

**Environmental Assessment
For Turning Basin #3 Aquatic Habitat Restoration Project**

LEAD FEDERAL AGENCY FOR EA: National Oceanic and Atmospheric Administration

PARTICIPATING AGENCIES/TRIBES: Elliott Bay/Duwamish Restoration Program Panel
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Department of the Interior, State of Washington,
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ABSTRACT: The EB/DRP proposes restoring aquatic and terrestrial habitat to a portion of the Turning Basin #3 on the Duwamish Estuary (River). The project, located on the left bank of the Duwamish River at River Mile 5.2, would involve removing existing upland and inwater structures, and excavating the bank to create a total of three intertidal and supra-tidal habitat benches on a 0.82 acre site owned by the Muckleshoot Indian Tribe. Intertidal and riparian, native vegetation would be planted to increase habitat and food for fish and wildlife. Five alternatives, including the no-action alternative, were considered. Alternative 5 was chosen as this alternative would provide the largest restoration area, maximize habitat diversity, and generate the greatest input of detrital material to the estuary. There would be short-term impacts to noise and vehicle traffic on West Marginal Place South, and marine commercial and recreational traffic in the Duwamish River from heavy machinery and barges, respectively, used during construction. Potential impacts to fish and wildlife species will be mitigated through construction windows and employment of BMPs. Conversion of this site will benefit fish and wildlife, particularly chinook and chum salmon. Long-term air, water and noise

pollution would be reduced at the site. Habitat restoration at this site would provide a more aesthetic view, and allow for passive, public education opportunities. No significant short- to long-term, significant adverse impacts are anticipated to either the built or natural environment, or Threatened or Endangered species such as Bald Eagle, bull trout, and chinook salmon, which occur in the project area. A separate Biological Assessment has been prepared for chinook and coho salmon, and bull trout.

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1.0 INTRODUCTION

This Environmental Assessment (EA) was prepared under the requirements of the National Environmental Policy Act (NEPA)¹, as amended (40 CFR Part 1500). The purpose of the EA is to determine the significant impacts to the quality of the human environment resulting from the implementation of the preferred alternative for the Turning Basin #3, Aquatic Habitat Restoration Project in the Duwamish River, King County, Washington (Township 23, Range 4 East, Section 4). This EA will also meet the requirements of the State of Washington State Environmental Policy Act². The project proposes to remove an existing commercial wharf, associated upland structures, excavate fill material, create three habitat benches, and plant native intertidal and riparian vegetation to restore fish and wildlife habitat at River Mile 5.2 of the Duwamish Estuary.

This project is proposed by the Elliott Bay/Duwamish Restoration Program Panel (EB/DRP or Program), an intergovernmental program established under a consent decree³ to help restore natural resources injured by pollution in Elliott Bay and the lower Duwamish River. The National Oceanic and Atmospheric Administration (NOAA) and the U.S. Fish and Wildlife Service (USFWS) are the federal natural resource trustees on the EB/DRP Panel. The settlement identified the need to remediate various contaminated sites and restore habitat for the purpose of restoring aquatic health and safety. This project is one of a series of habitat development projects proposed under the settlement. For more information about the settlement and Program established under it, see the Concept Document (EB/DRP 1994) and the Consent Decree. Both documents are part of the Administrative Record for this project and incorporated herein by reference.

The Turning Basin No. 3 property was acquired, on behalf of the Panel for restoration purposes, by the Muckleshoot Indian Tribe using a combination of King County's Shoreline Improvement Funds and the Panel's settlement implementation funds (Appendix A). The project will recreate previously lost intertidal habitat and functions necessary for the successful survival of juvenile salmon, such as the federally, listed chinook salmon (*Oncorhynchus tshawytscha*) migrating down the Green/Duwamish River system. The project involves removing existing upland and inwater structures and excavating the bank to create a total of three intertidal and supratidal habitat benches on the 0.82-acre site.

¹ 42 USC 4321 et seq., 40 CFR Parts 1500-1508, and requirements set out in NOAA's Administrative Order 216-6.

² State Environmental Policy Act, Ch 43 RCW, Ch 197-11 WAC; SEPA Rules WAC 197-11-960

³ United States, et al. v. The City of Seattle and the Municipality of Metropolitan Seattle, Civ. No. C90-395WD (W.D. Wash., Dec. 23, 1991). In 1994, the Municipality of Metropolitan Seattle became the King County Department of Metropolitan Services. The Natural Resource Trustees are: the National Oceanic and Atmospheric Administration, under the U.S. Department of Commerce; the U.S. Department of the Interior, acting through the U.S. Fish and Wildlife Service; the Muckleshoot Indian Tribe; the Suquamish Tribe; and the State of Washington, acting through the Department of Ecology. The Consent Decree and the Concept Document, both incorporated herein by reference and made a part of the Administrative Record, provide additional information on the settlement.

Based on a review of the environmental impacts associated with the five proposed alternatives, Alternative 5 was selected as the preferred alternative. Alternative 1, the No Action Alternative, was not selected even though some natural recovery will occur. The action alternatives vary in the number and scope of the habitat benches that would be constructed. While all alternatives would provide habitat benefits, Alternative 5 maximizes the restoration area and habitat diversity, as well as generates the greatest amount of detrital material to the estuary. The adverse environmental impacts of Alternative 5 are similar to the other action alternatives.

1.1 Project Area

1.1.1 Green/Duwamish Basin

A detailed description of the Green/Duwamish Basin is found in Appendix B. The lower ten-mile segment of the Green/Duwamish River (WRIA 09.0001) system from the City of Renton to Elliot Bay by Seattle is known as the Duwamish River. The rest of the river, upstream from its confluence with the Black River, approximately the upper extent of tidal influence, is known as the Green River (Williams *et al.* 1975).

The lower 10 miles of the river, the reach in which the project is located, has been almost completely altered from its pre-development condition (Blomberg *et al.* 1988). The Duwamish estuary once contained nearly 5,300 acres of intertidal mudflats, marshes and riparian⁴ habitats (Blomberg *et al.* 1988). Today, only 2% of these areas exist in the Duwamish Estuary (Blomberg *et al.* 1988). Since settlement, there has been a 98% loss of shallows, intertidal mudflats, and tidal marshes in the Green/Duwamish estuary and a 100 percent loss of tidal swamps (Blomberg *et al.* 1988). As a result, Blomberg *et al.* (1988) estimated that there are only 45 acres of intertidal mudflat and tidal marsh left in the Duwamish Estuary. There are 22.6 miles of total shoreline length between the mouth of the river and River Mile 6.5. Of this distance, 44% is rip rapped, 34% covered by pier aprons and 7% covered by sheet piling, leaving approximately 15% in lesser forms of disturbance (derived from data in Tanner 1991). Furthermore, barges cover some of the remaining intertidal and shallow subtidal portions of the Green/Duwamish estuary (Muckleshoot Indian Tribe Fisheries Department [MITFD], unpub. data).

1.1.2 Turning Basin Number 3 Project Area

The project site is located at 10054 West Marginal Place South, Seattle, Washington and is adjacent to the Duwamish River (Figure 1) in Township 23 North, Range 4 East, Section 4. The project site is within the City of Tukwila. The project site is on the left bank (looking downstream) within the last upstream, vessel turning basin, or Turning Basin #3, at River Mile 5.2 of the Duwamish River. Prior to modern development, Turning Basin #3 was a tidal swamp and river channel (Blomberg *et al.* 1988; Tanner 1991). The 0.82-acre property (32,000 ft² of upland and 4,100 ft² of intertidal mudflat) was purchased by the Muckleshoot Indian Tribe in 1997 to restore fish and wildlife habitat on behalf of the EB/DRP. There is an office/warehouse structure, small storage sheds, and asphalt and concrete pads on the site (Figure 2). A T-shaped, commercial pier made of creosote treated wood extends approximately 125 feet into the Duwamish River. Kenco Marine Services formerly owned this site, and used it for commercial marine operations, including moorage and vessel repair

⁴ Riparian is the area of transition between the terrestrial and aquatic communities.

(Corps 1994). Minor repair work, such as battery replacement, oil lubrication, and minor painting of tugs and barges also occurred at the site (Corps 1994). All tug and barge staging, support and maintenance operations that previously occurred at the site have ceased.

The following exempt or authorized activities have been completed on the site to date:

- 1) placement of a temporary security fence in September 1998, to prevent dumping of refuse;
- 2) remediation of two upland areas of approximately 100 and 40 ft² to remove hydrocarbons. This remediation work was completed by the previous owners of the site in July 1998 as part of the terms of sale (Radix Ortega Group 1998); and
- 3) removal, by the respective owners or operators, of the barges and tugs formerly moored at the site to new locations by 30 September 1998.

There is a 30-ft wide King County River Protection Easement parallel to the top of the riverbank. The easement gives King County the right to enter the property to construct, reconstruct, maintain, and repair bank protection and/or other flood control works. King County also has the right to trim, cut, fell, and remove all trees, brush and other natural growth and obstructions as necessary.

King County Parks has an easement for a bike and pedestrian trail through adjacent properties to the north and the south of the project site along Marginal Place. However, King County does not have an easement through the project site. King County will construct the trail within the existing road right-of-way between the project site and Marginal Place (pers. comm. between Roderick Malcom, Muckleshoot Tribe and Mile Lozano, King County Parks).

Owners of property adjacent to the site include: Seattle City Light to the North at 9600 West Marginal Way South, and the Washington State Department of Transportation (WSDOT) to the South (Jim Ward, WSDOT, pers. comm. dated March 2, 1999). Either the DNR or the Port of Seattle owns the riverbed located to the east of the property.

1.2 Public Participation Efforts

The public has had numerous opportunities to comment on the Panel's selection of this location for its restoration project, including during the development of the Concept Document, and through the Panel's public meetings and open houses. A public scoping meeting for this project design was held on October 21, 1998. Public opportunities to comment on the scope and design of the project have been, and will continue to be, available through the federal and state permitting processes that may be required for this project. Public comments on this EA will be considered in the federal agency's final determination (*i.e.*, whether a Finding of No Significant Impact (FONSI) should be issued) for this Project.

1.3 Administrative Record

This EA references a number of resource documents prepared by and for the Program and through the SEPA process, including the applications and permits required for the Panel's Turning Basin No. 3 Aquatic Habitat Restoration Project. These documents, incorporated by reference into this EA, are part of the Administrative Record. The construction records will be on file with Roderick Malcom, Muckleshoot Indian Tribe (see Fact Sheet for additional information).

