in the Thea Foss and Wheeler-Osgood Waterway to provide chemical isolation of contaminants. The dredging and capping of the waterways will cause a net decrease of 2.55 acres below minus 10 feet MLLW but offset by a 2.29-acre gain of more productive littoral elevations. Juvenile chinook salmon are dependent on littoral habitats and shorelines for longer periods and at smaller sizes than the other salmonid species (Simenstad *et al.* 1982; Levy and Northcote 1982; Levings 1982). Deeper-water habitats are used by juvenile chinook primarily at larger sizes near the end of the outmigratory period as fish begin their seaward movements (Healey 1991).

Capping material will be slightly coarser than the existing substrate, but is expected to approach pre-remediation conditions in a relatively short time through natural deposition and resuspension. Additionally, side slopes are designed to be as steep as or less steep than existing conditions. These shoreline protection measures have been specifically designed to improve salmonid habitat function, while maintaining the existing level of erosion protection. Capping associated with the project will occur during a period of several months over the duration of the Project and will result in a temporary and localized increase in suspended sediment concentrations as the clean capping material descends through the water column. There is also the potential that existing surface sediment would be suspended at the point of impact as the cap material comes in contact with the bottom (Pequegnat 1983, Truitt 1986).

Cap material will be hydraulically dredged from the Puyallup River delta. The recovery of up to 225,000 cubic yards of the sediments previously placed on the delta should have minimal effect on habitat for listed species for essential fish habitat. Although there would be a short-term loss of benthos in the areas dredged, benthic species on the dynamically-active delta are adapted to rapid recolonization of disturbed areas and are expected to recolonize dredged areas quickly (McCauley *et al.* 1977; Richardson *et al.* 1977; Romberg *et al.* 1995; Wilson and Romberg 1995). The probability of entrainment of listed species during the subtidal (minus 15 to minus 50 feet MLLW) hydraulic recovery of sediments for capping would be low.

The cap material will consist of an assortment of clean, fine sands with low organic content, and thus are not expected to result in a change in sediment oxygen demand (and resulting DO reduction) during transport through the water column. The coarse nature of the cap materials will produce lower turbidity for a shorter period of time in comparison to turbidity caused during dredging operations. Research by MEC Analytical (1997) indicates that fine sand and larger particles sank to the bottom within minutes. In addition, capping will take place in less than 35 feet of water and material will be placed in a controlled manner to minimize the free fall distance. All capping material will settle out quickly, with the majority of the material being contained on the overall cap footprint.

The potential for re-suspension of sediment during cap placement will vary, based on the placement technique. Data collected after the placement of a sand cap over very fine,

unconsolidated material at the Bellingham Log Pond restoration site and the Simpson restoration site using a low-energy delivery system showed that little or no sediment was entrained in the clean cap (Parametrix 1989; USEPA 2000a; Anchor 2001). Based on this analysis, the potential for re-suspension of bottom sediment during cap placement should be minimal.

Minimization measures to reduce the concentration of suspended sediment during cap placement will be employed during Project construction. These measures include placing slope capping material at low tides, placing material in a controlled manner and minimizing the free fall distance of the capping materials. Further, project construction is scheduled to occur when juvenile chinook salmon are not present in significant numbers in the action area, and turbidity caused by capping will have little or no adverse effects to these species. With the control of upland sources of water and sediment chemistry, the EPA (2000a) expects that these sediments would not become re-contaminated after placement or in the foreseeable future.

Enhanced natural recovery impacts will be similar in principle to those for thick-layer capping but generally of lower intensity and for a shorter period of time, due to the smaller quantity of capping material being placed. For instance, some epibenthic and benthic organisms may survive to repopulate the new surface.

The grout mat in RA 19 will be over laid with 1 foot of channel sand material from elevation minus 24 feet MLLW to an elevation of approximately minus 13 feet MLLW. Above minus 13 feet MLLW the grout mat will extend to plus 10 feet MLLW and will be over laid with a thick slope cap of 18-inches of slope cap filter material plus another 18 inches of light riprap. Finally, a layer of habitat mix will be evenly spread over the riprap slope so that no grout mat or riprap will be exposed.

Capping of this site will occur within an approved work window to minimize fish presence at that time and will be conducted in the dry, where feasible. The EPA will use BMPs to reduce turbidity and its effects at that time. Therefore, short-term, negative effects of capping will be minimized, and the long-term effect of the capping will be beneficial.

2.2.1.3 Slope Rehabilitation

Slope rehabilitation in a given RA may include piling and debris removal, dredging of contaminated sediments, regrading the slope, and/or slope protection with riprap or quarry spalls. The impacts of slope rehabilitation will thus be similar to those for previously-discussed remedial activities. Debris, piling, and sediment removal will result in short-term and localized increases in turbidity and some of the sediments suspended may contain contaminants and/or other organic materials that could result in slight decreases in DO levels in the immediate vicinity. Placement of slope protection and habitat mix, to the extent that is accomplished during high tides (i.e., through the water column) will temporarily increase turbidity; however, since these materials will be low in organics, few effects are anticipated on DO levels.

