BIOLOGICAL ASSESSMENT

Fremont Bridge Approach Replacement Project

Prepared for

Seattle Department of Transportation

April 2004

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Executive Summary

The Seattle Department of Transportation (SDOT) is proposing to replace the north and south approaches to the Fremont Bridge, in Seattle, King County, Washington. The approach structures are structurally deficient and functionally obsolete, and they were not designed to withstand the force of a major earthquake.

The proposed Fremont Bridge approach replacement project is located in a highly urbanized area in Township 25 North, Range 4 East, and Sections 18 and 19. The bridge crosses over the Lake Washington Ship Canal (the Ship Canal), which carries water from Lake Washington and Lake Union through the Hiram Chittenden Locks to Puget Sound.

This biological assessment has been conducted in accordance with Section 7(c) of the federal Endangered Species Act of 1973. The purpose of this assessment was to determine whether any protected species are present within the project area and whether they or their habitats will be adversely affected by the proposed Fremont Bridge approach replacement project. Information from the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries), the U.S. Fish and Wildlife Service, and the Washington Department of Fish and Wildlife indicates the presence of three threatened species (bald eagle, bull trout, and chinook salmon) and one candidate species (coho salmon) within the project area.

The construction activities associated with this project are planned to begin in 2005 and are estimated to last for approximately 18 months. In-water work will occur only during the WDFW designated window: from October 1 through August 15. The project components include replacing the bridge approach structures, replacing an underwater cable, replacing the bridge Operations and Maintenance Shop, incorporating water quality treatment vaults, reconstructing two outfalls for stormwater runoff from the Fremont Bridge approaches, upgrading the bascules electrical and mechanical system, and providing seismic upgrades and strengthening to the North 34th Street off-ramp. The new bridge approach structures will be located in the same location as the existing structures. The Operations and Maintenance Shop will also be rebuilt in the same general existing location, with some possible modification of the building footprint within the project area. The design for the new bridge approaches and roadway will be consistent with the City of Seattle *Street Improvement Manual*, the City of Seattle *Standard Plans and Specifications for Road, Bridge, and Municipal Construction*, and the Washington State Department of Transportation (WSDOT) *Design Manual*.

An existing cable that houses communication (and control) wires currently lies along the sediment surface in the Ship Canal, parallel to the Fremont Bridge. This cable will be replaced with a new cable. It is not expected that the original cable will be removed as part of this project. The new cable will be laid upon the sediment layer at the bottom of the canal by allowing it to sink by its own weight slowly through the water column.

To avoid or minimize potential impacts due to construction, the proposed project will implement best management practices, which will adhere to the *Seattle Department of Transportation*

Environmental Procedures Manual and the WSDOT *Local Agency Guidelines (LAG) Manual*. The best management practices are considered part of the proposed project upon which the effect determination in this biological assessment are based.

All potential impacts associated with the proposed project will be minimized by those best management practices that are proposed as part of this project. If the project results in any impacts on the Ship Canal, they are expected to be temporary and minor in nature. The project is expected to improve the overall water quality at the project site by treating stormwater that currently enters the Ship Canal untreated.

This project **may affect but is not likely to adversely affect bald eagles** for the following reasons:

- There are no bald eagle nests within a 1-mile radius of the project area.
- Bald eagles that migrate through the project area have likely become acclimated to the noise that is typical of the urban environment.

This project **may affect but is not likely to adversely affect marbled murrelets** for the following reasons:

- There are no marbled murrelet nests within a 1-mile radius of the project area.
- Marbled murrelets that migrate through the project area have likely become acclimated to the noise that is typical of the urban environment.

This project **may affect but is not likely to adversely affect bull trout**. Bull trout may be adversely affected by the project for the following reasons:

- The activities associated with the construction of the bridge approaches could result in sediment delivery to the Ship Canal if the best management practices were to fail.
- There will be in-water work associated with stormwater outfall reconstruction and placement of the underwater cable.

However, bull trout are not expected to be adversely affected by the proposed project because best management practices will be implemented to avoid or minimize all potential direct and indirect adverse effects of construction activities, such as sedimentation and accidental spills of construction-related chemicals.

This project **may affect but is not likely to adversely affect chinook salmon**. This determination is based on the same rationale as that provided for the potential effects on bull trout.

This project **is not likely to significantly impact coho salmon** within the Ship Canal. If, at a later date, the coho salmon is listed as a threatened species, this project **may affect but is not likely to adversely affect coho salmon**. This determination is based on the same rationale as that provided for the potential effects on bull trout.

Overall, the proposed project **will not adversely affect essential fish habitat for Pacific salmon**. It is likely to improve essential fish habitat over the long term by treating all potentially contaminated stormwater runoff from the project site.

Introduction

The Seattle Department of Transportation (SDOT) is proposing to replace the north and south approaches to the Fremont Bridge (the elevated roadway structures that lead to the double-leafed portion of the bridge). The existing approaches are structurally deficient and functionally obsolete, and they need to be replaced. The approaches, which were opened to traffic in 1917, are now 85 years old, cracked, and in a generally deteriorated condition. The approaches were not designed to withstand the force of a major earthquake. The proposed new approaches will be built according to current design standards, ensuring many more years of predictable and safe service to the community. This project is partially funded by federal bridge replacement funds, through a Bridge Replacement Advisory Committee grant. The remainder of the funds are from local sources.

The proposed Fremont Bridge approach replacement project is located in Seattle, King County, Washington (Figure 1). The Fremont Bridge is located in a highly urbanized area in Township 25 North, Range 4 East, and Sections 18 and 19. The bridge crosses over the Lake Washington Ship Canal (the Ship Canal), which conveys water from Lake Washington and Lake Union through the Hiram Chittenden Locks to Puget Sound.

Herrera Environmental Consultants was hired by SDOT to conduct this biological assessment, which has been conducted in accordance with Section 7(c) of the federal Endangered Species Act of 1973. This biological assessment is documentation for a National Environmental Policy Act (NEPA) Categorical Exclusion/State Environmental Policy Act (SEPA) Determination of Non-Significance (DNS). This biological assessment is not documentation for an Environmental Impact Statement. The purpose of this assessment was to determine whether any protected species are present within the project area and whether they or their habitats will be adversely affected by the proposed Fremont Bridge approach replacement project.

Information from NOAA Fisheries (2003) and the US Fish and Wildlife Service (2003) indicates the potential presence of the following species in the vicinity of the proposed project site:

Listed species: Bald eagle
Marbled murrelet
Bull trout
Chinook salmon.

Candidate species: Coho salmon.

Proposed species: None.

Correspondence from USFWS and WDFW is included in Appendix A. The NOAA Fisheries Switchboard to ESA Listing Pages website link is included in the reference section of this report.

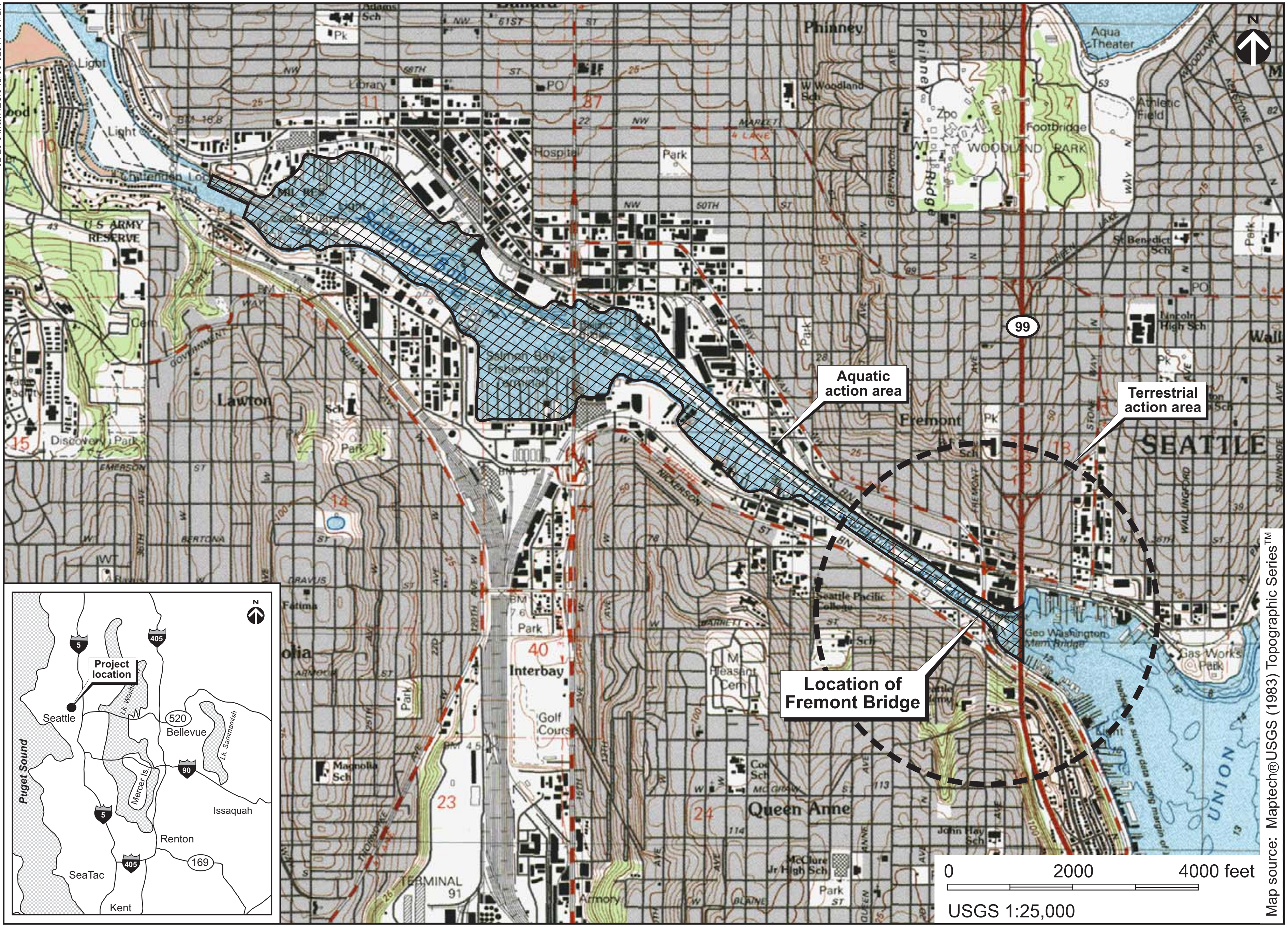

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Figure 1. Vicinity map showing the action area for the Fremont Bridge approach replacement project in Seattle, Washington.

Project Description

The proposed Fremont Bridge approach replacement project was partially designed by Parsons Brinckerhoff, who was hired to assist SDOT in the proposed project.

Project Considerations

According to Parsons Brinckerhoff (PB 2003), the following general project considerations were taken into account during the design of this project:

- Maintaining the existing bridge structural width of 78 feet
- Retaining trail configurations on the north and south sides of the Ship Canal at or near their existing configurations
- Minimizing construction impacts on businesses, communities, Ship Canal users, bridge users, and the environment
- Keeping the bridge open for the duration of the proposed project, rather than closing the bridge completely to traffic. One lane will be kept open in each direction at all times during the weekdays, with a maximum of 10 weekend closures estimated throughout the course of construction.
- Maintaining the existing clearance of 22 feet, 6 inches over the South Ship Canal Trail. Maintain a minimum clearance of 16 feet, 6 inches over the Burke-Gilman Trail
- Maintaining the existing structure height over the railroad right-of-way and South Ship Canal Trail on the south approach.