2.0 ALTERNATIVES, INCLUDING THE PROPOSED ACTION

As a result of the public meeting, five alternatives were developed, including the no-action alternative. Alternative 1 is the no-action alternative. Alternatives 2 through 5 involve removing the existing pier and buildings, and regrading the existing slope. The four Action Alternatives differ in total affected area, retention of some of the existing bank as a protective spit for bank stability, and the number and area of potential benches to be constructed. The purpose of the benches is to provide areas of relatively flat ground at various intertidal or supra-tidal elevations as the platform upon which intertidal and riparian vegetation would be planted. The use of the benches enables a larger area or greater, desired function at a specific elevation to be created.

Alternatives 2 through 5, the action Alternatives, include the following common modifications to the existing site:

- (1) Removal of the pier by either by barge or upland equipment based on the wharf apron. The preferred method would be to remove the structure by basing the equipment on the wharf and working landward. The exact methodologies for each construction activities listed below will be determined by the permit conditions and the use of Best Management Practices (BMPs). The piles will either be pulled or cut off at the mudline; the preference is to pull the entire pile;
- (2) Removal of concrete rubble and riprap from the bank;
- (3) Excavation of upland fill material to the desired grade. Much of the work will be done in the dry, though inwater work will be required. Erosion control measures will include use of silt fences, as applicable, and other standard BMPs. Erosion control measures will be taken during excavation, including installing a silt fence at the construction area perimeter. As excavation progresses toward the final finished grades, the silt fence will be repositioned to the next targeted excavation perimeter;
- (4) Removal of existing upland structures and features (e.g. buildings, concrete foundation, and wooden bridge). One upland concrete pad, which is partially outside of the property boundary, will remain. The concrete retaining wall along the property boundary at Marginal Way will remain, but would be either repaired or replaced;
- (5) Removal of existing utilities and storm drains;
- (6) A lower intertidal bench buttressed with large woody debris connected with galvanized chain to earth anchors to prevent bank sloughing during root development. The Elliott Bay/Duwamish Habitat Development Technical Work Group decided to use large wood rather than rip rap to maintain the slope during root development to minimize unnatural elements in the project and river, and to mimic nearby areas in the estuary where sedge benches are formed and stabilized by naturally occurring large wood. Some root wads would be emplaced to roughen the edge of the woody debris to create eddies and reduce flow laminarization so as to minimize bank erosion, at and off the site. The large woody debris would be left to decay naturally, as it is expected that the planted intertidal vegetation would have become established in the interim and the bank stabilized. As it is not the intent of the Technical Work Group to maintain bank stabilizing features at the site over the long term, ecology blocks or other large weights will not be used. Loss of wood from the project will not be considered a failure, unless the rate of loss is such that the growing root masses are unable to stabilize the bank. Root wads observed to interfere with the exercise of Treaty Fishing access, would either be moved or removed;

- (7) Beach habitat bench and zone would be planted with native vegetation appropriate for the target elevation;
- (8) Fences approximately 3 feet high and maximum two-inch mesh, would be erected for 3 to 4 years to protect growing plants from forging geese until intertidal vegetation becomes established (Caren Crandall, University of Washington, Center for Urban Horticulture, pers. comm. August 14, 1998). Facilities to exclude geese from vegetation plantings are becoming more common and designs are changing. Between the preparation of this document and permit issuance, other designs might be deemed to provide more benefit. Though, the exact design may differ, the potential footprint would be equivalent;
- (9) The upland boundary of the site would be marked by a 6-ft high chain link fence to protect the site and prevent dumping of refuse;
- (10) Two pier pilings would be left, or replacements set in existing locations, for tribal fishermen to attach set nets during fishing season;
- (11) The hired contractor would be responsible for maintaining and replacing dead or dying vegetation until the entire site has been vegetated to the standards set by the *EB/DRP*;
- (12) A stewardship plan to maintain the site;
- (13) A monitoring plan being developed by the Elliott Bay/Duwamish Restoration Panel (the decision making body); and
- (14) Due to the current elevations of the mudflat at the site and the proposed slopes leading to the lower bench, there will be a minor, but unquantified, increase in the area of intertidal mudflat at the lowest tidal elevation.

Alternatives 2 and 3 would, through leaving parts of the bank at its current location, provide a spit extending from the uplands to protect the restored area from potential erosion or scour by the river. The spit would reduce the area of intertidal habitat that could be created. Subsequently, it was determined the site was a depositional, rather than an erosional area (pers. comm. Hugh Shipman November 1998). The main force of the river does not strike the project area, but instead is directed towards the City Light Property to the north. Therefore, these Alternatives were not selected as the preferred alternative as there is not need for the spit. The areas of fish and wildlife habitat for each Alternative are shown in Table 1. Detailed descriptions of each Alternative, and the targeted elevations are presented in the following sections.

Table 1. Summary of Alternatives. Area (ft²) of fish and wildlife habitat provided under each Alternative. Areas of differing tidal elevation providing similar benefits have been grouped.

Alternative	Fish Habitat	Wildlife habitat (indirect benefits to fish)	In-common habitat	Total habitat area (ft ²)
1 – No Action	1,800	19,367	680	21,847
2 – Three Benches	4,246	13,431	4,000	21,677
3 – Two Benches	5,180	11,450	4,550	21,180
4 – Two Benches	9,780	7,810	6,500	24,090
5 – Preferred	6,500	7,404	6,050	19,954

2.1 Alternative 1 - No Action/Natural Recovery

Under Alternative 1, No Action/Natural Recovery, the Program would not take any direct action to restore injured natural resources or create habitat development projects. No habitat restoration activities would occur on-site. The No Action/Natural Recovery Alternative allows biological impacts to recover naturally (Figure 3).

The No Action/Natural Recovery Action is the baseline against which the impacts and benefits of the Action Alternatives will be compared. Though the infrastructure at the site is the same as before purchase, commercial operations at the site have ceased and the barges and vessels relocated, increasing the potential for natural recovery. Deposition of fine-grained materials would over the long term cover some of the rip rap and debris found along the bank. At suitable elevations, the current small fringing marsh of emergent vegetation might expand. Some introduced upland plant species would grow and dominate the abandoned parking lot. However, the wharf, hardened shoreline, and existing upland features would generally constrain natural restoration. Rainfall falling offsite would run off the adjacent road, collect contaminants, pass through the property, where fine sediment would be entrained, and discharge the materials to the Duwamish River.

In order for Alternative 1 to be selected as the preferred alternative: (1) natural processes must be more effective in restoring the environment than available or potentially available restoration options and alternatives; (2) the time to recovery must not be significantly different from that resulting from human intervention; (3) the affected area will not suffer from additional adverse ecological effects before the site returns to a natural state; (4) no negative threats to the health and safety of the general public will be caused by the time lag of natural recovery; and (5) funds are not available for restoration.

2.2 Alternative 2 - Three habitat benches.

This Alternative involves removing all existing structures, regrading the current slope to provide three habitat benches (Figure 4) and leaving a spit extending from the upland area. The existing slope would protect restored area from erosion, but the current shoreline of rip rap and broken concrete would be softened by removing the bank hardening material and planting native vegetation. This proposal would not maximize the area available for the restoration of emergent or riparian vegetation. The following specifies the habitat bench and zone area with applicable elevation ranges for this Alternative:

- 1) lower bench (2,900 ft²) constructed from +2.0 to +6.0 ft MLLW;
- 2) transition area⁵ (1,346 ft²) from +6.0 to 9.5 ft MLLW;
- 3) emergent bench (4,000 ft²) constructed from +9.5 to +11.0 ft MLLW;
- 4) transition area (2,600 ft²) from +11.0 to +14.0 MLLW;
- 5) ground cover bench (1,485 ft²) constructed at +14.0 ft MLLW; and
- 6) riparian zone (9,346 ft²) from +14.0 to + 21.0 ft MLLW.

The emergent bench would be planted with Lyngby's sedge (*Carex lyngbyei*), hardstem bulrush (*Scirpus acutus*), three-square bulrush (*Scirpus americanus*), and seaside arrowgrass (*Triglochin maritima*). The area of transition between the emergent and shrub benches would

⁵ Transition area is the area of transition between constructed habitat benches or zones.

be seeded with Douglas aster (*Aster subspicatus*), tufted hairgrass (*Deschampsia caespitosa*), saltgrass (*Distichlis spicata*), meadow barley (*Hordeum brachyantherum*) and Pacific silverweed (*Potentilla anserina*). The groundcover or shrub bench would be planted with Red-osier dogwood (*Cornus sericea*), sweet gale (*Myrica gale*), Pacific ninebark (*Physocarpus capitatus*) and Hooker's willow (*Salix hookeriana*). The riparian zone would be planted with red alder (*Alnus rubra*), Indian plum (*Oemleria cerasiform*), black cottonwood (*Populus balsa*), Sitka spruce (*Picea sitchensis*) shore pine (*Pinus contorta contorta*) and snowberry (*Symphoricarpos albus*).

2.3 Alternative 3 - Two habitat benches

This Alternative involves removing all existing structures, and regrading the current slope to provide two habitat benches, a riparian zone (Figure 5) and leaving a spit extending from the upland area. The following specifies the habitat bench and zone area with applicable elevation ranges for this Alternative:

- 1) lower bench (3,600 ft²) constructed from +2.0 to +6.0 ft MLLW;
- 2) transition area (1,580 ft²) from +6.0 to +9.5 ft MLLW;
- 3) emergent bench (4,550 ft²) constructed from +9.5 to +11.0 ft MLLW;
- 4) transition area (6,260 ft²) from +11.0 to +18.0 ft MLLW; and
- 5) transition area or riparian zone (2,220 ft²) from +18.0 to + 21.0 ft MLLW.

This Alternative would provide two benches (lower and emergent) and a riparian zone planted with native vegetation. The emergent bench would be planted with Lyngby's sedge (*Carex lyngbyei*) hardstem bulrush (*Scirpus acutus*), three-square bulrush (*Scirpus americanus*), and seaside arrowgrass (*Triglochin maritima*). The riparian zone would be planted with red alder (*Alnus rubra*), Indian plum (*Oemleria cerasiform*), black cottonwood (*Populus balsa*), Pacific willow (*Salix lucida*) and snowberry (*Symphoricarpos albus*).