Slope modifications will temporarily disrupt habitat accessibility in the affected areas. Littoral slopes requiring capping will be protected with riprap or quarry spalls for slope stabilization. However, shoreline armoring will be enhanced by covering the habitat mix to fill interstices, aid in water retention, and foster the development of epibenthic prey for juvenile salmonids. Rehabilitated slopes are expected to be quickly recolonized by organisms suited to the elevations, exposures, and substrates provided. Littoral slopes considered for offset against mitigation needs will be constructed with sufficient habitat mix to satisfy a performance criteria of at least 1 foot of material remaining one week after placement.

2.2.1.4 Construction and Disposal in the St. Paul CDF

Construction of the St. Paul Waterway CDF will cause in the permanent loss of 11.78 acres of existing aquatic habitat from Commencement Bay. Changes resulting from the remedial activities in the Thea Foss Waterway will result in the loss an additional 0.22 acres. The North Beach, Middle Waterway, and Puyallup Side Channel habitat mitigation activities will provide 11.42 acres of replacement aquatic habitat. Habitat construction in a number of small pocket habitat areas on the Thea Foss Waterway and potential expansion of other mitigation components will yield the remaining 0.58 acres of replacement littoral habitat. The EPA retains jurisdiction over this mitigation requirement.

Construction or presence of the St. Paul Waterway CDF will alter the existing shoreline geomorphology and bathymetry, causing the loss of intertidal habitat in close proximity to the mouth of the Puyallup River. This area ordinarily might provide a location used by salmonids to become accustomed to salt water (osmoregulation), however this loss is not expected to have much effect on the area available for osmoregulation adjustment since the St. Paul Waterway has a salinity structure that is similar to that in the adjacent Middle Waterway. Following construction of the Middle Waterway Brackish Marsh habitat, the addition of intertidal freshwater will have a localized effect but it may be limited to the marsh root zone along a 10 to 12 feet MLLW littoral band.

Hydraulic placement of sediment at the mouth of the Puyallup River for delta augmentation will create a concentrated plume of sediment-laden water that would flow with the prevailing river and tidal currents. Heavier bedload sand fractions would settle from the water column quickly, leaving a plume that is still very high in finer suspended sediments. Areas where sediment deposits on the delta face (slope) or platform (flatter top surface) are naturally dynamic, constantly shifting sands, with minimal epibenthic production, especially during the proposed period of deposition (November through January). Thus, only minimal loss of epibenthic productivity would result.

Discharge of hydraulically-pumped material from the St. Paul Waterway CDF will be directed onto the northwest face of the Puyallup River delta along a contour from approximately minus 15 feet to minus 50 feet MLLW. Because the discharge plume will consist of a high density of solids in saline water, it will flow down the delta face and settle to the sloping bottom.

Accumulations on the steep delta face will constantly slough downslope, augmenting the natural processes of the riverborne sediment load, contributing to the natural delta accretion.

The area of the delta directly influenced by the discharge plume at any point in time will constitute a relatively small percentage of the water cross-section at the river mouth and would occur for only a portion of each day. Juvenile salmon have been shown to avoid areas of unacceptably high turbidity (Servizi 1990), although they may seek out areas of moderate turbidity (10 to 80 nephelometric units (NTU)), presumably as cover against predation (Cyrus and Blaber 1987a and 1987b). Juveniles' feeding efficiency is also impaired by turbidity in excess of 70 NTU, well below sublethal stress levels (Bisson and Bilby 1982). Reduced preference by adult salmon homing to spawning areas has been demonstrated where turbidity exceed 30 NTU (20 mg/L of suspended sediments). However, chinook salmon exposed to 650 mg/L of suspended volcanic ash were still able to find their spawning stream water (Whitman *et al.* 1982). Based on these data, the winter timing of delta discharges, and the deep-water disposal on the face of the delta, it is unlikely that the locally-elevated turbidity generated by this proposed activity would directly affect juvenile or adult salmonids that might be present. It is highly probable that adult chum salmon and steelhead seeking to enter the often naturally-turbid Puyallup River during their upstream migrations, will simply avoid the discharge plume or swim through it. Thus, no measurable short-term adverse impacts to listed species or to essential fish habitat will result from the placement of clean sediment on the delta face.

Disposal of Thea Foss and Wheeler-Osgood Waterway dredged sediments in the St. Paul Waterway CDF may minimally, and temporarily, elevate suspended sediment levels (turbidity) and lower DO concentration in the localized CDF before the closure berm is completed. Once the berm is closed, effects will cease, except for decant waters which will monitored for Water Quality Criteria. Exceedances can bring about operational changes, where necessary. Suspended sediments and DO concentrations are not expected to reach levels detrimental to listed species.