In addition, consideration was given to the following hazardous material handling and waste disposal issues:

- A lead and asbestos environmental site assessment (Phase I) will be undertaken prior to demolishing the existing approaches and Operation and Maintenance Shop. If any lead or asbestos is found, it will be abated. However, most of the existing bridge is concrete; therefore, lead is not expected to be an issue.
- The contractor will dispose of all waste material generated by the project at a waste site (or sites) that is acceptable and approved by the City. No new waste disposal sites or facilities will be created by the project.

Proposed Action

Project Components

The project consists of various components, including the bridge approach structures, upgrading the bascule's electrical and mechanical system and providing seismic upgrades and strengthening to the North 34th Street off-ramp, underwater cables, Operations and Maintenance Shop, drainage configuration, pedestrian and vehicle access routes, construction equipment, construction sequence, and best management practices (BMPs). Each of these components is discussed and described below.

Bridge Approach Structures

The new bridge approach structures will be constructed in the same locations as the existing structures, to facilitate the connection of the existing bascule span (movable) bridge portion and the existing street grid on both ends of the bridge (Sheet B-1, Appendix B). Aesthetic improvements to the bridge will reflect the unique identity of the Fremont and lower Queen Anne neighborhoods that front the north and south approaches, respectively.

The design of the new bridge approaches and roadways will be consistent with the City of Seattle *Street Improvement Manual* (Seattle 1991), *Standard Plans and Specifications for Road, Bridge, and Municipal Construction* (Seattle 2003b), the Washington Department of Transportation (WSDOT) *Design Manual* (2002), and the WSDOT *Local Agency Guidelines (LAG) Manual* (2003). There will be no wetland or floodplain filling as a result of this project. All existing grades will be restored after project completion.

The existing north and south bridge approach superstructures are each made of a cast-in-place deck, with a width of 54 feet between curbs, and an overall width of 78 feet. The existing lanes are two 9.5-foot inside lanes and two 17.5-foot outside/curb lanes. At the south end of the North 34th Street ramp, the 17.5-foot curb lane splits into two lanes, the curb lane turns east onto the North 34th Street ramp, and the middle northbound lane continues northward. Sidewalks on the east and west sides are 11 feet wide. See Appendix C, Photos 2 and 3 for south and north approach views, respectively.

The improvements to the bridge approach structures will include replacing the existing substructures and superstructures for the north and south approaches and seismically retrofitting and strengthening the north approach off-ramp. Sidewalks and railings on the approach structures will also be replaced. Traffic on the bridge will be maintained at a reduced capacity (40 to 50 percent reduction) during construction of the new structures.

Removal of Existing Bridge Structures

The entire eastern half of both the north and south bridge approaches will be removed. During the removal, two lanes of traffic will be maintained along the west side of the existing bridge and approach structures. Because of the skew angle of the existing steel beams spanning the South

Ship Canal Trail/railroad on the south approach, it will be possible to cut and remove portions of the steel beams. Therefore, extensive shoring of the remaining portions of the steel beams will be required to maintain traffic flow.

Traffic will then be moved to the just-completed eastern half of the bridge approach (see the discussion under "New Bridge Structures" within this section for a description of the construction methods). The entire western half of the north and south bridge approaches will then be demolished (and then reconstructed).

The removal of the approach structures will require no in-water excavation. At each pier location, land-based excavation will be 7 feet deep, 14.5 feet wide, and 80 feet long (PB 2003), for a total of 8,120 cubic feet of excavation material at each pier location. Excavation for the pile caps will generate material that may require treatment and/or disposal because of possible contaminants (PB 2003). All excavated material will be tested for contaminants, including U.S. Environmental Protection Agency (U.S. EPA) priority pollutants, metals, polychlorinated biphenyls (PCBs), and total petroleum hydrocarbons (TPH). If contaminant concentrations in the excavated soils exceed the regulatory levels established under the Model Toxics Control Act (MTCA) (WAC 173-340), the contaminated soils will be disposed of at a preexisting, City-approved disposal facility identified by the contractor. Disposal of materials is prescribed in *Standard Specifications for Road, Bridge and Municipal Construction*, Section 2-01.2 (Seattle 2003b).

If the excavated material is not considered contaminated, it will be disposed of at a predetermined disposal facility. This facility will be an existing permitted facility, operating independently from the proposed project.

During excavation to remove the existing bridge approach structures, ground water may be encountered. Although not expected, such an encounter is possible. In a previous study, ground water was observed at depths of 10 to 15 feet on the north side and at 12 feet on the south side of the Fremont Bridge (Shannon & Wilson 2002). If ground water is encountered, dewatering of the excavation area will be required. Any dewatering of the excavation areas will be conducted by pumping water into either Baker tanks or one of two proposed wet vaults as appropriate, prior to testing (see the discussion under "Drainage Configuration" within this section). Water that meets the state water quality guidelines will be released into the Ship Canal. Water that does not meet the state water quality guidelines will either be treated and released (see the discussion under "Drainage Configuration" for treatment descriptions), disposed of in the sanitary sewer system, or transported to an approved general treatment, storage, and disposal facility (TSDF), as appropriate. All excavations that are more than 4 feet deep will be shored.

New Bridge Structures

In its Fremont Bridge approach replacement project study of type, size, and location, Parsons Brinckerhoff (PB 2003) recommended considering micropiles for the pier foundations and south abutment and using two types of deck structure for the bridge approaches (see the following discussions under "North Approach" and "South Approach."). Micropiles will be drilled and extended up into a pile cap just below the ground surface, on which the columns, pier caps, and girders will be supported (see Sheets B-2 through B-4, Appendix B). The pile placement will require predrilling and working underneath the existing bridge deck so as to not interfere with traffic during construction of the foundation. All four lanes will be open to traffic during this portion of construction.

For each pier structure on the north approach, there will be 48 micropiles per pile cap. No micropiles will be placed in the water within the Ship Canal. No drilling spoils will be allowed to enter the Ship Canal. All drilling will occur in upland areas.

The number of spans for the bridge structure will change from the existing 32 to 12, but the overall length of the structure will remain the same. The overall width of the new structure will be 78 feet, matching the existing approaches, leaving the width (footprint) of the over-water portion of the bridge the same as the existing width (see Sheet B-5, Appendix B).

North Approach. The proposed north superstructure will consist of standard WSDOT girders with a cast-in-place concrete slab as the deck. The proposed new 534-foot north approach structure will consist of six spans with a maximum span length of 120 feet. The north substructure will consist of four column piers, supported by 8-inch-diameter micropile-supported pile caps. For the north approach, there will be five pile caps, which will require approximately 240 micropiles to be drilled into the soil. The columns will rest on a pile cap that is just below ground surface, and the pile cap will be supported by the micropiles.

The exact number of piles that will be drilled and piers that will be constructed will be determined in the final design of the proposed project. The total excavation for the north approach will be approximately 40,000 cubic feet.

South Approach. The south superstructure will consist of two different support structures. Over the railroad right-of-way, 36-inch precast, prestressed concrete bulb tee girders with a cast-in-place concrete slab will be used. The remainder of the approach will consist of a multispan, cast-in-place reinforced-concrete space frame. The proposed new 124-foot south approach structure will consist of six spans that will vary from 20 to 72 feet in length. The south substructure will be more complex than the north substructure, to accommodate the Operations and Maintenance Shop underneath the south approach and the multi-use South Ship Canal Trail that is near the approach. To meet these requirements, the south approach structure will be constructed with a series of 3-foot-diameter concrete columns supported by micropile-supported pile caps. For the south approach, the exact number of pile caps will be determined by Parsons Brinckerhoff at a later stage in the project design.

The column bents on micropile foundation will consist of four columns and a pier cap at the deck level. The columns will rest on a pile cap, which in turn will be supported by micropiles. Excavation will be required to place the pile cap. Any hazardous material will be analyzed and disposed of as discussed above. Approximately 26 micropiles will be used for each bent. The micropiles will be drilled into the substrate. A pile cap will be placed between the piles and the remaining structure, requiring excavation of soil to form and place the caps. The micropiles can be drilled beneath the existing approach deck, which will greatly reduce the impacts on the existing traffic flow.

Underwater Cables

An existing underwater cable (two cables approximately 1.5 to 3 inches in diameter within one housing) that holds communication and control wires currently lies along the sediment surface in the Ship Canal, parallel to the Fremont Bridge. This cable has been in place since 1917, when the bridge opened.

This cable will be replaced with a new cable; however, it is not expected that the original cable will be removed as part of this project. The new cable will be laid upon the sediment layer at the bottom of the Ship Canal by allowing it to sink slowly by its own weight through the water column. This work will be conducted following all applicable SDOT-prescribed BMPs for in-water work and will occur within the work window prescribed by the Washington Department of Fish and Wildlife (WDFW) for the Ship Canal (October 1 through August 15) to protect migratory fish.

Operations and Maintenance Shop

The Fremont Bridge Operations and Maintenance Shop currently is located underneath the south approach of the bridge. The existing two-story concrete structure will be removed prior to removal of the eastern half of the south approach bridge structure. The building will be deconstructed, and all material will be disposed of according to the City of Seattle standard specifications (Seattle 2003b). The extent of hazardous materials in the old construction has not been determined. There may be asbestos in the floor tile, wall boards, and wall cavities in the existing shop and office areas. Old fluorescent ballasts containing PCBs could also be present. Lead-based paint may have been used on the existing walls and shelving.

The new Operations and Maintenance Shop will be constructed under one of two design schemes: Scheme 1 or Scheme 4. It will be determined later in the project design which of these schemes will be chosen; therefore, the environmental issues associated with both are addressed here. The building areas listed below are maximum estimates of square footage, which are expected to be reduced as the project proceeds through value engineering.

Under Scheme 1, the new Operations and Maintenance Shop would be built underneath the new south approach of the bridge. Scheme 4 includes building areas under the bridge and outside the bridge on the east side of the right-of-way property that is currently a paved parking lot. Under Schemes 1 and 4, there would be no net increase in impervious surface area because all the lot area to be developed is currently covered with asphalt paving (see Sheets B-13 and B-14, Appendix B). However, Scheme 4 allows the possibility of more points to achieve a Leadership in Energy and Environmental Design (LEED) Silver certification by reducing the impervious area of the building outside the bridge through installation of a green roof system. The roof areas would be planted with pervious green material such as grass and/or shrubs where stormwater would be contained. Scheme 4 also offers greater opportunity for use of day-lighting to reduce energy use in the new building area. Both schemes could include light-colored roofs over the parking spaces to reduce the exposure of stormwater to vehicle-related pollutants and reduce the amount of heat reflected into the atmosphere from exposed black pavement.

Scheme 1

Under Scheme 1, the building would be underneath and structurally integrated with the bridge approach. The administration offices and electrical shop would be located on the second level, with access to the parking yard through the building. An open-air parking yard would be located on the south side of the shop area. The loading area would be separated on the north side of the lot to allow free access to most of the parking yard area. Scheme 1 would provide a maximum of 6,960 square feet of building area and 5,370 square feet of open-yard parking space for 10 parking spaces (see Sheet B-13, Appendix B).

Scheme 4

Under Scheme 4, most of the parking area would be underneath the bridge approach, with an approximately 1,600-square-foot shop building area structurally independent of the approach structure. A separate building with a maximum of 900 square feet on the first floor and 3,000 square feet on the second floor, providing partial covering of the parking and yard area, would be constructed at the east end of the site adjacent to the bridge and an open paved yard of 4,950 square feet and 1,100 square feet of the covered shed area (see Sheet B-15, Appendix B). The loading area would be separated from the 12 parking spaces on the north side of the lot to allow free access to most of the parking yard area (see Sheet B-15 and B-16, Appendix B).