2.4 Alternative 4 - Two habitat benches

This Alternative involves removing all existing structures, and regrading the current slope to provide two habitat benches and a riparian zone (Figure 6). There would be no protective spit extending from the upland area. This proposal would provide approximately the same habitat area as Alternative 5, and almost twice that of Alternatives 2 and 3. The benefits of the increased habitat area are increased production and delivery of detrital materials and food items into the estuarine food chain. The planting scheme is similar to that proposed for Alternative 3. The following specifies the habitat bench and zone area with applicable elevation ranges for this Alternative:

- 1) lower bench (7,650 ft²) constructed from +2.0 to +6.0 ft MLLW;
- 2) transition area (2,130 ft²) from +6.0 to +9.5 ft MLLW;
- 3) emergent bench (6,500 ft²) constructed from +9.5 to +11.0 ft MLLW;
- 4) transition area (4,950 ft²) from +11.0 to +18.0 MLLW; and
- 5) riparian zone (2,220 ft²) from +18.0 to +21.0 ft MLLW.

2.5 Preferred Alternative - Three habitat benches

The proposed Alternative was selected to (1) provide the maximum amount of surface area for the lower vegetated intertidal habitat bench and (2) the greatest number of different habitat benches (Figure 7). The current slope will be regraded to provide a lower, emergent and groundcover bench, and riparian zone (Figure 8). There would be no protective spit extending from the upland area. This proposal would provide approximately the same habitat area as Alternative 4, and almost twice that of Alternatives 2 and 3. The benefit of the increased habitat area is increased production and delivery of detrital materials and food items into the estuarine food chain. Unlike alternative 4, there will be three benches, rather than two. The increased number of benches allows for a wider diversity of vegetation types at the project site.

After current slope is regraded, the lower bench would be buttressed with large wood (Figure 9) and connected with galvanized chain to small earth anchors (Figure 10) to prevent bank sloughing during root development. Some root wads would be placed to reduce erosion at the site. After the intertidal vegetation is established, the wood would be left to decay naturally. Root wads observed to interfere with the exercise of Treaty Fishing access would either be relocated or removed.

This Preferred Alternative will involve excavating approximately 1,794 yd³ of material below the Mean Higher High Water⁶ (MHHW) and moving it to an authorized, off-site location (Figure 11). This volume of material includes material located within the upland portion of the site that is located below the plane of the OHWM if extended towards Marginal Place.

Erosion control measures will include use of silt fences, (Figure 12) as applicable, and other BMPs. Erosion control measures taken during excavation of fill material will include a silt fence at the construction area perimeter. As excavation progresses toward the final finished grades, the silt fence will be repositioned to the next targeted excavation perimeter.

The following specifies the habitat bench and zone area with applicable elevation ranges for this Alternative:

- 1) lower bench (6,500 ft²) constructed from +2.0 to + 9.5 ft MLLW;
- 2) emergent bench (6,050 ft²) constructed from +9.5 to +11.0 ft MLLW;
- 3) transition area (1,967 ft²) from +11.0 to +14.0 MLLW;
- 4) groundcover zone (1,850 ft²) constructed from +14 to +17 ft MLLW; and
- 5) riparian zone (3,587 ft²) from +17 to +21 ft MLLW.

The planting scheme (Figure 13) is similar to that described for Alternative 3, though the areas differ.

3.0 AFFECTED ENVIRONMENT

3.1 Aesthetic Resources

⁶ Mean Higher High Water is a tidal datum. It is defined as the average of the higher high water height of each tidal day observed over the National Tidal Datum Epoch.

Current property conditions do not present an attractive view. A dilapidated, small, wooden pedestrian bridge of approximately 10 feet width and 20 feet length, a concrete block of a minimum size of 50 cubic feet, an old aluminum Quonset hut building, a 120 foot commercial wharf, and small piles of gravel currently exist on the property. There is a tendency for garbage and refuse to collect along the fenced property boundary.

3.2 Air Quality Resources

This is a Class II area according to national air quality standards (Gary Rothwell, DOE, pers. comm. dated May 18, 1999). *Class II classification allows for a moderate deterioration in air quality.*

3.3 Land Use Resources

The project site is located in a commercial industrial area. The shoreline designation for this area is Urban and the zoning designation is Manufacturing Industrial Center/Heavy. The property is bounded to the south and east by the Duwamish River, to the north by a Seattle City Light Station, and to the west by West Marginal Way.

There are several estuarine habitat restoration or mitigation projects within one mile of the site. Two hundreds yards south of the site is an intertidal mitigation site constructed by the Port of Seattle. Approximately 400 yards to the south is a Coastal America Restoration site. Approximately one thousand yards to the south is the proposed North Wind's Weir Restoration Site, an intertidal slough funded by the EB/DRP. Approximately 400 yards to the north is the Hamm Creek Restoration Site, partially funded by the EB/DRP.

3.4 Economic Resources

The Turning Basin #3 project site is located in the City of Tukwila, King County, Washington, and is part of the Duwamish industrial corridor. The Duwamish industrial corridor extends from Harbor Island to the City of Tukwila. This corridor is the most concentrated area for industry in the State of Washington and consists of covers more than 8,500 acres. The 2,000 plus businesses in the corridor provide nearly 87,000 jobs, with an annual payroll of \$2.5 billion. These businesses provide a wide range of economic opportunities for workers with a variety of skills. One in ten jobs in the King County is found in the Duwamish industrial corridor. Average annual wages paid in this corridor are above the countywide average of \$29,869. The area is targeted to accommodate 25,000 additional jobs over the next 20 years. Large businesses in this area include the Boeing Company and PACCAR/Kenworth Truck, along with hundreds of smaller traditional industrial businesses (Environmental Coalition of South Seattle 1999).

The Port of Seattle lies at the north end of the corridor, and the SeaTac Airport lies approximately five miles beyond the southern end. The King County International Airport (Boeing Field) is another major facility in the corridor. Two interstate highways and rail lines service the area. The Duwamish River also serves as a major maritime resource that transported 21.7 million tons of cargo in 1989 (Environmental Coalition of South Seattle 1999). Commercial marine operations in the Duwamish River occur downstream of the project site.

The Turning Basin #3 is within the "Usual and Accustomed" fishing areas of the Muckleshoot Indian Tribe. Tribal fishermen commercially harvest chinook, coho, and chum salmon and steelhead trout during late summer, fall and winter. At any one time, there are approximately 8-10 tribal fishing boats at the Turning Basin #3 during chinook fishing season (Roderick Malcom, Muckleshoot Fisheries Department, pers. comm. dated May 19, 1999).

3.5 Fish and Wildlife Resources

Threatened and Endangered Species, Species of Concern, Washington State Priority Species, and Essential Fish Habitat are discussed in detail in separate sections.

3.5.1 Fish

The Duwamish River is a significant migratory route, rearing area, and holding area for anadromous salmonids in the Green/Duwamish River basin (NMFS 1998a, Warner and Fritz 1995; Salo and Grette 1986). The Green Duwamish basin is used by many species of salmonids. Chinook (*O. tshawytscha*) and coho salmon (*O. kisutch*) are found in the basin, and are known to rear and hold at the project site. The Duwamish River also supports runs of chum salmon (*O. keta*), and summer and winter runs of steelhead trout (*O. mykiss*) Williams 1975; WDFW and Western Washington Treaty Tribes 1994). Juvenile chum salmon have been found in larger numbers at the project site (Warner and Fritz 1995), and particularly dependent upon an estuary for growth before moving to marine areas. Chum salmon spawn in the Green River above RM 30. Juvenile steelhead salmon have a short estuarine residence time due to their large size at outmigration. Upstream adult steelhead migration occurs year round. Sockeye salmon (*O. nerka*) also occur in the river though it is unknown if the population is self-sustaining or consists of strays from the Lake Washington system. The timing of adult sockeye migration is unknown, but spawning adults are seen in the Green River above RM 35 in September and October. Adult pink salmon (*O. gorbuscha*)

spawn in low numbers in the Green River (pers. comm. between Roderick Malcom, MITFD and Steve Foley, WDFW). Pink spawning has been successful in the Green River as juvenile pink salmon have been found in the Duwamish River estuary (Warner and Fritz 1995). However, it is unknown if the observed spawners are strays, a relict population, and a new population in the process of being established. Sea run cutthroat trout (*O. clarki*) and Dolly Varden char (*Salvelinus malma*) are also present in the Duwamish River (NMFS 1998a). Sea-run cutthroat (*O. clarkii*) occur in the project area. Resident cutthroat trout are found in the Green/Duwamish River and in Hamm Creek, 0.5 miles downstream. The large size of juvenile sea-run cutthroat at outmigration reduces their dependency on the estuary, though they can move repeatedly in and out of the estuary to feed. The outward migration of sea-run smolts would typically occur in April and May with upstream migration of adults in July through February. It is possible that sea-run cutthroat spawn in Hamm Creek. The mouth of Hamm Creek is located approximately 0.5 miles downstream (south) of the Turning Basin #3. Hamm Creek contains resident populations of cutthroat trout, sculpin (*Cottus*, spp.) and western brook lamprey (*Lampetra richardsoni*), (Divens 1997) and is used by spawning and rearing coho. A detailed list of salmon stocks and trout in the Green/Duwamish River is presented in Table 2, as well as the status of these stocks.

3.5.2 Birds

There were 58 species of birds observed over three seasons of monitoring at four Coastal America Restoration sites along the Duwamish River (Cordell *et al.* 1997), including the Coastal America Restoration site approximately 400 yards upstream of the proposed project site. Fifteen bird species were observed on the Duwamish Waterway, near Terminal 107 and the Seaboard Lumber site (approximately 5 miles downstream of project site), during previous studies conducted in 1995 and 1977-1978 (NMFS 1998a).

The Duwamish River also provides important forging habitat to waterbirds throughout the year. During previous studies conducted in 1995 and 1977-1978 (NMFS 1998a), 39 species of waterbirds were observed near Kellog Island on the Duwamish Waterway, approximately 5 miles downstream of project site.

Table 2. Salmon species and stocks found in the Green/Duwamish River. Species and stocks are derived from WDFW and WWTT (1994) unless otherwise noted. The NMFS Evolutionary Significant Units (ESU) under the Endangered Species Act (ESA) for listed or proposed species or ESU are included.