While the occurrence of juvenile chinook salmon is expected to be low during the winter construction period immediately prior to closing the CDF berm, and the existing St. Paul Waterway provides few features likely to attract adult salmon or their forage fish prey, the contractor will implement a fish protection plan to further reduce the chance of trapping of either juvenile or adult chinook salmon in the CDF at the time of berm closure.

2.2.1.5 Construction of Habitat

The City will construct the North Beach Habitat by filling portions of the mouth of the St. Paul Waterway and constructing the protective face on the north end of the Middle Waterway peninsula. Using recognized Puget Sound industry nearshore filling methods, suspended sediment concentrations are not expected to reach levels dangerous to salmonids, and any effects on water quality would be temporary. The contractor will be responsible for modifying operations, especially relating to the scheduling of substrate placement during incoming or slack tides, as necessary, to decrease the potential for water quality exceedances. Turbidity will be

monitored during filling, to demonstrate compliance with water quality criteria at the mixing zone boundary.

To compensate for the unavoidable loss of 11.78 acres of littoral habitat being converted to upland from filling in the St. Paul Waterway, the Middle Waterway Beach and Brackish Marsh and the Puyallup River Side Channel mitigation element will convert an equivalent upland or isolated wetland acreage to littoral habitat. This mitigation would yield increases in quality of littoral habitat and provide habitats that reverse past cumulative losses in the bay through the further enhancement of a number of small habitat features in the Thea Foss and Wheeler-Osgood Waterways. These pocket habitat sites will be constructed concurrent with remedial activities at Pick's Cove Marina, Foss Waterway Marina, Alber's Mill Marina, at the Head of Thea Foss, and Johnny's Seafood. In total, the replacement of the St. Paul Waterway with equivalent acreage at Middle Waterway and the Puyallup Side Channel combined with the geographically disperse pocket littoral habitats should satisfy not only the substantive section 404 evaluation but allow for temporal losses during cleanup, uncertainty in creating new littoral habitats, and the EPA's affirmative conservation obligation under ESA section 7(a)(1)).

The application of habitat mix over littoral surfaces, and especially existing hardened (riprap) shorelines will improve habitat quality in the Action Area. Creosote-treated wood piles and anthropogenic debris will be removed, and where possible the steepened slopes of littoral shorelines will be reduced, for the benefit of listed species. Further, the addition of large woody debris cover structures and native riparian plantings along the shorelines will also improve over the baseline condition by increasing habitat complexity and promoting accretion of finer grained materials.

The combination of the gentle slope, fine substrates, and increased acreage and function at the habitat mitigation sites, and the remediated waterway channel and shoreline areas will increase epibenthic prey organism productivity and subsequently the habitat value for juvenile salmonid feeding and rearing. Epibenthic organisms would be eliminated in the St. Paul Waterway and disturbed in certain areas on the existing littoral habitats. However, new intertidal and shallow subtidal acreage on the face of the berm and the new intertidal and shallow subtidal acreage constructed as part of the mitigation actions will increase the acreage that will support epibenthic production. Based on monitoring of constructed mitigation habitats at the Blair Waterway Slip 5 (Jones & Stokes 1988, 1991a, 1991b) and the Milwaukee Habitat Area (Parametrix 1996, Pacific International Engineering and Parametrix 1998; Pacific International Engineering 1998), it is expected that the new habitats in the nearby Middle and Thea Foss Waterways will be rapidly colonized by epifauna.

The construction would occur during a season when juvenile salmonids are present only in very low numbers, and the habitat would have time to recolonize the prey base prior to the following spring outmigration season. Because of this, the project and the associated mitigation (which is expected to be of much higher quality than the habitat affected) would result in an increase in the overall production of epibenthic prey for salmonids within Commencement Bay compared to

existing conditions. Overall, the remedial actions in the Thea Foss and Wheeler-Osgood Waterways are expected to improve over the baseline condition for epibenthic prey availability.

2.2.1.6 Reinstallation of Concrete and Steel Piles

The City will use both concrete and steel piling will be used which will have none of the chemical concerns associated with the removal of the old creosote timber piles. Pile driving could temporarily increase the turbidity of surrounding waters, but much less so than the dredging activities. In addition, pile driving of hollow steel pipe piles will temporarily increase the noise within the Project Area and potentially create overpressure waves adjacent to the pile driving activity. While a vibratory hammer will routinely be used, it may be necessary to test 5 to10% of the steel piles with an impact hammer to determine bearing capacity, referred to as "proofing" in the industry. Biological effects to PS chinook may result from the high sound pressures produced when driving hollow steel piles with an impact hammer. Extensive discussions of the effects of driving hollow steel piles was provided in a recent NOAA Fisheries ESA consultation of the Hood Canal Bridge Retrofit and Replacement (NMFS No. 2002-00546; NMFS 2003). The EPA and the City of Tacoma have agreed to use an approved bubble air curtain when pile driving with an impact hammer on hollow steel piles.