Mechanical and Electrical Upgrade

The mechanical and electrical components of the Fremont Bridge are old, and will be upgraded as part of the bridge approach replacement project. The upgrades will include power and control service for bridge operation, traffic signal and crossing gates, potential underground power conduit service, and traffic signal interconnection and pre-emption. The methods for the mechanical and electrical upgrades on the bridge will follow City of Seattle standard practices (2000a).

Drainage Configuration

Existing Stormwater Facilities

Under existing conditions, stormwater from the existing north and south bridge approaches drains untreated directly into the Lake Washington Ship Canal via two 8-inch outfall pipes (one on each bank). These pipes discharge onto the riprap-covered banks and are not equipped with flow separators.

Proposed Stormwater Facilities

Stormwater from the new bridge approaches will continue to drain into the Ship Canal without detention, but water quality treatment will be provided as part of the proposed project, helping to improve the overall water quality in the Ship Canal. The reconfiguration of the north approach stairway into a ramp will result in a small net increase of impervious surface area. This new impervious area will not be a pollution-generating surface, as it will be used primarily by bicyclists and pedestrians (see the discussions under Pedestrian Access and Vehicle Access within this section for further descriptions of impervious surface area).

Water quality treatment facilities will be designed to treat 100 percent of the stormwater runoff volume from the project area generated by a 6-month, 24-hour storm event. Stormwater facilities for the bridge approaches will be modified to provide a wet vault in accordance with Section 4.2 of the City's *Stormwater Treatment Technical Requirements Manual* (Seattle 2000b). The wet vault will be designed with the capability for oil-water separation that results in better separation of solids than a standard oil-water separator. Alley-type catch basins (type 241A) will be located under the north approach bridge. These catch basins are intended to generate no significant stormwater flows. (The drainage plans provided on Sheet B-6 in Appendix B show the locations of wet vaults and catch basin inserts.)

Oil treatment will be provided in accordance with "high use" project requirements for road intersections with a measured average daily traffic (ADT) count of 25,000 vehicles or more on the main road and 15,000 vehicles or more on any intersecting roadway. Flows exceeding the 6-month/24-hour storm will bypass the water quality treatment process and be discharged directly to the Ship Canal without treatment.

The new bridge approach grate inlets will be connected to pipes that will run down the new columns and drain into the new catch basins. These catch basins will connect to a 12-inch pipe storm drain (PSD), which will convey stormwater from the bridge to a water quality wet vault for each approach structure.

The stormwater conveyance and water quality system will be designed in accordance with the City's *Stormwater Treatment Technical Requirements Manual* (Seattle 2000b). Detention is not required for discharge to the Ship Canal and is specifically exempted under Director's Rule 16-00 (Seattle 2000c).

The water quality vault for the north approach will be located between the second (southernmost) column bent and the pedestrian ramp just north of the Burke-Gilman Trail, under the north approach (see Sheet B-6, Appendix B). The south approach water quality vault may be located either next to the trail under the south approach or on the west side of the south bridge approach.

Outfalls

Treated stormwater from the water quality vaults will flow into two separate outfalls (one near the north approach and one near the south approach) (see Sheet B-7, Appendix B). The project is designed to minimize impacts on the Ship Canal flow by using flow separators on the outfall pipes and by modifying the outfalls according to approved methods (Seattle 2000a).

The existing outfalls for the north and south approach drainage systems will remain at their current location; however, the pipe size will be increased from 8 to 12 inches to comply with the current City of Seattle design guidelines. On the basis of the project design engineering calculations, it was determined that storm flow will not be increased by the increase in the outfall pipe diameter (Lider 2003b personal communication). The catchment area draining to each outfall will be exactly the same after the project is completed as it was before project implementation. The replacements of the 8-inch pipes with 12-inch pipes is for maintenance and upgrading purposes, and flow velocities will also be reduced by the larger diameter pipes.

Both the north and south outfalls will be positioned with their inverts (the bottom of the outfall pipe) at the high water level, which is approximately 22 feet. The low water level of the Ship Canal is 20 feet. Slope protection will be provided from the outfall inverts to 1 foot below the low water level. However, there will not be a net increase in the amount of bank armoring/riprap because some of the existing riprap will be removed and replaced with vegetation. No additional contributory surface area will be added to the outfall as a result of this project. BMPs will be implemented to ensure that any sediment debris that is generated by the outfall work is contained and does not enter the Ship Canal (see the discussion under “Best Management Practices” within this section).

The riprap that currently is stabilizing the existing outfalls will be removed and disposed of according to City guidelines, thereby improving the area around the outfalls. Red-osier dogwood (*Cornus sericea*) or willow trees (*Salix* sp.) and oceanspray (*Holodiscus discolor*) will be planted within the disturbed outfall areas (see Sheet B-8, Appendix B) to increase the shading over the shallow portion of the Ship Canal stream bank. This will maximize any potential habitat for fish, compensate for the clearing of any vegetation during construction, and provide aesthetic visual screening. A minor amount of rock material (10 cubic yards or less) will be used to assist in slope stabilization at each stormwater outfall. This rock material will not cause a net increase of impervious surface area, as an equal or larger volume of rock material will be removed and replaced with vegetation to stabilize the outfall areas (see Sheet B-8, Appendix B).

Pedestrian Access

The existing stairs leading from the Burke-Gilman Trail up to the north bridge approach will likely be widened. However, due to budget constraints, this portion of the project may not occur. If the stairs are not widened, the existing stairway structure will be reinstalled. The width of the existing north stairway is 3 feet, and the new stairs will have an approximate width of 6 feet for the flights and landings so that two people carrying their bicycles can pass each other (one going down and the other going up the stairs). The north stairs will therefore increase in width by 3 feet. The existing stairs in the vicinity of the south approach will remain exactly as they are and will not be reconstructed or replaced.

The only new net impervious area will be a result of the widened stairs to the north approach and the widening of the existing concrete foundation pads to accommodate the new widened stairs, if these actions occur. Calculations for the new net impervious area are as follows:

West stairway to the north approach:

18 feet x 6 feet = 108 square feet

3 feet x 15 feet = 45 square feet (due to slight reshaping of gravel path to and from the widened stairway)

Subtotal = 153 net square feet of new impervious area for the west stairway.

East stairway to the north approach:

18 feet x 6 feet = 108 square feet

5 feet x 10 feet = 50 square feet (due to reshaping of gravel path to and from the widened stairway)

Subtotal =158 net square feet of new impervious area for the east stairway.

The total net new impervious surface area for the project will therefore be 311 square feet, as a result of the stairway widening. This new impervious surface area is considered to be minor in terms of potential impacts on ground water recharge in the project area (see the discussion under "Direct Effects" in the Effects of the Action section for further discussion).

Vehicle Access

The Burke-Gilman Trail will be widened by 3 feet to allow temporary access for construction vehicles. The widening will occur from the Adobe east parking lot (between the Adobe Fremont Campus and the Aurora Bridge) and the Fremont Bridge north approach. The widening will occur over a portion of the existing compacted-gravel jogging portion of the Burke-Gilman Trail; therefore, it will result in no additional impervious surface area (compacted gravel roads are considered impervious according to the Washington Department of Ecology [Ecology 1992]). A short access connection will be constructed to connect the Adobe parking lot and the widened Burke-Gilman Trail. During the trail reconstruction, all project BMPs will be applied. The access connection and the temporary widening of the Burke-Gilman Trail will be removed once the project construction is completed. The landscaping and gravel path portion of the Burke-Gilman Trail will then be restored to their previously existing conditions. (See Sheet B-9, Appendix B, for the site grading and paving plans for the Burke-Gilman Trail.)

Access to the south approach will be the same as that for the north approach (via the existing street grid). Access for the construction of the south approach substructure (micropiles, pile caps, columns, and pier caps) will be the same as the current access to the Operations and

Maintenance Shop (Westlake Avenue). The parking area for the Operations and Maintenance Shop will be used for construction staging. The South Ship Canal Trail, which will be closed during the construction of the south approach, will also be used for construction staging.

Construction Equipment

Heavy equipment used for construction may include demolition equipment, backhoes, excavators, planers, dump trucks, concrete and concrete pump trucks, cranes, and a boom truck. Trucks will be used for delivery of construction equipment and material and for removal of material when portions of the existing approaches are demolished.

Construction Sequence

The Fremont Bridge approach replacement project will take approximately 30 to 34 months to complete, beginning in 2005. This time period will include approximately 18 months to replace the approaches as well as an additional six months to complete the construction of the new mechanical and electrical system. The bridge Operations and Maintenance Shop construction will follow the mechanical and electrical system work and will take up to 9 months to complete. During approach construction, full bridge operations will be maintained (two lanes of traffic in each direction and both sidewalks) for approximately the first 9 months for the approach structures, and an additional 9 months for the bridge deck replacement, totaling approximately 18 months.

The current plan assumes up to 10 full bridge closures. Although it is expected that full bridge closures would take place on nights and weekends, it is possible that some full closures could occur during weekdays. Any full closures of the bridge during weekdays would be brief. In addition, weekday closures would only take place when it was determined to be more efficient than a weekend or night closure, and with community support.

The Burke-Gilman Trail and South Ship Canal Trail would be closed in the project area due to safety concerns. Users of these trails would be detoured around areas of construction. The Burke-Gilman Trail will be closed for up to approximately 24 months and the Ship Canal Trail for up to approximately 24 months. Once the approaches are replaced and the mechanical and electrical system is completed, the Burke-Gilman Trail will be reopened. The Ship Canal Trail will be reopened once the new Operations and Maintenance Shop is completed.

The Fremont Bridge approach replacement project activities are scheduled to occur in the sequence listed below.

- Place signage at the boundaries of the construction site and mobilization area.

- Close the trails parallel to the Ship Canal: the Burke-Gilman Trail on the north side and the South Ship Canal Trail on the south side. Shift the Burke-Gilman Trail traffic to North 34th Street between Stone Way and

Phinney Avenue. Shift the south side trail traffic to the sidewalks along Westlake Avenue and Nickerson Street.

- Remove riprap from the existing outfall areas.
- Construct wet vaults and implement temporary erosion and sedimentation controls (see Sheets B-10 through B-12, Appendix B).
- Relocate utilities (water main and vaults). Provide temporary sanitary facilities for the bridge tender.
- Remove the bridge Operations and Maintenance Shop after relocating personnel. Disposal of materials is prescribed in the City of Seattle *Standard Plans and Specifications for Road, Bridge and Municipal Construction* (Seattle 2003b, Section 2-01.2). The contractor will provide a list of potential disposal sites that are preexisting and City-approved facilities.
- Construct all of the new foundations, columns, and pier caps for both the north and south approaches and the North 34th Street ramp under the existing bridge approaches. The existing bridge will be fully opened to traffic at this stage. Construct abutment and pier, including micropile or shaft drilling, if applicable.
- Demolish and reconstruct the entire eastern half of the north and south approach structures. Erect girders, replace roadway decks, construct approach slab, construct sidewalks and barriers, and install expansion joints and railings for the east side of the north and south approaches. During construction, maintain two lanes of traffic (one in each direction) and the west sidewalk along the remaining western half. For structural considerations, the eastern half of the approaches will be removed and replaced first. Because of the skew angle of the existing steel beams spanning over the South Ship Canal Trail and railroad of the south approach, it will be necessary to cut and remove portions of the steel beams. Thus, in order to maintain traffic flow, extensive shoring will be required under the remaining portions of the steel beams.
- Modify/retrofit the North 34th Street ramp (only minor modifications are anticipated to occur on the north and south bascule piers, and no over-water modification or retrofit work is anticipated).
- Move traffic to the just-completed eastern half of the bridge. Demolish and reconstruct the entire western half of the north and south approaches.
- Install the underwater cable that houses the communication and control wires. This work will be conducted following all SDOT-prescribed BMPs

for in-water work (see the following discussion under “Best Management Practices”).