STOCK ¹	STOCK ORIGIN ²	PRODUCTION TYPE ³	ESU	ESA Status
Duwamish/Green River Fall Chinook	Mixed ⁴	Composite ⁷	Puget Sound ¹⁰	Threatened
Newaukum Creek Fall Chinook	Mixed	Wild ⁸	Puget Sound ¹⁰	Threatened
Duwamish/Green River Fall Chum	Mixed	Composite	Puget Sound /Strait of Georgia ¹¹	Not Warranted
Crisp (Keta) Creek Fall Chum	Non-native ⁵	Cultured ⁹	Puget Sound /Strait of Georgia ¹¹	Not Warranted
Green River/Soos Creek Coho	Mixed	Composite	Puget Sound/Strait of Georgia ¹²	Candidate
Newaukum Creek Coho	Mixed	Composite	Puget Sound/Strait of Georgia ¹²	Candidate
Duwamish/Green River Summer Steelhead	Non-native	Composite	Puget Sound ¹³	Not Warranted
Duwamish/Green River Winter Steelhead	Native ⁶	Wild	Puget Sound ¹³	Not Warranted
Duwamish/Green River Early Winter Steelhead	Non-native	Cultured	Puget Sound ¹³	Not Warranted
Following species or stocks are not listed in the 1994 document				
Green River Sockeye	Unknown	Wild	Not Determined	Uncertain
Green River Bull Trout ¹⁴	Native	Wild	Puget Sound	Threatened
Green River Coastal Cutthroat Trout	Native	Wild	Puget Sound	Not Warranted

Notes:

1. As defined in WDFW and WWTT (1994), the fish spawning in a particular lake or stream(s) at a particular season, which fish to a substantial degree do not interbreed with any group spawning in a different place, or in the same place at a different season.
2. The genetic history of the stock.
3. The method of spawning and rearing that produced the fish that constitutes the stock.
4. A stock whose individuals originated from commingled native and non-native parents, and/or by mating between native and non-native fish (hybridization), or a previously native stock that has undergone substantial genetic alteration.
5. A stock that has become established outside of its original range.
6. An indigenous stock of fish that have not been substantially impacted by genetic interactions with non-native stocks, or by other factors, and is still present in all or part of its original range.
7. A stock sustained by both wild and artificial production.
8. A stock that is sustained by natural spawning and rearing in the natural habitat, regardless of parentage (includes native).
9. A stock that depends on spawning, incubation, hatching, or rearing in a hatchery or other artificial production facility.
10. Meyers *et al.* (1998).
11. Johnson *et al.* (1997).
12. Weitkamp *et al.* (1995).
13. Busby *et al.* (1996).
14. Listed in WDFW SASSI (1998).
15. Johnson *et al.* (1999).

3.5.3 Mammals

No specific information on the occurrence of mammals at Turning Basin #3 has been found. Previous studies near the Seaboard Lumber site, approximately 5 miles downstream, revealed the presence of river otters, raccoons, snowshoe hare, Townsend vole, muskrat and Norway rats (NMFS 1998a). It is expected that the Turning Basin #3 site will have a small mammal community typical of disturbed urban areas along rivers. Harbor seals have been observed in Turning Basin #3 (pers. comm. Roderick Malcom, MITFD, dated May 11, 1999).

3.6 Threatened and Endangered Species and Critical Habitat Resources

Copies of the Biological Assessment, the correspondence applicable to the informal Section 7 Endangered Species Act consultation with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service, and State consultations are included in the Administrative Record. A list of Threatened and Endangered Species is found in Table 3. The U.S. Fish and Wildlife Service has determined that Peregrine Falcon is no longer an endangered or threatened species pursuant to the Endangered Species Act⁷.

Table 3. Threatened and Endangered Species

Common Name	Scientific Name	Status	Occurs at the site
Puget Sound Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	Threatened	Yes
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Threatened	Yes
Bull Trout	<i>Salvelinus confluentus</i>	Threatened	Yes
Puget Sound/Strait of Georgia Coho Salmon	<i>O. kisutch</i>	Candidate	Yes
Marbled Murrelet	<u><i>Brachyramphus marmoratus marmoratus</i></u>	Threatened	Unknown
Oregon spotted frog	<i>Rana pretiosa</i>	Candidate	Unknown

3.6.1 Chinook salmon

Puget Sound chinook salmon were listed as Threatened (Status list received 21 May 1999, Appendix A) by NMFS under the US Endangered Species Act. Chinook salmon in the Green/Duwamish River are part of the Puget Sound Evolutionary Significant Unit (ESU) (Meyer *et al.* 1998).

Green/Duwamish chinook are considered to be ocean type chinook. The Washington State Salmon and Steelhead Stock Inventory Report (SASSI) (WDFW and Western Washington Treaty Indian Tribes 1994) lists two summer/fall chinook stocks in the Green/Duwamish system: (1) Duwamish/Green summer/fall chinook; and (2) Newaukum Creek summer/fall chinook. These two populations are listed as separate stocks pending genetic analysis

⁷ Federal Register: August 25, 1999 (Volume 64, Number 164).

(WDFW and WWTT 1994). The Green/Duwamish summer/fall chinook is a composite stock with minimal influence from stocks outside of the Green River, while the Newaukum Creek stock is considered native (WDFW and WWTT 1994). Spawning occurs in the Duwamish/Green from RM 26 to the TPU Diversion Dam at RM 61, as well as in the major tributaries.

Adult chinook salmon commence entering the Duwamish Estuary in early July and the upstream migration through the estuary peaks in late August to early September (NMFS 1998a). Turning Basin #3 is a major holding area for adult chinook waiting to ascend to the spawning grounds in the Green River. Adult chinook are generally not found in the estuary after the end of the first week of October (MITFD, unpub. data). Spawning occurs in September and October with the young generally emerging from the gravel by February.

Juvenile chinook salmon are present in the Duwamish estuary from mid-February through early September, with the peak in mid to late May (Warner and Fritz 1995). The observed peak of juvenile chinook in the Duwamish Estuary and at Turning Basin #3 corresponds with the release of hatchery fingerlings (Warner and Fritz 1995). Juvenile chinook salmon densities were higher at Turning Basin #3 than at nine other sampling stations in the Duwamish Estuary between river miles 1.6 and 10.4 (Warner and Fritz 1995). This suggests that Turning Basin #3 is an important rearing area for juvenile chinook salmon. The critical, saltwater transition zone for juvenile chinook salmon appears to be located between RM 7 and 5 (Warner and Fritz 1995), an area that straddles the proposed restoration site at RM 5.2.

Chinook Critical Habitat. Chinook salmon critical habitat, as listed by NMFS Protected Resource Division, includes all marine, estuarine, and river reaches accessible to chinook salmon in Puget Sound. This includes the Duwamish/Green River.

3.6.2 Bald Eagle

The Bald Eagle (*Haliaeetus leucocephalus*) is listed as Threatened under the ESA. Bald Eagles are present in Elliot Bay all year. Elliot Bay is located approximately five miles downstream of the project site. There have been documented occurrences of eagles in the Duwamish Estuary, Kellogg Island, Lincoln Park and Seward Park. Bald Eagles were observed on the Duwamish River from September 1996 through February 1997 (Cordell *et al.* 1997). The USFWS provided a letter (March 15, 1999, Appendix A) indicating that wintering Bald Eagles might be present from October 31 to March 31 in the vicinity (Township 23N, Range 4E, Section 4) of the project.

No specific literature information on the occurrence of bald eagles at Turning Basin #3 has been found, though Bald eagles have been observed flying over Turning Basin #3 (pers. obsn. Roderick Malcom).

Present habitat at Turning Basin #3 is not conducive to Bald Eagle perching, roosting, or foraging. The site does not contain large trees suitable for perching, though eagles might be attracted to large electrical transmission towers at the Seattle City Light transformer station adjacent to the north property boundary (Corps 1998).

3.6.3 Marbled Murrelet

Marbled Murrelet (*Brachyramphus marmoratus marmoratus*) is listed as Threatened. There is no habitat at or near the site for Marbled Murrelet nesting or roosting, though Marbled Murrelets could forage or rest in the waters adjacent to the project site. No specific information on the occurrence of Marbled Murrelets at Turning Basin #3 has been found.

3.6.4 Bull trout

The bull trout (*Salvelinus confluentus*) is listed as threatened under the ESA. The USFWS provided a letter (March 15, 1999, Appendix A) stating bull trout (*Salvelinus confluentus*) might inhabit the area in the project's vicinity. The US Fish and Wildlife Service has approved a Habitat Conservation Plan for Plum Creek Timber Company, LP. that notes that bull trout are not found in the Green River above Howard Hanson Dam (US Fish and Wildlife Service and the National Marine Fisheries Service 1995, 1996). Watson and Toth (1994) also note that despite extensive surveys no bull trout have been found in the headwaters of the Green River. Native char have been found in the Green River as far upstream as RM 40; however, there is insufficient evidence to determine if these fish are fluvial or anadromous bull trout or dolly varden (US Fish and Wildlife Service and the National Marine Fisheries Service 1995, 1996). However, a bull trout was collected in the Duwamish Estuary at the project site in 1994 (Warner and Fritz 1995). The collected individual was identified as a bull trout by genetic analysis. It is unknown if this collected bull trout was of Green/Duwamish origin or a migrant from another system.

Bull trout are generally non-anadromous and live in variety of habitats. However, the Coastal/Puget sound bull trout are anadromous, migrating and maturing in Puget Sound or the Pacific Ocean. Bull trout may spend 2 to 4 years in natal streams prior to migrating to larger water bodies in transit to Puget Sound.

If bull trout do occupy the proposed project area, it is likely that the use is one of migration and feeding. Anadromous fish migrate to the ocean in the spring and return in late summer and the early fall. Spawning will not occur in the estuary. Spawning generally occurs in September and October, with some spawning in August in streams above 4,000 feet in elevation and as late as November in coastal streams. Spawning occur in low gradient stream reaches in areas of cold water, generally from 2 to 4°C. No such streams are found at or near the project area.

The migration periods of juvenile bull trout are similar to that of juvenile chinook salmon. Because of the complexities involved in the life history characteristics of bull trout, and the considerable variation among subpopulations, it is difficult to isolate and estimate how, and to what extent particular activities may impact bull trout.

3.6.5 Coho salmon

Coho salmon (*O. kisutch*) were listed as a Candidate species under the ESA by NMFS (Status list received May 21, 1999, Appendix A).

Adult coho salmon migrate upstream in late August through December (Salo and Grette 1986, WDFW and WWTT 1994). There is no distinct peak to the upstream migration (MITFD, unpub. data). All spawning occurs in freshwater. Coho salmon spawn in most of the accessible tributaries of the Green River as well as much of the mainstem river above RM 25. Additionally, coho salmon spawn and rear in Hamm Creek, whose mouth is located approximately 0.5 mile downstream (south) of the Turning Basin #3 (Divens 1997). Juvenile coho salmon migrate downstream from mid-February through mid-May. The peak of downstream migration is mid to late April which corresponds with hatchery releases (Warner and Fritz 1995). Due to their large size at outmigration, 70 to 120 mm, coho smolts are less dependent on the estuary for acclimation to salt water and growth, therefore their residence times are shorter than chum or chinook.