2.2.1.7 Demolition and Reconstruction of Structures

The proposed activities will have no effect on the presence, number, or configuration of remaining overwater structures, nor will they have any effect on the extent of existing armored shorelines.

The log haul out facility will be relocated to a subtidal area (below minus 10 feet MLLW) on the eastern side of the Middle Waterway. Log rafts will be positioned offshore at a location with sufficient water depth to assure they will not ground out on low tides, thereby minimizing impacts to nearshore habitats preferred by juvenile salmonids. The log bundles will be lifted intact from the subtidal area to an adjacent upland location and transported inland to the storage location.

The 'easy lift' nature of the haul out facility will reduce the potential for wood debris loss and accumulation of the sediments adjacent to the operation. The log bundles will be floated onto a track-mounted cradle lift. The City will move intact bundles from the water to the adjacent upland for delivery to an upland log bunker where they will be broken open.

In addition to the monitoring and adaptive management/contingency plan, the following BMPs will be incorporated to minimize impacts to the marine habitat:

- No raft storage or grounding of log rafts in the Middle Waterway. Current log rafts are typically 80 by 300 feet and moorage in the waterway will be limited to the time period required to handle and remove the bundles from the water.

- Floatables will be contained within a containment boom consisting of stringer logs placed around the working/rafting area and routinely removed from the water.

- Bundles of logs will not be broken in the water. Instead, unbroken bundles will be delivered to an upland log bunker.

- An upland storage bunker will be used to keep wood debris from falling or washing back into the waterway. The upland bunker will be periodically cleaned, with the debris reclaimed for upland disposal, hog fuel, or other beneficial use.

- Accumulation of debris on sediment at the log haul out facility will be monitored on a defined survey schedule, per the adaptive management/contingency plan, and removed as necessary.

Accumulations of bark and woody debris on intertidal and shallow subtidal habitat can have a number of adverse environmental effects including smothering of benthos and degradation of sediment conditions (see reviews by Tetra Tech 1996; Floyd & Snider and Pentec 1997). The design of the proposed easy lift system, the absence of long-term storage of log rafts, and the BMPs listed above should preclude significant adverse effects from the operations of the log haul out facility in Middle Waterway.

2.2.1.8 Natural Recovery

The EPA believes that the no-action and natural recovery remedial activities for selected RAs (sections 1.2.1 and 1.2.2) do not impact listed species; however, such natural recovery sites will be rigorously monitored as part of the long-term OMMP. Natural recovery monitoring in these areas will include analysis for all chemicals present above SQO criteria during the most recent sampling. The monitoring results will be used to verify the effectiveness of natural recovery in terms of reducing concentrations of these constituents of concern. Should future performance monitoring results confirm the predicted reduction in concentrations of contaminant in the ten-year period, no further remedial activities are planned. NOAA Fisheries considers the EPA's decision to conduct no remediation on these RAs to be part of their overall action under ESA.

2.2.2 Indirect Effects

Indirect effects are caused by or result from the proposed action, are later in time, and are reasonable to occur (50 CFR 402.02). Indirect effects may occur outside the area directly affected by the action.

Small-vessel marinas, petroleum handling, and ship repair industries are the principal water-related activities that currently occur on the Thea Foss and Wheeler-Osgood Waterways. After the completion of contaminated sediment removal and capping, no change in the level of these activities is expected. The St. Paul Waterway is currently used entirely by the Simpson entities, which is expected to continue. After filling the St. Paul for the CDF, the log transfer activities

will move to the Middle Waterway but is not expected to change in intensity. The proposed action does not substantially change water depths or structures such that increased uses could occur without requiring future Federal permitting and the accompanying ESA consultative effort.

2.3 Cumulative Effects

Cumulative effects are defined as "those effects of future State or private activities, not involving Federal activities, that are reasonable certain to occur within the Action Area of the Federal action subject to consultation" (50 CFR 402.02). The proposed action involves activity within a portion of the Thea Foss and Wheeler-Osgood Waterways, which has been previously altered by dredging, filling and other anthropogenic activities. However, future Federal actions that will affect the Action Area, such as navigational dredging and other activities permitted under section 404 of the Clean Water Act or section 10 of the Rivers and Harbors Act, will be reviewed under separate section 7 consultations, and cannot be considered cumulative effects.

Other effects in the action area are those from restoration actions taking place as a part of Commencement Bay Natural Resource Damage Assessment pursuant to CERCLA (USFWS and NOAA, 1997; Kerwin 1999). Landscape and watershed scale restoration sites have also been identified to increase connectivity between important salmon habitat transition regions (Simenstad 2000). It is particularly difficult to detect, with confidence, the effects of habitat improvements based on observed run size trends. It has been estimated that, because of inherent variability, it would take 30 years to detect a 50% improvement in average production, if we were to use adult run size as the response variable (Lichatowich and Cramer 1979, Mobrand Biometrics 2001).