- Move traffic to the final configuration (two lanes in each direction, the same as the existing configuration). Open the Burke-Gilman Trail and the South Ship Canal Trail.

Best Management Practices

BMPs are practices that are a part of the project design that are implemented to avoid or minimize impacts on plant and animal species and the environment. The following sections describe general and impact-specific BMPs that will be implemented as part of the proposed Fremont Bridge approach replacement project.

General BMPs

The proposed Fremont Bridge approach replacement project will implement BMPs to avoid or minimize construction impacts. The contractor will design BMPs in accordance with the requirements for temporary erosion and sedimentation control (TESC) described in the City of Seattle *Construction Stormwater Control Technical Requirements Manual* (Seattle 2000a). These BMPs will be supplemented as appropriate with TESC BMPs from Volume 2 of the *Stormwater Management Manual for Western Washington* (Ecology 2001). In the event of a conflict between the two manuals, the more stringent method will be required. These BMPs will adhere to the SDOT *Environmental Procedures Manual* (2003) and the WSDOT *Local Agency Guidelines (LAG) Manual* (2003) and will be considered part of the proposed project upon which the effect determinations made in this biological assessment are based.

All water and soil particles will be retained on the work site. BMPs will be implemented to reduce dust and contaminated soil from falling into the waterway. The BMPs will be monitored and maintained by a SDOT-approved inspector, if necessary. In the event that a release of turbid water occurs, the contractor will be directed to stop work and implement additional erosion and sediment controls before work is allowed to proceed.

In-water work required for the proposed project (cable replacement and outfall reconstruction) will occur during the WDFW-suggested work windows for the protection of chinook salmon and bull trout that may be present in the Ship Canal: from October 1 through August 15.

The project specifications will include language requiring that the contractor:

- Has an approved stormwater pollution prevention plan on the site at all times.

- Has an Erosion and Spill Control Lead who is certified by WSTOC/Associated General Contractors (AGC) on the site at all times during which work is performed. Turbidity will be monitored using a U.S.

EPA-approved turbidimeter to confirm that any turbid water releases do not measure more than 5 nephelometric turbidity units (NTU) above the background levels at all times. In the event that stormwater discharge turbidity exceeds 5 NTU above background, the contractor will be required to stop work and implement additional erosion controls until compliance is achieved.

- Will ensure that TESCs include early construction of the water quality wet vault, which will be used to contain stormwater runoff that may be affected by the demolition and construction activities. Water held in the wet vaults will be characterized prior to discharge to ensure that it meets the state water quality standards for discharge to the Ship Canal. In the event that there is insufficient storage volume in the wet vaults, additional temporary Baker tanks will be used to store construction water. Catch basin inserts will also be installed in adjacent drainage structures to prevent the accidental release of construction water.

The following controls will be undertaken in the following sequence, where applicable:

- Any painting over water will be appropriately enclosed and controlled to prevent any contamination, (such as dripping), of the surrounding environment.

- A spill control kit and additional containment materials will be kept on hand at the project site.

- Dust control will be implemented by directing a fog mist at any dust source. Dust controls will be implemented in accordance with BMP E2.00 of the City of Seattle *Construction Stormwater Control Technical Requirements Manual* (Seattle 2000a) and supplemented by BMP C140 of the *Stormwater Management Manual for Western Washington* (Ecology 2001). Dust emissions will also be required to meet the requirements of the Fugitive Dust Control Measures, Section 9.15, Article 9, Regulation I, of the Puget Sound Clean Air Agency.

- The contractor will be required to comply with standard concrete handling requirements. Concrete handling tools (e.g., truck and pumper washout) will be used in accordance with BMP C2.00 of the City of Seattle *Construction Stormwater Control Technical Requirements Manual* (Seattle 2000a) and supplemented by BMP C150 of the *Stormwater Management Manual for Western Washington* (Ecology 2001) when appropriate.

- A sawcutting and surfacing pollution prevention requirement will be met by the proposed project. Concrete sawcutting controls will be implemented in accordance with BMP C152 of the *Stormwater Management Manual for Western Washington* (Ecology 2001).

- A triangular silt dike (geotextile-encased check dam) will be used near the outfall reconstruction to control potential turbidity within the Ship Canal.
- Storm drain inlet protection will be implemented by the contractor.
- Construction stormwater chemical treatment will be conducted if chemicals are detected in stormwater runoff from the project site.
- Construction stormwater filtration will be conducted.

Stormwater Pollution Prevention Plan

The contractor will be required to submit a stormwater pollution prevention plan (SWPPP) that includes the following elements:

- Mark vegetation clearing limits.
- Establish construction access routes as described previously under "Vehicle Access."
- Control flow rates by storing water in Baker tanks or wet vaults for treatment as required prior to release.
- Install sediment controls.
- Stabilize soils.
- Protect slopes using polyethlene sheeting.
- Protect drain inlets using inserts.
- Stabilize outlets using rock riprap.
- Control construction pollutants using designated sites for concrete washout and proper disposal of waste concrete, as determined by the contractor.
- Conduct dewatering using Baker tanks and wet vaults.

Source Control BMPs

The following source control BMPs will be implemented as part of the proposed project:

- Preserve natural vegetation where possible.
- Stabilize entrance to construction site entrance.
- Mulch the site while planting (using bark mulch or organic compost mulch) to encourage growth of new plants.
- Use nets and blankets or plastic covering to prevent soil erosion.
- Control dust on the site by directing a fog mist at any dust source.
- Conduct sawcutting and surfacing pollution prevention by vacuuming and properly disposing of water lost during sawcutting.
- Wash the upper bridge deck using high-efficiency street sweepers. The under deck will be sprayed using straight-stream fire hoses to remove cliff swallow nests from the underside of the bridge approach, and spraying will be repeated as needed throughout the nesting period to prevent the reestablishment of nests (see discussion under "Cliff Swallow" in the Species and Habitat section). Washing will occur prior to approach demolition to minimize debris.

Runoff Conveyance and Treatment BMPs

The following runoff conveyance and treatment BMPs will be implemented as part of the proposed project:

- Establish outlet protection
- Establish storm drain inlet protection
- Use a straw bale barrier, if needed
- Use a brush barrier, if needed
- Use a gravel filter berm, if needed
- Establish a silt fence
- Use a sediment trap.

Action Area

The action area for the Fremont Bridge approach replacement project is defined as all areas within the project construction limits (i.e., all areas used for staging and mobilization, all construction areas, and all other areas specifically related to project activities), as well as adjacent and downstream areas where direct and indirect effects and effects due to interrelated and interdependent activities may occur during and following construction. The action area therefore includes all areas that may be affected by the actions associated with the proposed project including, but not limited to, the actual work site. For this project there are both terrestrial and aquatic components of the action area, which are shown on Figure 1.

The terrestrial action area for the project encompasses a 0.5-mile radius around all noise sources generated by the proposed project (Figure 1). This 0.5-mile radius represents the zone of potential disturbance for listed bald eagles due to any source of noise (USFWS 1986). Bald eagles are known to potentially exist in the project area, although there are no known nests or wintering areas within a 1-mile radius of the proposed project (WDFW 2004, provided in Appendix A).

The zone of potential aquatic impacts that may occur, if BMPs were to fail, extends downstream from the project site to the first major hydrologic change, where any turbidity would likely settle out at the front, where the two water bodies meet. This would occur at the Hiram Chittenden Locks, where the Ship Canal drains to Puget Sound. The aquatic action area would be limited to the in-water area of the Ship Canal.

Because of the presence of the locks and efforts to control salinity in the Ship Canal, tidal mixing upstream of the locks is limited (Rogowski 2000). However, a minor amount of saline water does move upstream of the locks, creating a small salt wedge at the bottom of the water column, with the salinity of pore water sediment samples mostly less than 1 part per million (ppt) (salinity during summer months has been measured in sediment pore water at concentrations as high as 12 ppt but on average remains at less than 1 ppt) (Rogowski 2000). During those months when flows in the canal are at a minimum and boat traffic is high (i.e., during the summer) and the locks operate more frequently, more salt water can move into the locks and up the canal into Lake Union, while surface waters in the canal continuously move westerly to the locks. Thus, if BMPs were to fail, no upstream effects due to the proposed project are expected because any discharge to surface waters at the project site would be expected to remain within the upper freshwater lens of the canal. The action area therefore extends only to the approximate upstream boundary of the project area (Figure 1), within the in-water limits.

Species and Habitat

A listing of protected species for the proposed project was received from the U.S. Fish and Wildlife Service on February 27, 2004 (USFWS 2004, provided in Appendix A). The USFWS provided only county-level species information (USFWS 2004). The species listed by the USFWS were cross-referenced with those identified in the Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species database (WDFW 2004) to determine which species potentially occur in the vicinity of the proposed project.

The USFWS included the following species in its list of potentially occurring species in King County, in the area of the proposed project: the Canada lynx (*Lynx canadensis*), the gray wolf (*Canis lupus*), the grizzly bear (*Ursus arctos = U.a. horribilis*), and the northern spotted owl (*Strix occidentalis caurina*). The USFWS also included the yellow-billed cuckoo (*Coccyzus americanus*), a candidate species. Although these species are listed as potentially occurring in King County, none of them is likely to be present and no suitable habitats are available in the vicinity of the proposed project because of the extensive urbanization and commercial development of the project action area. These species are therefore not discussed further in this report. The species listed by the USFWS and the WDFW that are most likely to be present in the project area are addressed in this report:

- Bald eagle (*Haliaeetus leucocephalus*): federal threatened and state threatened species

- Marbled murrelet (*Brachyramphus marmoratus*): federal threatened species and state threatened species

- Bull trout (*Salvelinus confluentus*): federal threatened species and state species of concern.

Information from NOAA Fisheries indicated that the following species may also occur in the project area:

- Puget Sound chinook salmon (*Oncorhynchus tshawytscha*): federal threatened species and state species of concern (NOAA Fisheries 2000)

- Puget Sound/Strait of Georgia coho salmon (*O. kisutch*): federal candidate species (NOAA Fisheries 2001).

Bald Eagle

Species Status

The bald eagle is currently listed as a threatened species under the Endangered Species Act. Historically, bald eagles inhabited most of the continental United States. However, by the mid-twentieth century, they were limited to a few isolated areas such as the Pacific Northwest, the Great Lakes states, and Florida.

Life History Information

In the Pacific Northwest, bald eagle populations include local nesting birds and wintering birds. Bald eagles typically breed between January 1 and August 15 in Washington state (Anthony et al. 1982). Wintering bald eagles congregate along Washington rivers between October 31 and March 31 to feed on stranded, spawned-out salmon. Wide, braided river reaches with numerous gravel bars are the optimal areas for feeding because the gravel bars catch and retain salmon carcasses and provide the eagles with unrestricted flight paths. Diurnal feeding perches selected by eagles tend to be the highest perch site overlooking a good food source. Nocturnal communal perches, on the other hand, tend to be in mature conifer stands that offer protection from cold and inclement weather.

Bald eagles appear to acclimate to traffic noise and are more tolerant of auditory disturbances when the sources are partially or totally concealed from view (Stalmaster and Newman 1979). Human activity is considered potentially disturbing to bald eagles when it occurs within 0.5 miles of a nest or roost in direct line-of-sight or within 0.25 miles when not within direct line-of-sight. Wintering bald eagles are considered less sensitive to human disturbance than are nesting eagles; however, they avoid areas with significant human activity. Eagle sensitivity appears greatest during feeding. In addition, there is no critical habitat for bald eagles currently designated.