3.6.6 Oregon spotted frog

The Oregon spotted frog (*Rana pretiosa*) is a Candidate species under the ESA. The USFWS provided a letter (March 15, 1999, Appendix A) stating Oregon spotted frogs might occur in the vicinity of the project site. No specific information on the occurrence of the Oregon spotted frog near the project site was found. In general, frogs require moist, forest habitat with riparian and freshwater pools (Corps 1998). The absence of this type of habitat at the Turning Basin #3 suggests that frogs would not be present.

3.6.7 Species of Concern

The following are Species of Concern under the ESA. The USFWS provided a letter (March 15, 1999, Appendix A) stating the following species may occur in the vicinity of the project: Pacific Townsend's big-eared bat (*Comyorhinus townsendii townsendii*); Long-eared myotis (*Myotis evotis*); Long-legged myotis (*Myotis volans*); Olive-sided flycatcher (*Contopus cooperi*); Pacific lamprey (*Lampetra tridentata*) and River lamprey (*Lampetra ayresi*).

River lamprey were caught in the Duwamish River estuary in a beach seine during a distribution and growth study in 1994 (Warner and Fritz 1995). However, there is no suitable spawning habitat at the project site for lampreys. The nearest spawning area would be Hamm Creek.

No specific information on the occurrence of other Species' of Concern at Turning Basin #3 was found.

3.6.8 WDFW Priority Habitat and Species Program (PHSP)

The PHSP was contacted concerning potential utilization of the Duwamish River and adjacent uplands by State-listed species (May 24, 1999, Appendix A).

The following are Priority anadromous and resident fish species that occur in the vicinity (T23N, R4E, S4) of Turning Basin #3:

- 1) fall chinook salmon;
- 2) chum salmon;
- 3) coho salmon;
- 4) pink salmon;
- 5) sockeye salmon;
- 6) summer steelhead;
- 7) winter steelhead; and
- 8) bull trout.

Priority habitat maps indicate the presence, wetlands, riparian zones, estuarine zones, and urban natural open spaces in the vicinity (T23N, R4E, S4) of Turning Basin #3.

3.7 Essential Fish Habitat ⁸

The Duwamish/Green River below the Diversion Dam at RM 61 is designated as Essential Fish Habitat (EFH) for Pacific Salmon (Pacific Fishery Management Council 1999). The project site is located near the upstream extent of an estuary. Estuaries are designated as Essential Fish Habitat for numerous species of ground fish (NMFS 1998b).

3.8 Vegetation Resources

The upland area at this site contains non-native vegetation (Deodar cedar, mountain ash, Himalayan blackberry, Scotch broom, common tansy, and grasses) and landscaped native vegetation (shore pine). The largest of the four existing conifer trees is approximately four inches in diameter at breast height (dbh) and 25 feet high.

3.9 Wetland Resources

The King County Sensitive Areas Map Folio (1990) does not indicate the presence of wetlands at the project site. The entirety of the upland site is composed of fill material of various depths and composition.

There is a small wetland fringe (approximately 50 ft²) along the south property boundary that extends onto the adjacent property. The steep slope in this location confines the wetland plants to a narrow band in the intertidal zone. This emergent marsh area includes native vegetation.

⁸ Magnuson-Stevens Fishery Conservation and Management Act, 16 USC 1801 *et seq.*, 50 CFR 600-920(a).

3.10 Historical and Cultural Resources

The US Army Corps of Engineers (1997a) completed a Phase II Site Assessment that included a Cultural Resources Assessment. Report findings revealed that most of the surface fill on the site occurred after 1950. To date, no evidence of archaeological artifacts evidence has been observed date (Corps 1997b). There are two structures on site: a wharf and a small warehouse. These mid-twentieth century structures do not meet the criteria of eligibility for the *National Register*. *The closest National Register-eligible prehistoric site is a mile downstream (Corps 1997b).* The National Historic Preservation Act (16 USC 470 et seq.) and Executive Order 12898, Environmental Justice pertain to this restoration proposal.

The Muckleshoot utilizes the Duwamish River for fishing for commercial, subsistence and cultural purposes. Approximately 1 mile upstream there is a riffle in the river known as North Winds' Weir. This upstream site is of cultural importance to Native Americans.

3.11 Noise Resources/Light/Glare

This is a commercial/industrial area. Sources of background noise include automobile, boat and airplane traffic. Aircraft landing at, and departing from SeaTac airport to the south often fly over the site. These flights, at times, can generate sufficient noise to make it difficult to carry out a conversation at the proposed restoration site.

The existing building has outdoor lighting. Light and glare is common in the area from vehicles on the adjacent roads and building lighting across the river.

3.12 Recreational Resources

There are five marinas located on the Duwamish River. It is estimated that approximately 1,000 recreational boats (averaged over a year) use the Duwamish River (Jim Quinn, Quinn's Boat Sales located on the Duwamish River, pers. comm. dated May 19, 1999).

The Duwamish River provides opportunity for sport and tribal fishing. Fishing activities in the lower Duwamish River and Elliott Bay are co-managed by the Muckleshoot Indian Tribe, the Suquamish Indian Tribe and the WDFW. Fishing activity in the project vicinity is co-managed by the Muckleshoot Tribe and the WDFW. Limited recreational fishing from boats occurs in Turning Basin No. 3 due to restrictions imposed by current fishing regulations.

Kayakers and canoeists use the Turning Basin for recreational activities. It is likely that bird watchers also come to the site. Walkers and joggers use East Marginal Place. King County Parks has a right-of-way to the north and south of the project site and is in the process of completing a trail system along the Duwamish River. Upon completion, the trail will be adjacent to the riparian area of the project. When completed, the trail system is expected to bring greater numbers of walkers, joggers, and bikers by the restoration site.

3.13 Transportation Resources

The Duwamish River Turning Basin #3 is located at the upstream end of the river's maintained navigation channel. Information on the number of commercial, and recreational

boats that use Turning Basin #3 is not available, but commercial usage near the project site would be significantly reduced since the closure of marine operations at the proposed restoration site.

At any one time, there are approximately 8-10 tribal fishing boats at the Turning Basin #3 during chinook fishing season (Roderick Malcom, Muckleshoot Fisheries Department, pers. comm. dated May 5, 1999).

The project site is adjacent to West Marginal Place South. This road is a two lane arterial road that was first constructed as an access road for Seattle City Light's power station (WSDOT, Jim Ward, pers. comm. dated March 2, 1999). The posted speed limit is 30 mph. Traffic volumes on West Marginal Place South are approximately 1,439 vehicles per day (Robin Tischmack, City of Tukwila Public Works Department, pers. comm. dated April 22, 1999). The recent addition of three new trucking companies and a US Post Office have increased traffic volumes in the area (Scott Moore, City of Tukwila Public Works Department, pers. comm. dated April 22, 1999).

3.14 Soil Resources

The US Department of Agriculture (USDA) National Resource Conservation Service (USDA 1952) classifies land in this area as urban. Urban land is defined as land that has been modified by disturbance. The natural soil layer in this region has additions of fill material several feet thick in order to accommodate large industrial and housing developments. In the Green River valley of which the Duwamish River is part, the fill ranges from 3 ft to 12+ ft thick and has a texture from gravelly sandy loam to gravelly loam.

The Phase II Site Assessment, conducted by the US Corps of Engineers in 1997, determined that a release of diesel and heavy oil had occurred at two small locations on the upland portion of the site (Corps 1997a). The soil from these areas were removed by the previous property owner and subsequent testing indicated that the remaining soils in the two, remediation areas are below concentrations listed in the MTCA as requiring further action (Radix Ortega Group 1998). However, despite removal of the soils from the two spill areas, soils from the site contain polycyclic aromatic hydrocarbons (PAH) slightly above the Model Toxics Control Act (MTCA) Method B cleanup levels (Corps 1997a).

3.15 Sediment Resources

The US Army Corps of Engineers (1994) analyzed sediment samples from the site for a Phase I Assessment. Samples exceeded the state Department of Ecology's (DOE) Sediment Management Standards (SMS) for arsenic and acenaphthylene. None of the samples exceeded DOE Minimum Cleanup Levels (Corps 1997a).

Maintenance dredging of the Duwamish Waterway occurs approximately every other year. The portion of the Duwamish Waterway adjacent to the project site, but outside the work boundaries of the proposed project, is ranked "low-moderate" for sediment contaminant levels (Corps1997a).

A Phase II Site Assessment was conducted in 1997 to address concerns arising from the Phase I Analysis conducted in 1994. During sediment sampling, hydrocarbon sheens were visible in some samples; however, in each case the sheen was not on the surface of the sample, but at a depth of about 5 cm, reflecting the historical nature of the contamination (Corps1997a). The 1997 assessment concluded that sediments adjacent to the property, and the pier, did not contain contaminants above Washington State Sediment Management Standards Minimum Cleanup Levels, though two samples exceeded Sediment Quality Standard (Corps 1997a).

3.16 Water Quality Resources

The Duwamish Estuary has a simple saltwater intrusion process as a result of the dredged channel. This simple saltwater intrusion process results in minimal mixing between the salt and freshwater, which influences water quality characteristics in the river (Warner and Fritz 1995). The Turning Basin #3 is under tidal influence, and as such is flushed by tidal cycles. This flushing activity influences dissolved oxygen levels, temperature and water-column water quality. The 1996 Section 303(d) List for the State of Washington lists the Duwamish Waterway (that portion of the Duwamish River at and downstream of the project site) and River as exceeding numerous State water quality parameters.

3.16.1 Pollutants

Water quality in the Duwamish River has been severely degraded by years of industrial discharge, municipal sewage, stormwater runoff, and nonpoint source agricultural waste. Metals that have been documented in the Duwamish River estuary include: arsenic; cadmium; chromium; copper; iron; mercury; nickel; lead and zinc (NMFS 1998a). The Duwamish Waterway and River exceeds State water quality parameters for bioassay, numerous metals, and organics.

3.16.2 Dissolved Oxygen

The Duwamish Waterway and River fails to meet State water quality parameters for dissolved oxygen. Dissolved oxygen (DO) levels were normally above 7 ppm at nine sampling sites located from Duwamish River mile 1.6 to 10.4, with DO levels near saturation in the spring and lower in the late summer (Warner and Fritz 1995). However, DO levels decreased with increased water depth (Warner and Fritz 1995), with decreasing freshwater inflow and increasing water temperature. Late summer and early fall DO concentrations likely impair chinook holding, migration, and rearing.