2.4 Conclusion

Having evaluated the collective effects of the proposed or continuing action, effects from the environmental baseline, and any cumulative effects, and taking into account measures for survival and recovery specific to the listed species' life stage, NOAA Fisheries finds that the proposed in-water work activities may result in short-term adverse effects to chinook salmon. Of the 10 salmonid indicators, seven indicators(turbidity; DO; area, diversity; accessiblity; salt/fresh water mixing; water current patterns; shoreline armoring; and forage fish) will be maintained in the long-term and three (water quality, sediment quality, and benthic community) will be restored. Water quality and benthic community will be temporarily degraded before being restored to levels above existing baseline conditions. Water quality degradation is expected to be temporary and limited to dredging, capping, and in-water construction periods only. Due to the potential for benthic effects, NOAA Fisheries agrees with the EPA's conclusion that the proposed action could temporarily degrade the baseline condition for benthic prey at the point of dredging and capping but improve long-term from restoration of shoreline and exposing clean sedimentary substrates. Measures to avoid work in the juvenile salmonid migration period, and engineering controls, will help minimize adverse short-term effects to salmonids.

Over the long-term, removal of highly contaminated sediments and creosote-treated timber piling is a beneficial aspect of the Project that will restore water quality over the baseline condition. NOAA Fisheries agrees with the EPA's conclusions that the remedial action will address risks to the environment and public health, reduce the levels of chemical constituents in sediment, and thereby help improve and restore salmon habitat in Commencement Bay. The City's agreement to enhance additional habitat beyond that needed to offset the permanent habitat losses (.58 acre loss caused directly by the action) will offset temporal losses and uncertainty in designing complex habitats, and contribute to the action agency's affirmative ESA section 7(a)(1) obligations, ultimately leading to the recovery of listed species in the Puyallup River/Commencement Bay ecosystem.

Based on the foregoing, it is NOAA Fisheries' biological opinion that the proposed action is not likely to jeopardize the continued existence of PS chinook. In arriving at a non-jeopardy conclusion for this action, the minimization measures were important to consider, as is the establishment of clean substrates which supports increased benthic diversity and productivity. NOAA Fisheries finds that short-term potential negative effects associated with the actual construction activities are to be minimized or eliminated through the adherence to the project design objectives and conservation measures.

2.5 Reinitiation of Consultation

This concludes formal consultation on this proposed action in accordance with 50 CFR 402.14(b)(1). The EPA must reinitiate this ESA consultation if: (1) new information reveals effects of the action that may affect listed species in a way not previously considered; (2) new information reveals the action causes an effect to listed species that was not previously considered; or (3) a new species is listed or critical habitat designated that may be affected by the identified actions. In instances where the amount or extent of authorized incidental take is exceeded, any operation causing such take must cease pending conclusion of the reinitiated consultation.

2.6 Incidental Take Statement

The ESA at section 9 prohibits the take of endangered species. Regulation promulgated pursuant to section 4(d) of the ESA extends the take prohibition to threatened species. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (50 CFR 222.102). "Harm" is defined as "an act which actually kills or injures fish or wildlife. Such an act may include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns such as breeding, spawning, rearing, migrating, feeding, and sheltering" (50 CFR 222.102). "Harass" is defined as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering" (50 CFR 17.3).

"Incidental take" is take of listed animal species that results from, but is not the purpose of, the Federal agency or the applicant carrying out an otherwise lawful activity. Under the terms of section 7(o)(2), taking that is incidental to, and not intended as part of, the agency action, is not considered prohibited taking provided that such takings are in compliance with the terms and conditions of the incidental take statement which is provided under ESA section 7(b)(4). 16 U.S.C. 1536.

An incidental take statement specifies the impact of any incidental taking of endangered or threatened species. It also provides reasonable and prudent measures that are necessary to minimize the impact, and sets forth terms and conditions with which the action agency, its applicant, or both, must comply in order to implement the reasonable and prudent measures.

2.6.1 Amount or Extent of Take Anticipated

The in-water dredging, capping, disposal, and habitat construction activities of the proposed action are scheduled to occur during a period of time (July 16 - February 14) when few individuals of the listed species are expected to be present. However, PS chinook use the Action Area in a way that they are likely to experience the various environmental effects of the proposed action. Therefore, the incidental take of PS chinook is reasonably likely to occur.

Incidental take is likely to be in the form of harm, or habitat modification that kills or injures fish by impairing certain normal behavioral patterns (feeding, rearing, migrating, etc.). Because in-water work is timed to reduce the number of PS chinook exposed to projects effects to the fewest individuals possible, because incidental take is likely mainly from habitat modification, and because the number of fish that use the action area is highly variable over time, NOAA Fisheries cannot quantify the precise number of individual fish that might be taken. In such circumstances, NOAA Fisheries characterizes the take as unquantifiable and uses a surrogate to estimate the extent of take. The extent of habitat affected by an action can be a surrogate measure for take.