Site-Specific Occurrence

Terrestrial habitat around the project area is highly urbanized, with roadways and buildings edging the Ship Canal on both sides. Although there are some small trees along the canal within the project area and some poplar trees further downstream, there are no significant perch trees for bald eagles. Most of the trees are small deciduous trees or ornamental saplings and shrubs (see Photo 6, Appendix C).

Bald eagles are potentially present within the project area during migration to and from Puget Sound and Lake Washington for feeding. The Washington Department of Fish and Wildlife has identified two bald eagle nests within the general vicinity of the Fremont Bridge project area, but both of these nests are more than 1 mile from the Fremont Bridge project area (WDFW 2004, provided in Appendix A). Because the proposed project is within a highly urbanized area, any eagles in the vicinity of the project site are likely to be acclimated to noises associated with automobile and shipping traffic and other noises typical of an urban setting.

It is unlikely that the Ship Canal provides foraging habitat for bald eagles that may occur in the project area, as this area does not contain gravel bars or large, overhanging perch tree branches. However, the canal could be used as a flyway for eagles traveling between Lake Washington or Lake Union and Puget Sound.

Marbled Murrelet

Species Status

The marbled murrelet is listed as a threatened species under the Endangered Species Act. There is also designated critical habitat for the marbled murrelet, consisting of 32 critical habitat units within mostly old-growth forests.

Life History Information

The marbled murrelet is a small seabird that feeds in marine waters and nests inland in mature conifers forests, west of the Cascades. Marbled murrelets winter on marine waters. During late spring and summer, reproductive adults fly substantial distances inland to establish nests in late-successional or old-growth coniferous forests. Most nesting sites are found within 40 miles of marine waters; however, they range to a distance of as much as 70 miles (Lynch 2004 personal communication). Marbled murrelets are more commonly found inland during the summer breeding season but make daily trips to the ocean to gather food and have been detected in forests throughout the year. Adult marbled murrelets approach and leave their nests at high speed, primarily at dusk and dawn or at night, making nest detection difficult. Mated pairs typically lay a single egg on a naturally occurring platform formed by the wide, mossy limbs of an old-growth tree, usually 100 feet or more above ground. The single egg hatches within 28 days, and chicks fledge at 35 to 40 days. Upon fledging, the chicks immediately fly to marine waters to begin feeding on small fishes and other aquatic animals. The breeding period in Washington is estimated to last from April to late August.

Site-Specific Occurrence

Foraging marbled murrelets may occur in the waters of Puget Sound, which is over 1 mile west of the project site. However, it is highly unlikely that marbled murrelets would be present in the vicinity of the site because of its high disturbance level and noisy urban setting (Lynch 2004 personal communication). The levels of noise and human disturbance in the vicinity of the project site are extremely high due to the proximity of I-5 and the heavily urbanized environs that are adjacent to it. In addition, marbled murrelets fly up to a mile in elevation above ground to migrate inland from foraging areas in marine waters (Lynch 2004 personal communication), a height that is well above the project activities.

The Fremont Bridge approach replacement project site does not lie within one of the 32 designated critical habitat areas for marbled murrelet. No suitable marbled murrelet nesting habitat is present in the vicinity of the project site or within the action area defined for the proposed project. The highly urbanized project site and the fragmented and immature vegetation community in the vicinity of this site are surrounded by transportation corridors and dense urban development.

Bull Trout

Species Status

The Coastal/Puget Sound bull trout population segment encompasses all Pacific Coast drainages within Washington, including Puget Sound. This population segment is discrete because the Pacific Ocean and the crest of the Cascade Mountain Range geographically segregate it from subpopulations. The population segment is significant to the species as a whole because it is thought to contain the only anadromous forms of bull trout in the contiguous United States, thus occurring in a unique ecological setting. There is currently no designated critical habitat for bull trout.

Life History Information

The bull trout occurs in four life history forms: anadromous (associated with marine waters), resident (remaining in headwater areas), adfluvial (associated with lake areas), and fluvial (associated with river areas). Fluvial, anadromous, and resident adults can spawn in the same area (WDFW 1998). After spawning, fluvial adults move throughout the upper river areas and remain in pools throughout the winter, spring, and early summer. Bull trout return to their spawning staging areas in late summer. After spawning, anadromous adults begin the downstream migration from late fall through the winter. These adults then enter the estuary area in the spring where they remain until late spring/early summer when they begin their upstream spawning run again.

Bull trout have more specific habitat requirements than other salmonids and are most often associated with undisturbed habitat with diverse cover and structure. Spawning and rearing activities are restricted primarily to relatively pristine, cold streams, often within headwater reaches. Water temperature is also a critical factor for bull trout, and areas where water temperatures exceed 15 degrees Celsius (°C) limit their distribution (Rieman and McIntyre 1993). Spawning occurs in upstream areas as water temperature decreases to approximately 8°C (WDFW 1998).

Site-Specific Occurrence

Bull trout are known to occur in the vicinity of the project area (USFWS 2004, provided in Appendix A). Bull trout that are present in the Ship Canal are likely migrating and/or feeding.

Chinook Salmon

Species Status

The Puget Sound chinook salmon was listed as a threatened species by NOAA Fisheries on March 24, 1999. The identified evolutionarily significant unit (ESU) includes all naturally spawned populations of chinook salmon from rivers and streams flowing into Puget Sound, from the North Fork Nooksack River to the Elwha River on the Olympic Peninsula. There is currently not designated critical habitat for chinook salmon.

Life History Information

The chinook salmon is the largest of the Pacific salmon, averaging 90 centimeters in length and 8 to 19 kilograms in weight. Because of their large size and inability to jump significant heights, adult chinook salmon prefer large, low-gradient rivers and streams for spawning. Consequently, the species has been significantly affected by the construction of dams in major river systems (Wydoski and Whitney 1979). Their population decline can also be attributed to degradation of water quality and loss of spawning habitat due to the effects of logging, road construction, and urbanization of streams and rivers (WDF et al. 1993).

Chinook salmon (*Oncorhynchus tshawytscha*) that spawn in the Lake Washington system are classified as ocean-type chinook salmon because after emerging from spawning gravels they spend a short period of time rearing in fresh water before they enter estuarine habitats (Fresh 2000). Ocean-type chinook salmon return to their natal streams or rivers as spring, winter, fall, summer, and late-fall runs, but summer and fall runs predominate (Healey 1991).

Chinook salmon eggs hatch in 33 to 178 days after deposition, depending on water temperatures, dissolved oxygen concentrations, and other physical and chemical factors. Stream flow, gravel quality, and silt load all significantly influence the survival of developing chinook salmon eggs. Juvenile chinook may spend from 3 months to 2 years in fresh water after emergence and before migration to estuarine areas as smolts, and then into the ocean to feed and mature. Juvenile chinook salmon feed primarily on aquatic insect larvae and terrestrial insects, typically in the nearshore areas.

In general, ocean-type juveniles migrate downstream to estuarine and marine areas during the first few months after hatching. Juvenile ocean-type chinook tend to utilize estuaries and coastal areas more extensively for juvenile rearing. Fall chinook fry usually feed for a short time, then undergo smoltification and migrate to the ocean. Some fry rear for a year, especially juveniles in systems with lakes, before smolting and migrating to the Pacific Ocean (Wydoski and Whitney 1979; Emmet et al. 1991).

During the downstream migration of juveniles, low concentrations of dissolved oxygen and high water temperatures can hamper their swimming ability. Juvenile preference for winter habitat has not been well studied. Use of the main channel, side channels, overhanging banks with cobble substrate, and backwater areas have all been reported (Healy 1991).

Site-Specific Occurrence

Chinook salmon use the Lake Union/Ship Canal system during two stages in their lifecycle: adult upstream migration and juvenile outmigration and rearing (Seattle 2003a).

The precise migration routes of adult chinook salmon through Lake Union and the Ship Canal are unknown. Adult chinook use the Ship Canal primarily as a migratory corridor, typically spending less than 1 day, but up to 2 to 3 days, in the Ship Canal system (Fresh et al. 1999). In 1999, 75 percent of the fish passed through the Ship Canal in less than 1 day. Travel time ranged from 0.2 to 7.7 days and increased with fish size (Fresh et al. 1999). At a University of Washington sample site, the earliest adult chinook salmon were detected with the use of pit tags in August of 1998 and in July of 1999 (Fresh et al. 1999).

It is not well known how juvenile chinook move through the Lake Union/Ship Canal system (Seattle 2003a). Littoral, shallow areas along the shoreline are expected to be the preferred habitat for juvenile chinook. Given that there is limited preferred habitat in the Ship Canal, the canal may serve primarily as a migratory corridor rather then a rearing and foraging area for juvenile chinook (Seattle 2003a).

Predation on outmigrating juvenile chinook is thought to be high within the Lake Union/Ship Canal system (Seattle 2003a). In addition, competition from introduced species could reduce the availability of food for juvenile chinook.

Coho Salmon

Species Status

On July 25, 1995, NOAA Fisheries determined that listing coho salmon was not warranted for the Puget Sound/Strait of Georgia ESU. However, this ESU is currently designated as a candidate for listing due to concerns over specific risk factors.

This ESU includes all naturally spawned populations of coho salmon from drainages of Puget Sound and Hood Canal, the eastern Olympic Peninsula (east of Salt Creek), and the Strait of Georgia from the eastern side of Vancouver Island and the British Columbia mainland (north to and including the Campbell and Powell Rivers), excluding the upper Fraser River above Hope, British Columbia. There is currently no designated critical habitat from coho salmon.

Life History Information

The coho salmon is an anadromous species common in many coastal streams. In general, river entry and spawn timing show considerable spatial and temporal variability. Despite this high variability, some regional patterns can be noted. Most West Coast coho salmon enter rivers in October and spawn from November to December, and occasionally into January (Weitkamp et al. 1995).

Early rearing habitat consists of shallow areas associated with backwater pools, beaver ponds, or side channels (Reeves et al. 1989). Beaver ponds and pools of all types are preferred for summer rearing (Laufle et al. 1986; Reeves et al. 1989). Overwinter habitat includes streams with mean temperatures less than 7ºC and abundant cover, mainly large woody debris (Reeves et al. 1989). Optimal rearing habitat contains a mixture of riffles and pools, abundant instream and streamside vegetation, and water temperatures that average 10ºC to 15ºC in summer (Laufle et al. 1986).

Site-Specific Occurrence

Coho salmon are known to occur in the Lake Washington/Ship Canal system. Adult coho salmon migrate through Lake Washington to reach spawning grounds in the Cedar River system and in small tributaries of lakes within the watershed. Adults begin migrating from Puget Sound into fresh water in August. They spawn from late October through December in most systems, but spawn through mid-March in the Cedar River (WDF et al. 1993). Tabor and Chan (1996) found coho smolts in south Lake Washington from April to early June, with peak abundance in early May.

Cliff Swallow

In addition to species that are protected under the Endangered Species Act, the cliff swallow (*Petrochelidon pyrrhonota*) is also present in the project area. Nests of this species have been observed on the underside of the south approach to the Fremont Bridge (Lider 2003a personal communication). Although this species is not of state or federal concern under the Endangered Species Act, it is protected under the Migratory Bird Treaty Act.

The cliff swallow is a migratory insectivorous bird. Cliff swallows generally winter in South America and arrive in the Northwest in April and May to begin nest building. Nesting generally peaks in June and July (Tate-Hall 2003 personal communication). The birds potentially nest more than once within a given season.