3.16.3 Water temperature

Though the Duwamish Estuary is not listed on the 303(d) list for failing to meet State water quality parameters for temperature, water temperatures can exceed preference levels for salmonids. Surface water temperatures in the Duwamish Estuary are dependent upon the temperature in the Green River system. Surface flow temperatures ranged from 7.58°C in late March to 19.5°C in early August at nine sampling sites located between Duwamish River mile 1.6 to 10.4 (Warner and Fritz 1995). Approximately 200 feet from the proposed restoration site, water temperatures have varied from 2.5 to 17.8°C (MITFD, unpub. data). At the project site, water temperature is primarily influenced by the relative temperatures of the freshwater inflow and the salt water intruded from Elliott Bay (Warner and Fritz 1995). This saltwater intrusion profoundly influences water temperature at various depths in the Turning Basin (MITFD, unpub. data). In January, water temperatures measured at 1 m depths can increase from 2.5°C to 8.2°C over a depth of 8 m. In May, temperatures measured at 1 m depths can decrease from 17.7° to 11.6°C measured over a total depth of 4 m. In September, temperatures are more uniform decreasing from 16.6° to 13.8°C. The range of temperatures over depth is also influenced by the tidal stage. The variation in water temperature with depth provides adult and juvenile salmonids some refuge from the higher temperatures. However, in the late summer and early fall, the general range of temperatures offers no refuge from temperatures considered to exceed the preferred range.

3.16.4 pH

The 1996 Section 303(d) List for the State of Washington lists the Duwamish Waterway and River as failing State water quality parameters for pH. The pH levels at nine sampling sites along the Duwamish River ranged from 6.9 and 8.9 (Warner and Fritz 1995). However, in the Turning Basin, pH ranged from 7.1 to 8.9 as a function of depth, tidal stage and date.

3.16.5 Turbidity

The river meets Ecology water quality standards for turbidity according to the 1996 Section 303(d) list. Turbidity is mainly a function of river flow. Warner and Fritz (1995) found the highest turbidity levels at low tide. Turbidity levels at 3.25 feet below the surface of the water averaged 18.8 NTU in the estuary as a whole (Warner and Fritz 1995). Turbidity as measured in the Turning Basin over a period of several months can range from 2.0 to 122 NTUs (mean of 29 with a standard deviation of 23.8) and varies with depth and tidal stage (MITFD, unpub. data).

3.16 Public Safety

The current building and creosote treated wharf represent a fire and safety hazard. There is the possibility of arson. The abandoned building could become an attractive nuisance, or be used for a variety of illegal activities. There have been incidents of trespass at the site due to the cessation of commercial operations and the lack of a security guard. Additionally, refuse is being dumped at the perimeter of the site. Injuries could result from people attempting to enter the building or jump from the wharf. Illicit and illegal activities at the site, as well as the possibility of an accident create a need for emergency services.

3.17 Flooding

The upland portion of the site is above the 100-year floodplain, however the riverbank is armored to prevent lateral erosion of the bank that could threaten the property or the adjacent road.

4.0 ENVIRONMENTAL CONSEQUENCES

To accomplish the objectives of the project, excavation of soils, placement of fill and temporary stabilization of the lower intertidal bench will be necessary. During the construction phase of the project, there will be short-term direct and indirect impacts to the environment, some of which are unavoidable. These short-term direct and indirect impacts will be offset by modifications to the site, which are expected to result in long-term positive environmental impacts. There will be no long-term, direct, indirect, or cumulative adverse impacts to the natural environmental or resources.

4.1 Effects on Aesthetic Resources

4.1.1 Alternative 1 - No Action/Natural Recovery: This Alternative would leave the site undisturbed. Current site conditions offer an unattractive and run-down appearance. The existing adverse impacts to aesthetic resources would continue under this Alternative and adverse consequences to the site and adjacent properties would increase over time due to dumping of refuse at the site.

4.1.2 Alternative 2: The presence of construction equipment and the act of construction will have short-term adverse impacts on aesthetics. There would be long-term benefits to onsite and adjacent property aesthetics resources under this Alternative as the existing upland structures and wharf would be removed and the area revegetated with native intertidal or riparian vegetation. A small area will be established to provide public viewing of the Duwamish River and the restored site.

4.1.3 Alternative 3: Same impacts as Alternative 2.

4.1.4 Alternative 4: Same impacts as Alternative 2.

4.1.5 Proposed Alternative: Same impacts as Alternative 2.

4.2 Effects on Air Quality Resources

4.2.1 Alternative 1 - No Action/Natural Recovery: There has been improvement in air quality at the site from the termination of commercial activities. No further improvements in air quality would occur.

4.2.2 Alternative 2: There will be short-term vehicle and marine emissions during construction and pier removal. During excavation and hauling, the potential exists for suspended particles to be released into the air. There will be no long-term adverse impacts to air quality.

4.2.3 Alternative 3: Same short-term adverse and long-term beneficial impacts as Alternative 2.

4.2.4 Alternative 4: Same short-term adverse and long-term beneficial impacts as Alternative 2.

4.2.5 Proposed Alternative: Same short-term adverse and long-term beneficial impacts as Alternative 2.

4.3 Effects on Land Use Resources

4.3.1 Alternative 1 - No Action/Natural Recovery: The site is no longer available for commercial activity. Therefore, there has been a small, long-term reduction in the commercial land base. The site would be used for fish and wildlife habitat, but without added habitat improvements.

4.3.2 Alternative 2 - Three habitat benches: Long-term impacts to the commercial land base are similar to Alternative 1. The site would be used for fish and wildlife habitat, with an opportunity for limited public passive use after habitat improvements are made. The habitat area would be greater than under Alternative 1.

4.3.3 Alternative 3: Same impacts as Alternative 2.

4.3.4 Alternative 4: Same impacts as Alternative 2.

4.3.5 Proposed Alternative: Same impacts as Alternative 2.

4.4 Effects on Economic Resources

4.4.1 Alternative 1 - No Action/Natural Recovery: The property was purchased with a restrictive covenant mandating that the site be used for habitat restoration purposes. Thus, no future commercial use can occur at the site. There would be no significant adverse impacts to economic resources under this Alternative. Natural recovery at the site over the long-term may increase fish production and income derived from fishing.

4.4.2 Alternative 2: Same potential adverse impacts as Alternative 1. However, there is a greater potential for increased fish production and therefore, indirect economic benefits. A potential increase in tribal or recreational fishing at Turning Basin #3, or an increase in salmon production due to this project would provide increased income. The extent to which the loss of income that would accrue from converting the site from commercial to non-commercial use would exceed or not exceed the direct and indirect income accrued through habitat restoration is unknown and beyond the scope of this analysis.

4.4.3 Alternative 3: Same impacts as Alternative 2.

4.4.4 Alternative 4: Same impacts as Alternative 2.

4.4.5 Proposed Alternative: Same impacts as Alternative 2.

4.5 Effects on Fish and Wildlife Resources

Threatened and Endangered Species, Species of Concerns, Priority Species, and Essential Fish Habitat are discussed in separate sections.

4.5.1 Alternative 1 - No Action/Natural Recovery: Over the long-term, there is the potential for adverse impacts to fish and wildlife habitat through continued leaching of contaminants from the treated pilings into the water and sediments.

4.5.2 Alternative 2: There would be no long-term, adverse impacts to fish or wildlife under this Alternative. There would be minor loss of exotic vegetation used by small birds and mammals due to clearing at the site. These animals would be forced to move to adjacent sites. *After the project was completed there would be an increase in onsite habitat available for birds and small mammals, a beneficial impact.* This alternative would increase connectivity between existing upstream and downstream habitat patches for fish, birds, and small mammals. Increased connectivity would benefit fish, birds, and small mammals using the adjacent properties and habitat patches.

4.5.3 Alternative 3: Same impacts as Alternative 2.

4.5.4 Alternative 4: Same impacts as Alternative 2.

4.5.5 Proposed Alternative: Same impacts as Alternative 2.

4.6 Effects on Threatened and Endangered Species and Critical Habitat Resources

4.6.1 Alternative 1 - No Action/Natural Recovery: This Alternative, over the short-term, would provide no greater better benefit for fish and wildlife than currently exists. Over the long-term, some improvements would occur as natural sedimentation: (1) filled in the depressions in the mudflats caused by grounding of barges at the site and (2) filled and covered the rip rap and concrete rubble found at the lower tidal elevations. However, this improvement will be minor.

4.6.2 Alternative 2:

Chinook salmon: During the pier removal and bank excavation phases, there is the possibility that water quality would be effected by an unavoidable increase in turbidity from the disturbed sediments and uplands. Impaired water quality can effect both adult and juvenile fish migration and use of the site. The removal of the piles and wharf and other inwater works has the potential to disturb adult or juvenile fish rearing, feeding, or holding in the vicinity. By using the erosion control measures outlined in Section 2, doing as much work as possible in the dry, and adhering to the WDFW in-stream work windows of June 15 to 1 July and 16 October to March 14 impacts to fish would be reduced. There are no mainstem spawning areas downstream of the project site that will be impaired by the turbidity. The nearest spawning area is in Hamm Creek and is suitable for coho salmon and cutthroat trout, not chinook. Furthermore, any turbidity from the project site is unlikely to move upstream against the current into the spawning areas of Hamm Creek

There would be no long-term, adverse impacts to chinook salmon or their habitat under this Alternative. The value of this area will be increased by habitat improvements at this site compared to the existing conditions and would benefit juvenile chinook salmon by:

- (1) Increased area of intertidal vegetation available for foraging;
- (2) Increased production of invertebrates consumed by juvenile chinook;
- (3) Providing overhanging riparian vegetation for detrital input and cover from predators;
- (4) Removing creosote treated pilings from the water, a potential long-term source of PAH contamination in the juvenile chinook food chain;
- (5) Root wads providing from predators and attachment points for food items; and
- (6) Increased connectivity between existing upstream and downstream habitat patches and restoration projects located on different properties.

Bald Eagle: As stated in Section Section3.6, the project site does not provide good habitat conditions for Bald Eagles due to nearby electrical transformer towers and commercial industries and lack of suitable perches. Upon maturation, planted black cottonwood planted in the riparian zone, would provide better perching conditions for immature and adult Bald Eagles. The mature riparian zone would also provide a visual and sound buffer from road traffic. Increased structure along the face of the project may trap salmon carcasses upon which eagles could feed.