In this action, the amount of habitat modification anticipated can be assigned based on the amount of change or activity in the littoral zone where juvenile chinook salmon can be found, if any are present during the time of the year when the construction occurs. Dredging, capping, shoreline modifications, and habitat enhancements occur over approximately 101 acres of Commencement Bay habitat - 18.6 acres of upland (above 13 feet MLLW), 42.0 acres of subtidal (below minus 10 feet MLLW) with the remaining 40.8 acres being in the littoral zone between.

Injury to or harassment of fish from pile-driving and other in-water operations is likely. In this proposed action, juvenile chinook salmon are reasonably certain to be harmed throughout the 82.8 acres of the total project footprint, but with differing levels of injury or harassment. NOAA Fisheries anticipates, and would exempt from the take prohibition that take which would occur from a 20% exceedance of the open water dredging area , or 8.4 acres, 10% exceedance of littoral areas dredged or capped above minus 10 feet MLLW, or 4 acres, 7 piling change in the total of 73 hollow steel pilings or a one piling change needed to test ("proof") the piling with an

impact hammer, if driven in-water, but no less than 44.41 acres of functional littoral habitat, or no less than the proposed approximately 180 creosote-treated piling permanently removed from Thea Foss Waterway. Any work causing habitat modifications exceeding these would exceed the anticipated extent of incidental take and require reinitiating the consultation.

2.6.2 Reasonable and Prudent Measures

The following reasonable and prudent measures (RPMs) are necessary and appropriate to minimize the take of PS chinook. The RPMs are integrated into the BA Addendum (See excerpts in Attachement No. 1) for the proposed action. NOAA Fisheries has included them here to provide further detail as to their implementation.

1. The EPA will minimize incidental take from dredging activities.

2. The EPA will minimize incidental take from capping activities.

3. The EPA will minimize incidental take from during demolition/reconstruction activities.

4. The EPA will minimize incidental take from habitat development.

2.6.3 Terms and Conditions

In order to be exempt from the prohibition of section 9 of the ESA, the EPA, the City, or both, must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms are non-discretionary. The EPA should include these terms and conditions as remedial requirements under Superfund orders to the City of Tacoma.

1. To implement reasonable and prudent measure No. 1, the EPA and/or the City shall:

    a) Comply with the in-water work window of August 15 through February 14 for the dredging of contaminated sediments when the chance of encountering chinook salmon is minimal.

    b) Comply with all conservation measures appropriate for dredging from section 7.2 and BMPs from sections 7.1.1 and 7.1.3 of the BA Addendum.

    c) Require the City's contractor to implement a St. Paul Waterway CDF Berm Closure Fish Protection Plan.

    d) Rehabilitate any littoral and adjacent riparian habitats disturbed by the temporary dredge pipe installation to pre-construction functions or better.

2. To implement reasonable and prudent measure 2 the EPA and/or the City shall:

a) Comply with the in-water work window of July 16 through February 14 when the chance of encountering chinook salmon is minimal.

b) Comply with all the conservation measures appropriate for capping from section 7.2 and BMPs from sections 7.1.2 and 7.1.3 of the BA Addendum.

c) Require that concrete grout shall be totally confined to its mat and not be allowed to come in direct contact with the sediments or water column.

d) Require that where habitat mix is placed over other substrates (riprap, quarry spall, grout matting, unremediated beaches) it shall be at the appropriate specifications. Where habitat mix is used for mitigation purposes, it should retain its minimum design thickness as measured one week after installation.

3. To implement reasonable and prudent measure No. 3 the EPA and/or the City shall:

a) Comply with the in-water work window of July 16 through February 14, when the chance of encountering chinook salmon is minimal.

b) Comply with all the conservation measures appropriate for demolition/reconstruction of overwater structures from section 7.2 and BMPs from sections 7.1.3, 7.1.4, and 7.1.5 of the BA Addendum.

c) Ensure that, providing substrate conditions are appropriate, vibratory hammers are used to drive all piles. If substrate conditions are not appropriate, impact hammers may be used. Impact hammers will require hydroacoustic monitoring and use of a bubble curtain if the pressure thresholds are exceeded, as described below, or the automatic use of a bubble curtain without monitoring.

d) Have City's contractor develop an acceptable design for a bubble curtain to be used only if in-water driving of hollow steel piles with an impact hammer is planned, equivalent or better than that described by Longmuir and Lively (2001).

e) Require the Simpson Timber Company to adhere to BMPs, monitoring, and an adaptive management/contingency plan for the operation of the log haul out ramp on the Middle Waterway, as agreed to and presented in Appendix Z of the Final Thea Foss Round 3 Data Evaluation and Pre-Remedial Design Evaluation (Parametrix 2000).