Under the Migratory Bird Treaty Act, it is unlawful for any person to take a migratory bird, including its eggs or occupied nests. In this context, *take* is defined as “pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, included in the terms of this Convention.” (16 U.S.C. 703)

The U.S. Fish and Wildlife Service allows for and encourages the destruction of cliff swallow nests that are found to be a nuisance, if and only if the nest is destroyed before it is completed and before egg laying activity begins (Tate-Hall 2003 personal communication). Cliff swallow nests that are present on the Fremont Bridge will need to be removed before the swallow’s arrival at the beginning of the nesting season. A permit from the U.S. Fish and Wildlife Service is not required for the removal of existing unoccupied nests (Tate-Hall 2003 personal communication).

Because the cliff swallow nests on the Fremont Bridge will be removed before the cliff swallow nesting season, no cliff swallows are expected to return to the bridge. Cliff swallow nesting season in Washington State can occur from April through as late as September, although it is more likely to range from April through June (Link 2004 personal communication). If cliff swallows do return to the Fremont Bridge during project construction, the project contractor will contact the USFWS to consult on the situation. Therefore, no impacts on nesting cliff swallows are expected as a result of the proposed project, which will occur after the existing nests have been removed. Because this biological assessment is a document written for compliance with the Endangered Species Act, the cliff swallow is not addressed further in this document.

Environmental Baseline

On July 30, 2003 Herrera biologists conducted a site visit to evaluate environmental baseline conditions within the project area. The information collected by the biologists is included in the sections below. For this biological assessment, the aquatic environmental baseline conditions and project-specific impacts are summarized in the environmental baseline and effects checklist (Table 1). The completion of this checklist was based on the Matrix of Pathways and Indicators developed for Pacific salmon by the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) (NMFS 1996). The functionality of each indicator was evaluated in terms of the criteria established by NOAA Fisheries and was rated as follows: *properly functioning*, *at risk*, or *not properly functioning*. The potential effect of the proposed project on the functionality of each indicator was then determined. This determination consisted of evaluating whether the project has the potential to *restore*, *maintain*, or *degrade* the functionality of each indicator. The existing baseline conditions for this biological assessment were evaluated at the watershed scale, with evaluations specific to the project area when appropriate.

Table 1. Environmental baseline and effects checklist for the Fremont Bridge approach replacement project.

Pathways:	Environmental Baseline Condition			Effect of Proposed Action(s)		
Indicators	Properly Functioning	At Risk	Not Properly Functioning	Restore	Maintain	Degrade
Water Quality:						
Temperature		X			X	
Sediment/turbidity			X		X	
Chemical contamination/nutrients			X		X	
Habitat Access:						
Physical barriers			X		X	
Habitat Elements:						
Substrate			X		X	
Large woody debris			X		X	
Pool frequency			X		X	
Pool quality			X		X	
Off-channel habitat			X		X	
Refugia			X		X	
Channel Conditions/Dynamics:						
Width/depth ratio			X		X	
Stream bank conditions			X		X	
Floodplain connectivity			X		X	
Flow/Hydrology:						
Peak/base flows			X		X	
Drainage network increase			X		X	
Watershed Conditions:						
Road density and location			X		X	
Disturbance history			X		X	
Riparian reserves			X		X	

The Matrix of Diagnostics/Pathways and Indicators developed by the U.S. Fish and Wildlife Service for bull trout (USFWS 1998) was used to document the environmental baseline conditions and the potential effects of the proposed project on the relevant indicators for bull trout in the Ship Canal (Table 2). These indicators and the associated rating criteria are based on scientific data related to the habitat requirements of bull trout (USFWS 1998). The functionality of each indicator was evaluated according to the criteria established by the U.S. Fish and Wildlife Service for freshwater and was rated as follows: *properly functioning*, *functioning at risk*, or *functioning at unacceptable risk*. The potential effect of the proposed project on the functionality of each indicator was then determined at the watershed scale. This determination consisted of evaluating whether the project has the potential to *restore*, *maintain*, or *degrade* the functionality of each indicator.

Basin and Drainage Configuration

The 8.6-mile-long Ship Canal includes the Montlake Cut, the Fremont Cut, and the Hiram Chittenden Locks. The entire Lake Washington drainage basin flows through the Ship Canal, which in turn flows through Lake Union, and finally into Puget Sound (see Figure 1).

Geology and Soil Characteristics

In December 1995, Shannon & Wilson prepared a geotechnical report for replacing the existing Fremont Bridge approaches (Shannon & Wilson 1995). Subsurface conditions were characterized by Parsons Brinckerhoff from three soil borings collected by Shannon & Wilson (1995) for the geotechnical study and from a review of City of Seattle files (PB 2003).

The south approach portion of the project site consists of relatively steep slopes restrained by retaining walls and bridge abutments and terraced slopes down to the south side of the Ship Canal. The north approach portion of the project site is relatively flat, sloping gently down to the north side of the Ship Canal.

Shannon & Wilson (1995) analyzed subsurface soils in an area extending out to approximately 80 to 100 feet from the project site. The results indicated that the subsurface soils near the north approach consist of 3 to 10 feet of fill comprised of loose to medium-dense silty sand with some gravel and/or organics and wood debris. The fill is underlain by 6 to 19 feet of loose to medium-dense, fine to medium sand with some silty sand or silt layers. From a depth of 10 to 22 feet, there is a layer of dense to very dense silty, gravelly sand and sandy gravel underlain by hard silt and clay.

Along the south approach there is approximately 12 feet of very loose to loose, silty, gravelly sand, clayey silt, and organic silt. A loose to medium-dense, silty sand was encountered at a depth of 12 to 22 feet, which was underlain by 16 feet of dense to very dense, silty, sandy gravel and silty, gravelly sand. At a depth of approximately 38 feet, there is hard, silty clay and clayey silt, which corresponds to the clay/silt layer observed at the north approach (Shannon & Wilson 2002).

Table 2. Bull trout matrix of diagnostics/pathways and indicators for the Fremont Bridge approach replacement project.

Pathways: Indicators	Environmental Baseline Condition			Effect of Proposed Action(s)		
	Properly Functioning	Functioning at Risk	Functioning at Unacceptable Risk	Restore	Maintain	Degrade
Subpopulation Characteristics:						
Subpopulation size	Unknown	Unknown	Unknown			
Growth and survival	Unknown	Unknown	Unknown			
Life history diversity and isolation	Unknown	Unknown	Unknown			
Persistence and genetic integrity	Unknown	Unknown	Unknown			
Water Quality:						
Temperature		X			X	
Sediment/turbidity			X		X	
Chemical contamination/nutrients			X		X	
Habitat Access:						
Physical barriers			X		X	
Habitat Elements:						
Substrate embeddedness			X		X	
Large woody debris			X		X	
Pool frequency and quality			X		X	
Large pools			X		X	
Off-channel habitat			X		X	
Refugia			X		X	
Channel Conditions/Dynamics:						
Wetted width/maximum depth ratio			X		X	
Stream bank condition			X		X	
Floodplain connectivity			X		X	
Flow/Hydrology:						
Change in peak/base flows			X		X	
Drainage network increase			X		X	
Watershed Conditions:						
Road density and location			X		X	
Disturbance history			X		X	
Riparian reserves			X		X	

Shannon & Wilson (2002) also found the levels of volatile organic compounds (VOCs) in all the subsurface soil samples except one to be equal to background levels. Samples were also screened for hydrocarbon contamination, and no evidence of contamination was found. A sawmill and lumberyard were once located at the north end of the existing bridge, and it is expected that wood debris and other foreign materials remain under the north approach.

Ground water levels were observed at depths of 10 to 15 feet on the north side and at 12 feet on the south side of the Fremont Bridge (Shannon & Wilson 2002). The overall conclusion of the geotechnical report was that liquefaction is not a significant concern for the Fremont Bridge approaches. Therefore, liquefaction is not discussed further in this report.

Water Resources

The Fremont Bridge crosses over the Ship Canal, which drains Lake Washington and Lake Union to Puget Sound. The Ship Canal serves as the migratory route for Lake Washington chinook salmon, coho salmon, and bull trout.

The Ship Canal is a freshwater system; however, periodic minute influxes of salt water from Puget Sound do occur (King County 2003, 1999). The amount of salt water entering the Ship Canal varies, based on the water volumes in both the canal and Lake Union. In 2002, daily average salinities were between 0.072 and 0.63 parts per thousand, as measured at the Fremont Bridge (Rogowski 2000). These values are less than the state threshold for salinity in the Ship Canal (1 part per thousand) (see the discussion under "Action Area" in the Project Description section). For this biological assessment, it was assumed that any upstream flow is insignificant and discountable.

Water Quality

Temperature

During the summer, surface water temperatures in the Ship Canal system can reach as high as 20 to 22°C. During the period 1999 to 2001, average temperatures in the late summer months reached 25°C (King County 2002). Air temperature appears to be the primary factor in contributing to warm lake temperatures (Weatherbee and Houck 2000). However, temperatures do not appear to be a limiting factor for juvenile salmon in the canal, because high water temperatures occur generally after the peak migration of juvenile salmonids (Seattle 2003a). Water temperature is rated *at risk* for migrating salmonids in the project action area.

The proposed project will not affect, and will therefore *maintain*, the current status of water temperature in the project action area.

Sediment/Turbidity

Historical and current industrial practices within the Ship Canal system have resulted in extensive bottom sediment contamination (Seattle 2003a). High concentrations of organic compounds from historical sawmill practices have been identified at several sites within the Ship Canal system (Parametrix 1992; Metro 1993; Herrera and Brown and Caldwell 1994). In addition, dredging in the canal has removed native substrate. During monitoring between 1998 and 2002, transparency at the mouth of the Ship Canal was determined to be between 6 and 24 feet, with an average of approximately 12 feet (King County 1999), indicating that turbidity is low at the mouth of the canal. Near the locks, measurements of transparency were approximately the same for years 1998–2002. No other transparency or turbidity data are available for the Ship Canal or Lake Union.

Despite low turbidity conditions in Lake Union and the Ship Canal during these monitoring events, water quality is highly degraded due to the highly urbanized areas adjacent to the lake. Sediment quality is also known to be degraded in the Ship Canal and Lake Union (Metro; EVS 2000). Combined sewer overflow discharges and high stormwater runoff are known to contain particulates that would increase turbidity in the system, creating elevated background turbidity levels. It is therefore assumed that sediment and turbidity conditions are *not properly functioning* in the project action area.

No sediment from the land-based excavation activity would extend to the ship canal. Activities for the two project outfalls will be conducted along either shoreline, and if BMPs were to fail, some turbidity could enter the canal. However, the proposed project will not likely significantly affect turbidity levels in the project area or in the Ship Canal system in general. Turbidity will be monitored to ensure that it is no more than 5 NTU greater than the background level (see the discussion under “Best Management Practices” in the Project Description section for a description of actions to be taken if the threshold of 5 NTU is exceeded). The proposed project will therefore *maintain* the current status of turbidity in the project action area.

Chemical Contamination/Nutrients

Lake Union experiences periods of anaerobic conditions that typically begin in June and can last until October (GLWTC 2001). This lack of mixing and a strong oxygen sediment demand in bottom waters of the lake can reduce dissolved oxygen levels to less than 1 milligram per liter (mg/L) (GLWTC 2001). During the peak outmigration of juvenile chinook salmon in June, low dissolved oxygen levels at the bottom of the lake can be a source of stress for fish (median: 4.3 mg/L), and the levels can decline to lethal levels in July (Davis 1975).