Marbled Murrelet: No short- to long-term adverse impacts are expected.

Bull trout. Potential short-term adverse impacts to bull trout as the same as for chinook salmon. Improvements at the site would create cover and foraging estuarine habitat that is

presently lacking for bull trout. This would result in a beneficial impact, though the benefits would not be as great for bull trout due to their reduced dependency upon shallow water estuarine areas.

Coho salmon. Same potential short-term impacts as listed under chinook salmon. However, the extent of beneficial impacts will be less as juvenile coho are less estuarine dependent than juvenile chinook.

Oregon spotted frog. As mentioned in Section 3.6, the Oregon spotted frog's preferred habitat is currently absent at the site. Improvements at the site would create a forested riparian area, but not freshwater pools. If there is fresh water in the area and a source of immigrants, Oregon spotted frogs might eventually utilize the newly created habitat. This could result in a beneficial impact to this species. There would be no short-term or long-term, adverse impacts to Oregon spotted frogs under this Alternative.

Species of Concern. There will be some short-term construction related impacts to species of concern that occur at the site. All species of concerns would benefit from the habitat improvements at the site. There are no long-term, adverse impacts to these species under this Alternative.

WDFW Priority Habitat and Species Program (PHSP). There will be some short-term construction related impacts to these species. All these species would benefit from habitat improvements at the site. There are no long-term, adverse impacts to these species under this Alternative.

4.6.3 Alternative 3: Same impacts as Alternative 2.

4.6.4 Alternative 4: Same impacts as Alternative 2.

4.6.5 Proposed Alternative: Same impacts as Alternative 2.

4.7 Effects on Essential Fish Habitat

4.7.1 Alternative 1 - No Action/Natural Recovery: Over the long-term, there is the potential for adverse impacts to Essential Fish Habitat through continued leaching of contaminants from the treated pilings into the water and sediments.

4.7.2 Alternative 2: Soil excavation would only occur during designated time periods to avoid salmonid migration periods. Minor disturbances to fish and fish habitat would occur during the construction phase, but these impacts would be short-term in nature. Over the long-term, the proposed restoration project would increase biological diversity and improve Essential Fish Habitat. Some species of ground fish and all juvenile salmonids would benefit from increased habitat quantity and quality. The project would enhance resting areas for rearing and feeding, increase prey species and reduce environmental stresses.

Essential Fish Habitat for Pacific Salmon and Ground Fish would not be adversely impacted. Federal laws pertaining to fish and wildlife and Essential Fish Habitat will be followed to

ensure that no long-term adverse impacts would result. Consultation with NMFS regarding the Pacific Coast Groundfish estuarine composite EFH has been initiated and will be completed during the permit process. Related correspondence will be included in the Administrative Record for this project. The project will be in compliance with all state and federal permit conditions.

4.7.3 Alternative 3: Same impacts as Alternative 2.

4.7.4 Alternative 4: Same impacts as Alternative 2.

4.7.5 Proposed Alternative: Same impacts as Alternative 2.

4.8 Effects on Vegetation Resources

4.8.1 Alternative 1 - No Action/Natural Recovery: This Alternative would leave existing vegetation on site. The existing vegetation is composed mostly of non-native, invasive, or ornamental species that would not provide optimum habitat conditions for fish and wildlife. There would be no adverse impacts to existing vegetation under this Alternative.

4.8.2 Alternative 2: This Alternative would involve the removal of all non-native and probably all of the native landscape vegetation, and planting native marsh and riparian vegetation on newly created habitat benches and zones. Most of the native landscape vegetation, such as shore pine must be removed so that the banks could be cut back. This will result in the loss of three to five trees, of which only one is greater than 15 feet height. No trees at the site exceed 25 feet in height.

Removal of the existing vegetation would create an adverse impact over the immediate to short term. However, the planting of native vegetation at the site would provide better, overall habitat conditions in terms of species composition and stem density. The non-native vegetation growing along the banks of the property will be predominately replaced by intertidal vegetation. Within 15 years of planting, the planted, upland, riparian area will have trees exceeding 25 feet and in greater density than the existing condition. This alternative would increase connectivity between existing upstream and downstream marsh and riparian vegetation patches. Marsh vegetation plant on the site may become a source of colonizers for the adjacent properties, increasing the habitat value of the adjacent intertidal properties.

4.8.3 Alternative 3: Same impacts as Alternative 2.

4.8.4 Alternative 4: Same impacts as Alternative 2.

4.8.5 Proposed Alternative: Same impacts as Alternative 2.

4.9 Effects on Wetland Resources

4.9.1 Alternative 1 - No Action/Natural Recovery: There are no adverse impacts to wetland resources under this Alternative.

4.9.2 Alternative 2: This Alternative would create 6,900 ft² of new wetland. The current intertidal wetland on site is approximately 50 ft² in size and is located along the north property boundary. It would not be directly affected by construction activities. The value of the existing wetland would be increased as it would be functionally enlarged due to the newly created intertidal benches with emergent vegetation. This alternative would increase connectivity between existing upstream and downstream, marsh and riparian vegetation patches. Marsh vegetation planted on the site may become a source of colonizers for the adjacent properties, increasing the habitat value of the adjacent intertidal properties. There are no direct short- or long-term adverse impacts to wetland resources under this Alternative.

4.9.3 Alternative 3: This Alternative would create 8,100 ft² of new wetland at Turning Basin #3 project site. The benefits would be similar, but increased compared to Alternative 1. Adverse impacts are similar to Alternative 2.

4.9.4 Alternative 4: This Alternative would create 14,150 ft² of new wetland at Turning Basin #3 project site.

4.9.5 Proposed Alternative: This Alternative would create 12,550 ft² of new wetland at Turning Basin #3 project site. The benefits would be similar, but increased compared to Alternative 1. Adverse impacts are similar to Alternative 2.

4.10 Effects on Historical and Cultural Resources

4.10.1 Alternative 1 - No Action/Natural Recovery: There are no adverse impacts to historical and cultural resources under this Alternative.

4.10.2 Alternative 2: The EB/DRP has concluded there are no low income or ethnic minority communities that would be affected adversely by the proposed restoration activities. The restoration proposal complies with National Historic Preservation Act (16 USC 470 et seq.) and Executive Order 12898, Environmental Justice. The proposal will not adversely impair the extent to which the Muckleshoot Indian Tribe utilizes the Duwamish River for fishing for subsistence and cultural purposes. There will be no impact to known cultural or historical resources or artifacts since known sites are located hundreds of yards away from the project site. However, despite the filled nature of the site, there is always the potential that excavation of material will expose unknown cultural resources or artifacts. If during construction and excavation, cultural or historic artifacts are found, an archaeologist will be sent to the site to take the necessary precautions to preserve the remains or materials. The State Historic Preservation Office, the Muckleshoot Indian Tribe and the Suquamish Indian Tribe will be informed, as applicable. The project will not effect historical or cultural resources located on other properties in the Duwamish River.

4.10.3 Alternative 3: Same impacts as Alternative 2.

4.10.4 Alternative 4: Same impacts as Alternative 2.

4.10.5 Proposed Alternative: Same as impacts as Alternative 2.

4.11 Effects on Noise Resources/Light/Glare

4.11.1 Alternative 1 - No Action/Natural Recovery: There would be no adverse, noise impacts under this Alternative. Cessation of the former commercial operation has reduced noise, light and glare at the site. The no action alternative will have no effect on existing noise, light or glare.

4.11.2 Alternative 2: There would be short-term noise impacts both, on and off the site during pier removal, building demolition, and bank excavation. Noise, light, and glare impacts will be mitigated by following applicable regulations and permit conditions. No noise impacts are expected during the planting stage of this project. Upon maturation, the planted riparian area would provide a sound buffer from road noise and lighting. There would be no long-term, adverse noise impacts under this Alternative.

4.11.3 Alternative 3: Same as impacts as Alternative 2.

4.11.4 Alternative 4: Same as impacts as Alternative 2.

4.11.5 Proposed Alternative: Same impacts as Alternative 2.

4.12 Effects on Recreational Resources

4.12.1 Alternative 1 - No Action/Natural Recovery: There would be no adverse impacts to recreational resources under this Alternative. However, the existing building would block certain views of the Turning Basin from Marginal Place as well as the proposed King County Parks trail.

4.12.2 Alternative 2: A restrictive covenant dated November 8, 1996 mandates that development at the site is restricted to fish, wildlife habitat, and restricted passive public use. No onsite, short- or long-term adverse impacts to recreation are anticipated from this alternative since the project site. Removal of the existing building would improve the public's view of the Turning Basin as well as enhance the view of the restoration site from Marginal Place, providing a beneficial offsite consequence.

There would be a public viewing/educational area established under this alternative. Interpretive areas and signs would constitute only small component of the project area to maximize ecosystem re-establishment potential and minimize long-term maintenance requirements (Muckleshoot Indian Tribe Fisheries Department 1997). King County Parks is developing a trail along Marginal Way, between the road and the river. The proposed trail alignment would place the trail at the edge of the proposed riparian area, offering trail users the opportunity to view the restoration site. Removal of the wharf structure would remove an obstacle in Turning Basin #3, and therefore benefit canoe and kayak recreation. The project will have long-term benefits for adjacent recreational use.

4.12.3 Alternative 3: Same impacts as Alternative 2.

4.12.4 Alternative 4: Same impacts as Alternative 2.

4.12.5 Proposed Alternative: Same impacts as Alternative 2.

4.13 Effects on Transportation Resources

4.13.1 Alternative 1 - No Action/Natural Recovery: There are no adverse impacts to transportation under this Alternative.

4.13.2 Alternative 2: There would be short-term impacts to river and vehicle traffic by increased heavy machinery in the area. Work would begin in July and last through December 2000, though the work would not be continuous. Traffic would be impacted during construction work hours (8 hrs/day, for 5 days/week) by the movement of vehicles containing construction workers and supplies. The project is expected to generate approximately 20 round trips a day. Sufficient parking is available on and off the site to avoid impacts to adjacent properties.

During demolition, excavation, and pier removal activities, there would be an increase in traffic on West Marginal Way Place South and in the Duwamish River. It is estimated that the initial removal and construction phase would be completed within four months.

After excavation and planting of vegetation, maintenance work would be required for approximately eight months to establish planted vegetation. There would be no impacts to traffic during the vegetation maintenance phase of this project as this activity would involve less than two vehicles per week.

The removal of the wharf will increase the area of water available for commercial vessels and barges to turn. There are no long-term, adverse impacts to transportation under this Alternative.