4. To implement reasonable and prudent measure No. 4 the EPA and/or the City shall:

a) Comply with the in-water work window of July 16 through February 14 when the chance of encountering chinook salmon is minimal.

b) Comply with all the conservation measures appropriate for habitat development from section 7.2 and BMPs from section 7.1.3 of the BA Addendum.

c) Require no net loss of littoral habitat acreage and shall require that all major mitigation construction activities be completed within 24 months of the activity that takes the existing habitat out of service. Failure to accomplish this will require an additional 0.1 acre of new and functioning habitat for every acre (prorated) not completed for each year of delay [prorated on a monthly basis (0.0083 acres equals 363 square feet/month/acre)]. Habitat enhancements in Thea Foss Waterway pocket habitats will provide minimization measures to offset for temporal losses, uncertainty in habitat mitigation, and affirmative conservation under ESA section 7(a)(1).

d) Require a minimum delivery of freshwater to the Middle Waterway Brackish Marsh sufficient to maintain a sediment pore water salinity of less the 10 parts per thousand over 50% of the intertidal shoreline area between plus 11 and 12.5 feet MLLW; sediment pore water salinity is to be reached within 2 hours after the tidal has fallen below the elevation being measured.

e) Chair an Adaptive Management Team to evaluate the results of the performance and long-term monitoring of the OMMP and the Adaptive Management Plan (OMMP, Section 4.3.4). As a minimum, the Team shall be made up of the responsible parties (City and Utilities), the natural resource agencies (NOAA Fisheries, FWS, Washington Departments of Fish and Wildlife, Natural Resources, and Ecology, the Puyallup Tribe of Indians, the Muckleshoot Indian Tribe), the COE, Simpson, and other interested parties. Participation by agencies and tribes will be voluntary, as time and commitments permit.

f) See that, as a minimum, the habitats constructed to offset the impacts of this action are maintained at their functional design for as long as the St. Paul Waterway remains filled with contaminated sediment. Should circumstances require modification of any of the habitats, functional replacement must be at a factor of 1.5 the acreage and any replacement habitats must be constructed and functioning 12 months prior to disturbance of the original habitat. The preference is for in-kind and on-site replacements; replacements outside the Action Area would require an additional factor of two (i.e., 3 acres for every original acre disturbed). If unable to complete the replacement habitat more than 12 months before disturbance, impacts can be offset by increasing the new acreage by a minimum of 10% per month. Adaptive management activities recommended by the Adaptive Management Team and accepted by NOAA Fisheries are exempt from this condition.

3.0 MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

3.1 Background

The MSA, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance EFH for those species regulated under a Federal fisheries management plan. Pursuant to the MSA:

- Federal agencies must consult with NOAA Fisheries on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (section 305(b)(2));

- NOAA Fisheries must provide conservation recommendations for any Federal or State action that would adversely affects EFH (section 305(b)(4)(A));

- Federal agencies must provide a detailed response in writing to NOAA Fisheries within 30 days after receiving EFH conservation recommendations. The response must include a description of measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with NOAA Fisheries EFH conservation recommendations, the Federal agency must explain its reasons for not following the recommendations (section 305(b)(4)(B)).

Essential Fish Habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (MSA section 3). For the purpose of interpreting this definition of EFH: waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR 600.110). Adverse effect means any impact which reduces quality and/or quantity of EFH, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), site-specific or habitat-wide effects, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810).

Any reasonable attempt to encourage the conservation of EFH must take into account actions that occur outside EFH, such as upstream and upslope activities, that may have an adverse effect on EFH. Therefore, EFH consultation with NOAA Fisheries is required by Federal agencies regarding any activity that may adversely affect EFH, regardless of its location.

The objective of this EFH consultation is to determine whether the proposed action may adversely affect designated EFH, and to recommend conservation measures to avoid, minimize, or otherwise offset potential adverse effects to EFH resulting from the proposed action.

3.2 Identification of Essential Fish Habitat

Pursuant to the MSA, the Pacific Fisheries Management Council (PFMC) has designated Essential Fish Habitat for federally-managed fisheries within the waters of Washington, Oregon, and California. The designated Essential Fish Habitat for groundfish and coastal pelagic species encompasses all waters from the mean high water line, and upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon and California, seaward to the boundary of the U.S. exclusive economic zone (370.4 km) (PFMC 1998a, 1998b). Freshwater Essential Fish Habitat for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers (as identified by the PFMC), and longstanding, naturally-impassable barriers (i.e., natural waterfalls in existence for several hundred years) (PFMC 1999). In estuarine and marine areas, designated salmon Essential Fish Habitat extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone (370.4 kilometers) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border.

Detailed descriptions and identifications of Essential Fish Habitat are contained in the fishery management plans for groundfish (Casillas *et al.* 1998, PFMC 1998a), coastal pelagic species (PFMC 1998b), and Pacific salmon (PFMC 1999). Assessment of the effects to these species' Essential Fish Habitat from the proposed action is based on these descriptions and information provided by the EPA.