Water quality in the Ship Canal is significantly poor in comparison to that in Lake Washington and has been included on the Washington Department of Ecology’s 303(d) list of impaired and threatened water bodies on the basis of dieldrin contamination and the results of sediment bioassay tests (Ecology 1998). The Department of Ecology is currently pursuing water quality issues and cleanup of contaminated sediments in the Lake Union and Ship Canal systems (USACE 1998). Chemical contamination and nutrients are rated *not properly functioning* in the project action area.

The proposed project includes the treatment of all stormwater flowing into the Ship Canal from the Fremont Bridge approaches. None of this stormwater is currently being treated, and it flows directly into the open waterway.

At each micropile and pile cap location on land adjacent to the canal, the excavation will be 7 feet deep, 14.5 feet wide, and 80 feet long, for a total volume of 8,120 cubic feet of excavated material (PB 2003). BMPs will be implemented to contain these materials on land or to transport by truck to a contractor-determined and City-approved disposal facility (Seattle 2003b). Should

BMPs fail to capture any potentially contaminated dust or soil, some particulates may enter the ship canal. The particulates would be moved downstream, where they would settle out at the locks.

The proposed project will improve the condition of this indicator in the immediate project area, but will *maintain* the chemical contamination or nutrient status in the Ship Canal and Lake Washington drainage system.

Habitat Access

Physical Barriers

The Ship Canal serves as an important migration zone for migrating adult and outmigrating juvenile salmon (Weitkamp et al. 2000). There are no physical barriers that prevent salmon from migrating through the Lake Union/Ship Canal system, except for the partial barrier posed by the Hiram Chittenden Locks at the western end of the system, which is outside of the project action area (Seattle 2003a). However, habitat components such as off-channel areas, tributaries, pools, and overhanging banks are not present in the channelized Ship Canal. Habitat access is therefore rated *not properly functioning* in the project action area.

There will be no barriers to salmonids migrating through the Ship Canal during the proposed project construction periods. The BMPs used to contain material during the outfall reconstruction (see the discussion under “Best Management Practices” in the Project Description section for a description of BMPs) will be installed at either shoreline and will not extend into the Ship Canal and pose barriers to fish migration. The proposed project will therefore *maintain* the condition of this indicator in the project action area.

Habitat Elements

Substrate

Bank hardening with armoring and riprap along the Ship Canal has resulted in limited substrate recruitment into the canal from upland sources (Seattle 2003a). Such substrate naturally creates beaches and shallow water habitats, which are severely lacking in the Ship Canal system (USACE 1998).

The main substrate type in the Ship Canal is mixed coarse sand and mud (Toft et al. 2003), with some riprap and large cobble in the proposed project area (see Photo 9, Appendix C). Salmon use the canal for migration only and do not rely on these substrates for potential spawning habitat (Weitkamp et al. 2000). Substrate is therefore rated as *not properly functioning* in the project action area.

The proposed project will have no measurable effect on, and will therefore *maintain*, this indicator in the project action area.

Large Woody Debris

The Ship Canal is a human-made feature. Due to the channelization of the canal and the armoring of the stream banks, there is no large woody debris, present to provide high-quality habitat for salmonids. In addition, the area surrounding the canal (metropolitan Seattle) is urbanized and does not provide potential for large woody debris recruitment. This indicator is therefore rated as *not properly functioning* in the Ship Canal and project action area.

The proposed project will have no effect on, and will therefore *maintain*, large woody debris in the project action area.

Pool Frequency and Quality

Due to the channelization of the Ship Canal, the lack of large woody debris, and the lake-type nature of the system there are no natural pools that could provide good high-quality habitat for salmonids. This indicator is therefore rated as *not properly functioning* in the Ship Canal.

The proposed project will have no effect on, and will therefore *maintain*, the current status of pool frequency and quality in the project action area.

Off-Channel Habitat

Piers, bulkheads, and over-water structures throughout the Ship Canal limit any off-channel habitat or overhanging banks and vegetation that could potentially provide habitat for salmonids or salmonid prey species. The Ship Canal is a riprap-armored, channelized waterway, with no off-channel habitat for migratory salmonids. This indicator is therefore rated as *not properly functioning* in the Ship Canal and project action area.

The proposed project will not affect, and will therefore *maintain*, the condition of this indicator.

Refugia

The majority of the stream bank vegetation in the project area consists of planted, horticultural species (Photo 6, Appendix C). A single row of Lombardy poplar (*Populus nigra* 'Italica') lines the northwestern shoreline, and a cluster of immature cottonwood (*Populus balsamifera*), Himalayan blackberry (*Rubus armeniacus*), iris (*Iris* sp.), and clematis (*Clematis vitalba*) grows at the northwestern base of the existing bridge (see Photo 8, Appendix C). Vegetation on the northeastern side of the bridge is dominated by landscaping strips supportive nonnative species Himalayan blackberry and with willow-dominated (*Salix* sp.) scrub-shrub vegetation along the shoreline.

The steep bank between the access roadway and the adjacent South Ship Canal Trail is densely vegetated southwest of the bridge (Photo 8, Appendix C). The species growing in this area include a single large big-leaf maple (*Acer macrophyllum*), birch trees (*Betula* sp.), oceanspray (*Holodiscus discolor*), one shore pine (*Pinus contorta*), Himalayan blackberry, English ivy

(*Hedera helix*), and English holly (*Ilex aquifolium*). A small, open grassy area also occurs at the southwestern base of the bridge. One big-leaf maple, nonnative English ivy, and pea vine (*Vicia americana*) occur at the southeast base of the approach, and Himalayan blackberry grows along the nearby shoreline. Some large poplar trees are located downstream of the project area along the Ship Canal shorelines.

Although there is vegetation around the Fremont Bridge approaches, in general over-water structures along the Ship Canal shoreline have disrupted the growth of aquatic and stream bank vegetation which can be used by juvenile salmon as a refuge from predators. Adult salmon also benefit from overhanging vegetation which is lacking within the project action area due to the extensively modified shoreline (see Photos 3, 5, 8, and 9, Appendix C). This indicator is therefore rated as *not properly functioning* in the Ship Canal.

The proposed project will temporarily remove some vegetation at the immediate project site. However, the project will also result in the addition of larger overhanging tree species (willow and dogwood) at the project site. Although the proposed project will improve vegetation at the project site, it will *maintain* the condition of this indicator in the project action area.

Channel Conditions and Dynamics

Width/Depth Ratio

The Ship Canal was created for navigational purposes and is therefore deep and wide to accommodate shipping activity. Shallow, littoral habitats, which are used by juvenile chinook salmon to avoid predators within the Ship Canal system, have been considerably reduced through bank hardening and dredging along the shoreline (Seattle 2003a). This indicator is therefore rated as *not properly functioning* in the Ship Canal and project action area.

The proposed project will not affect, and will therefore *maintain*, the condition of this indicator.

Stream Bank Conditions

Over-water coverage, bulkheads, and shoreline armoring associated with land uses (such as marinas, shipyards, and drydocks) are extensive in the Ship Canal (Seattle 2003a). As a result, there is relatively little shallow water habitat (natural or altered), undercut banks or overhanging vegetation, or in-water plant roots along the industrialized shorelines in the majority of the canal (Weitkamp et al. 2000). However, at the project site, a small area of shallow water habitat does exist (Photo 9, Appendix C). In general, the presence of hardened shorelines and piers has severely reduced the available nearshore habitats in the action area. Bank armoring has resulted in a loss of shallow water habitat and aquatic vegetative covering that promotes prey species recruitment and protection from predators. This indicator is therefore rated as *not properly functioning* in the Ship Canal.

New vegetation planted at the stormwater outfalls on both the north and south bank of the canal will improve the stream bank conditions at the outfalls. However, the proposed project will not affect, and will therefore *maintain*, the condition of this indicator in the Ship Canal as a whole.

Floodplain Connectivity

As a human-made waterway, the Ship Canal does not have a historical floodplain. However, the creation of the canal greatly altered the natural floodplain in the Lake Washington watershed by lowering the depth of the lake by almost 10 feet (Thorson and Leopold 1997). Currently, there is no floodplain associated with the canal, as it is lined with urban development on both the north and south sides. This indicator is therefore rated as *not properly functioning* in the Ship Canal and project action area.

The proposed project will not affect, and will therefore *maintain*, the condition of this indicator.

Flow/Hydrology

Change in Peak/Base Flows

The Ship Canal links Salmon Bay, Lake Union, and Lake Washington to Puget Sound. The Hiram Chittenden Locks in Ballard provide a connection between the saltwater and freshwater systems. The locks and the adjacent fish ladder allow adult anadromous fish passage from salt water to fresh water, and a movable saltwater barrier located in the large lock reduces saltwater intrusion into the Ship Canal and Lake Washington during lock operations (USACE 1998). The Lake Washington inflow to the Ship Canal from 1980 to 1995 has been only 80 percent of the long-term historical average (1939 to 1995), resulting in reduced flows over the spillway at the locks. The locks are an important passage route for downstream migrating smolts (USACE 1998). This indicator is therefore rated as *not properly functioning* in the Ship Canal and project action area.

The proposed project will not affect, and will therefore *maintain*, the condition of this indicator.

Increase in Drainage Network

The Lake Washington drainage network, which drains via the Ship Canal into Puget Sound, has increased considerably in this century with the extensive impervious surface area lining most of Seattle. Drainage in the watershed has also increased due to the presence of roadways and their associated drainage structures. This indicator is therefore rated as *not properly functioning* in the the Ship Canal and project action area.

The proposed project will not affect, and will therefore *maintain*, the condition of this indicator.

Watershed Conditions

Road Density and Location

There is an extensive network of roads in the Ship Canal and the city of Seattle area. This indicator is considered *not properly functioning* in terms of impacts on salmonid habitat within the project action area.

The project site will be accessed via existing city roadways. The proposed project will not add new access roads that would alter the existing road density or location; therefore the project will *maintain* the condition of this indicator.

Disturbance History

The Ship Canal is a completely human-made water body. The shorelines of Lake Washington and the Ship Canal are almost completely developed and have bulkheads and other structures that have eliminated nearshore habitat for juvenile salmon migration and rearing (USACE 1998). The tributaries and rivers in the Lake Washington basin, including the Ship Canal, are lacking habitat features that promote salmon survival, such as pools, riffles, large woody debris, good sources of spawning gravel, and riparian vegetation (USACE 1998). This indicator is therefore rated as *not properly functioning* in the Ship Canal and the project action area.

The proposed project will not affect, and will therefore *maintain*, the condition of this indicator.

Riparian Reserves

The Ship Canal has experienced a substantial loss of riparian cover or riparian reserves as Seattle has developed. Bank hardening and vegetation clearing to make way for development have caused a loss of riparian cover, and this is a key factor in the overall habitat degradation within the Ship Canal area. This indicator is therefore rated as *not properly functioning* in the Ship Canal and the project action area.

The proposed project will not affect, and will therefore *maintain*, the condition of this indicator.

Effects of the Action

Direct Adverse Effects

Direct effects are caused by, and occur during, the construction process (or are caused by the removal of conservation measures installed during construction and removed after project completion). Direct effects are typically temporary. Direct effects are described below in terms of general effect, and in terms of protected species (species-specific effects) addressed in this biological assessment.

General Effects

The construction activities associated with the proposed Fremont Bridge approach replacement project will mostly be limited to land-based work, with the exception of one in-water activity (laying the underwater cable across the Ship Canal), and one activity below the ordinary high water mark but above the water level at the time of the construction (reconstructing the stormwater outfalls for the north and south approaches). Any impacts resulting from these activities will be minimized by implementing all the requirements set forth in the hydraulic project approval obtained for this project and the best management practices described in the Project Description section of this biological assessment.