4.13.3 Alternative 3: Same impacts as Alternative 2.

4.13.4 Alternative 4: Same impacts as Alternative 2.

4.13.5 Proposed Alternative: Same impacts as Alternative 2.

4.14 Effects on Soil Resources

4.14.1. Alternative 1 - No Action/Natural Recovery: There would be no adverse impacts to soil resources under this Alternative.

4.14.2 Alternative 2: This Alternative would remove existing soil, which could result in an adverse impact from possible erosion exposure of low-level contaminants in the soil (Corps 1997a). Soil will be removed from the site and transported to an approved, off-site location, determined by the contractor. The removed creosote treated pilings and wharf apron would be transported to an authorized disposal site or stored for salvage at a suitable site. There would be no long-term, adverse impacts to soil resources under this Alternative. Restoration would improve on-site soil quality.

4.14.3 Alternative 3: Same impacts as Alternative 2.

4.14.4 Alternative 4: Same impacts as Alternative 2.

4.14.5 Proposed Alternative: Same impacts as Alternative 2.

4.15 Effects on Sediment Quality Resources

4.15.1 Alternative 1 - No Action/Natural Recovery: This Alternative would leave sediments and the existing wharf undisturbed. The creosote-treated pier pilings would continue to decompose and leach contaminants into the water. There would be adverse impacts to onsite and adjacent sediment quality under this Alternative as creosote, or its degradation products, leach from the pilings.

4.15.2 Alternative 2: This Alternative could result in short-term, adverse impacts to sediments during pier removal. However, the majority of sediment samples taken at the site did not exceed the Washington State Sediment Management Standards Minimum Cleanup Levels, so release of contaminants from sediments would be minimal (Corps 1997a). To further reduce short-term potential impacts, a blanket of sand would be laid down around pilings during pier removal to minimize sediment disturbance and potential release of contaminants. There would be no long-term, adverse impacts to onsite or off-site sediment quality.

Removal of the pier will eliminate direct sources of water contamination at the site (Corps 1997a). The removal of the wharf and piles will prevent the possibility of future leaching of creosote and PAHs into the sediments. *Pier removal will improve long-term sediment quality in the project area.*

4.15.3 Alternative 3: Same impacts as Alternative 2.

4.15.4 Alternative 4: Same impacts as Alternative 2.

4.15.5 Proposed Alternative: Same impacts as Alternative 2.

4.16 Effects on Water Quality Resources

4.16.1 Alternative 1 - No Action/Natural Recovery: This Alternative would leave the existing pier intact. The creosote-treated pier pilings would continue to decompose and leach contaminants into the water. There would be long-term adverse impact to onsite and off-site water quality resources under this Alternative if the pier is not removed.

4.16.2 Alternative 2 - Three habitat benches: This Alternative will result in short-term, adverse impacts from increased turbidity during the removal of the pier and bank excavation. Erosion control measures include the use of silt fences, as applicable, and other BMPs. Erosion control measures would be taken during excavation by installing a silt fence at the construction area perimeter. As excavation progresses toward the final finished grades, the silt fence would be repositioned to the next targeted excavation perimeter. The project will

not influence water temperature, pH, or dissolved oxygen. There will be no long-term, adverse impacts to onsite or off-site water quality. Removal of the pier will eliminate direct sources of water contamination at the site (Corps1997a) and to adjacent properties and thereby improve long-term water quality.

4.16.3 Alternative 3: Same impacts as Alternative 2.

4.16.4 Alternative 4: Same impacts as Alternative 2.

4.16.5 Proposed Alternative: Same impacts as Alternative 2.

4.17 Effects on Public Safety

4.17.1 Alternative 1 - No Action/Natural Recovery: The existing building and creosote treated wharf would remain. These structures would continue the existing potential need for emergency services to respond to accidents, fire, or illegal activity at the site. The dumping of refuse at the site would continue.

4.17.2 Alternative 2 - Three habitat benches: Existing hazardous, wooden structures on site will be demolished. This would eliminate the risk of arson activity on site and substantially reduce the probability of illegal activity at the site. There will be significantly reduced requirements for fire, police, and emergency services over the long term as the structures most likely to generate the need for such services will be removed. During construction, there will be a small potential increase in the requirement for such services because of the construction activity.

4.17.3 Alternative 3: Same impacts as Alternative 2.

4.17.4 Alternative 4: Same impacts as Alternative 2.

4.17.5 Proposed Alternative: Same impacts as Alternative 2.

4.18 Effects on Flooding

4.18.1 Alternative 1 - No Action/Natural Recovery: There will be no change from the current situation.

4.18.2 Alternative 2 - Three habitat benches: The project will not increase the level of the 100-year flood plain, nor increase flooding potential on adjacent properties. As the project involves the net removal of hundreds of cubic yards of material from below the OHWM, the project will have no short- or long-term adverse impacts upon flooding due to encroachment into the floodplain. The restored bank will be at a much shallower grade than the existing bank and should be stable. Existing projects in the Turning Basin have been shown to have stable slopes at approximately the same grades as the proposed finished grades project. Additionally, much of the upland material close to the road will not be removed and thus will provide a buffer in case there is a sudden, unanticipated bank failure along the river.

4.18.3 Alternative 3: Same impacts as Alternative 2.

4.18.4 Alternative 4: Same impacts as Alternative 2.

4.18.5 Proposed Alternative: Same impacts as Alternative 2.

4.19 Summary of Environmental Consequences

4.19.1 General

The adverse, direct and indirect, site specific impacts of the four action alternatives are roughly comparable. Site specific, short-term adverse impacts to the natural and built environmental will be mitigated. After evaluating the potential environmental consequences associated with each of the alternatives, the Panel decided that their selection of Alternative 5 had the greatest potential for beneficial impacts to the natural environment, fish and wildlife, and endangered species.

4.19.2 Controversial Impacts

The Panel participants believe that this restoration project, under any action alternative, would pose no uncertain or controversial risks to the natural or built environment. All construction activities proposed at the site are common to routinely approved maintenance and restoration projects in the Duwamish Estuary.

4.20 Cumulative Impacts

The project is designed to restore and enhance fish and wildlife habitat and will not have any significant adverse, direct or indirect, cumulative impacts upon the environment. It is likely that this project will slightly reduce the cumulative impacts of habitat alteration and degradation that have occurred in the Duwamish Estuary. Creation of additional estuarine habitats such as this proposed project would be valuable to chinook salmon and would result in positive cumulative effects in the Duwamish River for these species, other natural resources, and their habitats by increasing habitat types that are now rare. In concert with existing and proposed estuarine restoration and mitigation projects in this part of the Duwamish Estuary, the project will have cumulative, beneficial consequences through increased habitat connectivity between patches, increased effective patch size and decrease anthropogenic disturbance of intertidal and shallow, subtidal habitats.

5.0 SELECTION OF THE PREFERRED ALTERNATIVE

Alternative 1, the No Action alternative was not selected, though it met the legal requirements for complying with the settlement, it did not meet the Program's goals and objectives. Since purchase of the site and subsequent removal of the existing barges and business operations created an increase in accessible intertidal mudflat for fish and wildlife, and decreased potential water quality impacts, the legal requirements of the settlement agreement have been met. However, because nearly 98 percent of the riparian vegetation, estuarine wetlands and marsh vegetation in the Duwamish Estuary have been lost due to development activities, the Panel believes that restoring these habitats are mandatory to benefit fish and wildlife populations that have declined because of habitat loss and degradation. This Alternative will not restore these lost habitat functions and their benefits to fish and wildlife, and therefore will not be further considered in this evaluation.

Alternatives 2, 3 and 4 were not selected since though these alternatives will benefit fish and wildlife and restore lost habitat functions, they would not maximize the benefits provided by marsh and riparian vegetation. These alternatives have therefore not been further considered in this evaluation.

6.0 CONSULTATION, PERMIT AND REVIEW REQUIREMENTS

6.1 General

The Concept Document (Elliott Bay/Duwamish Restoration Program 1994) references a number of area programs which may be potentially applicable to this project. The project manager will ensure that there is coordination, where applicable. There are also a number of potentially relevant laws, regulations, and policies that need to be considered during the development of this restoration project as well as several regulatory requirements which are typically evaluated during the federal and state permitting processes. A supplemental listing of these requirements has been included in the Administrative Record.

6.2 Biological Assessment

A Biological Assessment has been prepared for chinook and coho salmon and bull trout in the project area.

6.3 Joint Aquatic Resource Permits Application (JARPA)

The following permits (Table 4) were applied for by the Muckleshoot Indian Tribe during the submission for JARPA form. The permits will be issued upon receipt of the final NEPA EA and SEPA documents:

Table 4. List of required permits.

Permit	Issuing agency	Status
Section 404	Army Corps of Engineers	Applied April 12, 1999
HPA	WDFW	Applied April 12, 1999
Aquatic Resources Use Authorization Notification	DNR	Applied April 12, 1999
Substantial Shoreline Development Exemption	City of Tukwila	Applied April 28, 1999

6.4 City of Tukwila Permits

The following permits are issued by the City of Tukwila and will be applied for by the chosen construction firm for this project:

- 1) Demolition Permit
- 2) Hauling Permit
- 3) Miscellaneous Permit (Land altering and bank restoration)

7.0 BUDGET SUMMARY

Total project restoration costs are estimated at \$639,000 divided as follows: \$117,000 for planning, design, permitting and environmental review; \$420,000 for construction; and \$100,000 for maintenance and stewardship.

8.0 LIST OF PREPARERS

Table 5. List of people that prepared this report.

Name	Company/ Organization	Contributions	Expertise
Marian Berejikian	Fish Pro, Inc.	Fisheries Affected Environment Environmental Consequences	Fisheries, vegetation
Rick Covert	Fish Pro, Inc.	Design	Project design, construction mitigation measures and BMPs
Roderick Malcom	Muckleshoot Indian Tribe Fisheries Department	Fisheries, Water Quality, Affected	Fisheries, environmental review

9.0 LIST OF AGENCIES, AND ORGANIZATIONS CONSULTED

U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
U.S. Department of the Interior, U.S. Fish and Wildlife Service
U.S. Army Corps of Engineers
U.S. Department of Agriculture, National Resource Conservation Service
Suquamish Tribe
Muckleshoot Indian Tribe Fisheries Department
Washington State Department of Ecology
Washington State Department of Fish and Wildlife
Washington State Department of Natural Resources
King County Department of Natural Resources
City of Seattle
City of Tukwila
Seattle City Light

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