3.3 Proposed Action

The proposed action is detailed above in section 1 of this document, are within the marine waters of Commencement Bay, and include habitats which have been designated as Essential Fish Habitat for various life stages of 46 species of groundfish, four coastal pelagic species, and three species of Pacific salmon (Table 1).

Table 1. Species of fishes with designated Essential Fish Habitat of Puget Sound.

Groundfish Species	redstripe rockfish *S. proriger*	Dover sole *Microstomus pacificus*
spiny dogfish *Squalus acanthias*	rosethorn rockfish *S. helvomaculatus*	English sole *Parophrys vetulus*
big skate *Raja binoculata*	rosy rockfish *S. rosaceus*	flathead sole *Hippoglossoides elassodon*
California skate *Raja inornata*	rougheye rockfish *S. aleutianus*	petrale sole *Eopsetta jordani*
longnose skate *Raja rhina*	sharpchin rockfish *S. zacentrus*	rex sole *Glyptocephalus zachirus*
ratfish *Hydrolagus colliei*	splitnose rockfish *S. diploproa*	rock sole *Lepidopsetta bilineata*

Pacific cod *Gadus macrocephalus*	striptail rockfish *S. saxicola*	sand sole *Psettichthys melanostictus*
Pacific whiting (hake) *Merluccius productus*	tiger rockfish *S. nigrocinctus*	starry flounder *Platichthys stellatus*
black rockfish *Sebastes melanops*	vermilion rockfish *S. miniatus*	arrowtooth flounder *Atheresthes stomias*
bocaccio *S. paucispinis*	yelloweye rockfish *S. ruberrimus*	
brown rockfish *S. auriculatus*	yellowtail rockfish *S. flavidus*	**Coastal Pelagic Species**
canary rockfish *S. pinniger*	shortspine thornyhead *Sebastolobus alascanus*	anchovy *Engraulis mordax*
China rockfish *S. nebulosus*	cabezon *Scorpaenichthys marmoratus*	Pacific sardine *Sardinops sagax*
copper rockfish *S. caurinus*	lingcod *Ophiodon elongatus*	Pacific mackerel *Scomber japonicus*
darkblotch rockfish *S. crameri*	kelp greenling *Hexagrammos decagrammus*	market squid Loligo opalescens
greenstriped rockfish *S. elongatus*	sablefish *Anoplopoma fimbria*	**Pacific Salmon Species**
Pacific ocean perch *S. alutus*	Pacific sanddab *Citharichthys sordidus*	chinook salmon *Oncorhychus tshawytscha*
quillback rockfish *S. maliger*	butter sole *Isopsetta isolepis*	coho salmon *O. kisutch*
redbanded rockfish *S. babcocki*	curlfin sole *Pleuronichthys decurrens*	Puget Sound pink salmon *O. gorbuscha*

3.4 Effects of Proposed Action

As described in detail in section 2.2 of this document, the proposed action may result in detrimental short- and long-term effects to a variety of habitat parameters. These adverse effects are:

1. Short-term degradation of benthic foraging habitat during dredging, capping, and habitat development activities.

2. Short-term degradation of water quality (e.g., elevated turbidity or the accidental release of contaminants including petroleum products, chemicals or deleterious materials) because of in-water construction activities.

    d) Temporal delays during replacement of functioning subtidal habitat by enhanced intertidal habitats as part of habitat development.

e) Short-term production of high sound pressure levels during the impact driving of hollow steel piles that may injure or kill fishes.

3.5 Conclusion

NOAA Fisheries believes that the proposed action may adversely impact the Essential Fish Habitat for the groundfish, coastal pelagic, and Pacific salmon species listed in Table 1.

3.6 Essential Fish Habitat Conservation Recommendations

Pursuant to Section 305(b)(4)(A) of the MSA, NOAA Fisheries is required to provide Essential Fish Habitat conservation recommendations to Federal agencies regarding actions that would adversely affect Essential Fish Habitat. NOAA Fisheries was invited by the EPA and City to recommend conservation measures during the preparation of the BA so that all of NOAA Fisheries' concerns have been addressed by the stated conservation measures (section 7.2) and BMPs (section 7.1) in the BA. These conservation measures are sufficient to conserve the Essential Fish Habitat of the species in Table 1, and no additional conservation recommendations are necessary.

Because NOAA Fisheries is not providing conservation recommendations at this time, no 30-day response from the EPA is required (MSA section 305(b)(4)(B)).

3.7 Supplemental Consultation

The EPA must reinitiate Essential Fish Habitat consultation with NOAA Fisheries if the proposed action is substantially revised in a manner that may adversely affect Essential Fish Habitat, or if new information becomes available that affects the basis for NOAA Fisheries' Essential Fish Habitat conservation recommendations (50 CFR 600.920(l)).

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