Although significant impacts due to construction activities are not expected, they are possible. Construction activities that may disturb steep slopes directly adjacent to the south bridge approach structure could result in surface erosion by wind, rain, and other forces. However, the best management practices implemented as part of the project would contain any land-based erosion and would not allow the eroded soil to enter the Ship Canal.

The construction work will result in a small increase in exhaust emissions from construction vehicles and equipment and a temporary increase in dust in the project area. The construction activities will also result in short-term noise impacts. A traffic analysis conducted by Parsons Brinckerhoff (2003) determined that traffic will flow at acceptable levels during construction, based on conventional delay and level-of-service thresholds.

Dust from project excavations may be blown into the Ship Canal if the best management practices implemented were to fail, which could increase turbidity and potentially introduce contaminants into the water column of the Ship Canal. Such increases in potentially contaminated dust could temporarily harm fish that are present in the project area during construction. However, the best management practices (listed in the Project Description section) will ensure that any dust created during project construction is controlled on the site by directing a fog mist at any dust source. Dust controls will be implemented in accordance with BMP E2.00 from the *Construction Stormwater Control Technical Requirements Manual* (Seattle 2000a), and supplemented by BMP C140 from the *Stormwater Management Manual for Western Washington*

(Ecology 2001). Dust emissions will also be required to meet the requirements of the Fugitive Dust Control Measures, Section 9.15, Article 9, Regulation I, of the Puget Sound Clean Air Agency.

Asbestos, which may be present in the Operations and Maintenance Shop, could be exposed during the shop deconstruction, as could old fluorescent ballasts, which contain PCBs. If encountered, these materials will be disposed of according to City of Seattle standards and codes (Seattle 2000a).

Vegetation that provides limited shading over the Ship Canal will be cleared during construction. However, the existing vegetation overhanging the canal is minimal and does not likely contribute adequate canopy cover to the existing fish habitat. New vegetation planted as part of the proposed project will increase the overhanging vegetation along the stream bank in the long term, enhancing the existing habitat for migrating salmonid fish.

Construction associated with the project will occur within already developed and paved areas and is not expected to result in a substantial disturbance of soils or substantial vegetation clearing. The area around the Burke-Gilman Trail may be used by construction vehicles to access the project site and this may require the temporary removal of some vegetation along the trail. Any vegetation that is removed during construction will be replaced under the guidance of a landscape architect, and the site will be restored.

The construction of new bridge approach structures will not result in an increase in impervious surfaces. However, the possible widening of the east and west stairs connecting the existing pedestrian paths to the north bridge span will result in the creation of a small amount (311 square feet) of new impervious surface. This new impervious surface area, if generated, is not expected to result in impacts on water quality or ground water recharge. The new surfaces will consist of concrete and gravel areas that will not be used by vehicles; therefore, they are not considered to be pollution generating. Likewise, given the heavily disturbed nature of the site under existing conditions, ground water recharge under existing conditions is assumed to be limited. Therefore, the proposed increase in impervious surface is not expected to result in a substantial loss of infiltration and ground water recharge. Overall, the 311 square feet of new impervious surface area will not significantly affect protected species or their habitat.

The reconstruction of the existing Operation and Maintenance Shop underneath the south approach of the Fremont Bridge will result in no net increase impervious surface area. Under either Scheme 1 or Scheme 4 (see sheets B13-B16, Appendix B), the new facility and parking stalls would be constructed in the same area as the existing shop and parking stalls. All applicable City-determined conservation measures and best management practices that are applied for the Fremont Bridge approach replacement project will be applied to the deconstruction and reconstruction of the bridge Operation and Maintenance Shop. In addition, all materials generated during the deconstruction of the existing facility would be disposed of at a City-approved facility by means of City-approved methods. This component of the proposed project is expected to have no adverse effects on protected species or their habitat in the project or action areas. Habitat access, habitat elements, channel conditions/dynamics, flow and hydrology, and watershed conditions (described in the Environmental Baseline section) will not be adversely affected by any component of the proposed project. By implementing the previously described best management practices and adhering to the approved work window (October 1 through August 15), this project will not adversely affect protected species or their habitat. Species-specific impacts are discussed in the following section.

Species-Specific Effects

The following project-related actions may impact bald eagles in the project action area:

- Drilling and other construction-related noise-producing activities. Bald eagles that may be migrating through the project area are not expected to be affected by noise generated at the project site because eagles in the project area have likely become well acclimated to the noise that is typical in the urban environment. Because it is unlikely that bald eagles will be present within the project area during construction activities, no bald eagle work window is necessary for this project.

- Vegetation removal. Some vegetation will be removed along the stream banks within the project area, which will be replaced after the construction work is complete. Vegetation removal will not include any potential perch trees that could be used by bald eagles. In addition, new vegetation will be planted where riprap currently exists along the streambank.

- Exhaust emissions. Project construction work will result in a small increase in exhaust emissions from construction vehicles and equipment and a temporary increase in dust. Due to the short duration of project construction activities, any decrease in air quality will be temporary. Furthermore, the project will not likely create a significant decrease in air quality below that of existing conditions. Bald eagles will not likely be affected by changes in air quality, if they occur, because they would be migrating through the project area.

The following project-related actions may impact marbled murrelets in the project action area:

- Drilling and other construction-related noise-producing activities. Marbled murrelets that may be migrating through the project area are not expected to be affected by noise generated at the project site because they are likely well acclimated to the typical noise levels associated with the urban environment. Because it is unlikely that marbled murrelets will be present within the project area during construction activities, no marbled murrelet work window is necessary for this project.

- Exhaust emissions. Project construction work will result in a small increase in exhaust emissions from construction vehicles and equipment, and a temporary increase in dust in the project area. Furthermore, any decrease in air quality would be temporary due to the short duration of project construction activities. A significant decrease in air quality from existing conditions is not expected. Marbled murrelets will not likely be affected by changes in air quality, if they occur, because they would be migrating through the project area.

The following project-related actions may impact bull trout in the project action area:

- Sediment runoff. The activities associated with the construction of the bridge approaches could result in sediment delivery to the Ship Canal if the BMPs were to fail. However, with implementation of BMPs listed in the Project Description section of this report, no impacts to water quality are expected. In addition, the hydraulic project approval to be obtained for this project will specify additional impact avoidance measures. Because project BMPs are intended to prevent any impacts to bull trout or other aquatic species, no work window is necessary for this project.

- Accidental spills. Bull trout are not expected to be adversely affected by the proposed project because best management practices will be implemented to avoid or minimize all potential impacts of accidental spills of construction-related chemicals.

- In-water work. There will be in-water work associated with the outfall reconstruction and placement of the underwater cable, which could affect bull trout if they are present in the Ship Canal during construction activities. However, with the implementation of BMPs, no impacts to bull trout or their habitat are expected to result from this in-water work. In addition, the BMPs will ensure that any dust created during project construction is controlled on the site by directing a fog mist at any dust source.

- Increased turbidity. Dust from project excavations could be blown into the Ship Canal if the BMP implemented were to fail, which could increase turbidity and potentially introduce contaminants into the water column of the Ship Canal. However, it is expected that the BMPs will be successfully implemented, so increased turbidity is not expected.

- Vegetation removal. Some vegetation will be removed along the stream banks within the project area, which could affect habitat for fish. However, existing vegetation overhanging the canal is minimal and does not likely contribute adequate canopy cover to fish habitat. New vegetation planted as part of the proposed project will increase the overhanging vegetation along the stream bank in the long term, enhancing the existing habitat for migrating bull trout, or other salmonid species.

The project-related impacts described above will not likely impact chinook salmon or their habitat for the same reasons that are described for bull trout. Project BMPs that are described in the Project Description section of this report will likely avoid any impacts to chinook salmon.

The project-related impacts described above will not likely impact coho salmon or their habitat for the same reasons that are described for bull trout. Project BMPs that are described in the Project Description section of this report will likely avoid any impacts to coho salmon.

Direct Beneficial Effects

Construction of the new water quality treatment vaults for the Fremont Bridge will improve water quality at the immediate project site and in the Ship Canal in general. Currently there is no water quality treatment for stormwater runoff at the Fremont Bridge, and the outfalls that drain into the Ship Canal are substandard in terms of current City conveyance requirements. The diameter of the existing outfalls for the north and south bridge approaches will increase from 8 to 12 inches, which will allow easier maintenance and will not alter the water conveyance to the Ship Canal. The flow velocities from the outfalls will be reduced by the larger pipe capacity; however, storm flow will not be increased. The conveyance of this water will not increase the potential contaminant loading to the canal because all outfall effluent will be treated for water quality prior to discharge. Overall, the effects of this project on water quality are expected to be beneficial. The proposed project will decrease the amount of stormwater contaminates that enter the Ship Canal at the Fremont Bridge.

Riprap that is currently stabilizing the existing stormwater outfalls will be removed and disposed of according to City guidelines, thereby improving the area around the outfalls. Red-osier dogwood (*Cornus sericea*) or willow trees (*Salix* sp.) and oceanspray (*Holodiscus discolor*) will be planted within the disturbed outfall areas (see Sheet B-8, Appendix B) to increase shading over the shallow portion of the Ship Canal slope, maximize any potential habitat for fish, compensate for the clearing of any vegetation during construction, and to provide aesthetic visual screening. Adding this vegetation as a replacement for removed riprap will improve the canal bank conditions at the outfalls on both the north and south banks, thereby improving the overall habitat quality.

Indirect Effects

Indirect effects are expected potential impacts that are caused by the proposed project, but occur later in time (after the proposed actions have been complete (WSDOT 2001). These effects are generally long term and permanent.

No indirect effects are expected from the operation of the proposed project. The proposed project will not promote future development, and any potential impacts will only be associated with construction and will be short term.

Interrelated and Interdependent Activities

Interdependent activities are those that have no independent utility apart from the proposed action. Interrelated activities are those that are a part of the primary action and are dependent upon that action for their justification.

There are no known interrelated or interdependent activities scheduled to occur in the Ship Canal during the construction period for the proposed Fremont Bridge approach replacement project, or as a result of the operation of the Fremont Bridge (construction activities are planned to begin in 2005 and are estimated to last for approximately 18 months).

Determination of Effect

The proposed project **may affect but is not likely to adversely affect bald eagles** for the following reasons:

- There are no bald eagle nests or wintering sites within a 1-mile radius of the project area.
- Bald eagles that migrate through the project area have likely become acclimated to noise that is typical of the urban environment.

The proposed project **may affect but is not likely to adversely affect marbled murrelets** for the following reasons:

- There are no marbled murrelet critical habitat areas within a 1-mile radius of the project area.
- Marbled murrelets that migrate over the project area have likely become acclimated to noise that is typical of the urban environment.

This project **may affect but is not likely to adversely affect bull trout.** Bull trout may be adversely affected by the project for the following reasons:

- The activities associated with the construction of the bridge approaches could result in sediment delivery to the Ship Canal if the best management practices were to fail.

- There will be in-water work associated with the outfall reconstruction and the placement of the underwater cable.

However, bull trout are not expected to be adversely affected by the proposed project because best management practices will be implemented to avoid or minimize all potential direct and indirect adverse effects of construction activities, such as sedimentation and accidental spills of construction-related chemicals. During construction, dust will be prevented from entering the Ship Canal by means of the implementation of site-specific best management practices.

This project **may affect but is not likely to adversely affect chinook salmon or their habitat**. This determination is based on the same rationale provided for the potential effects on bull trout.

This project **is not likely to significantly impact coho salmon** within the Ship Canal. If the coho salmon is listed as a threatened species at a later date, this project **may affect but is not likely to adversely affect coho salmon**. This determination is based on the same rationale provided for the potential effects on bull trout.

Essential Fish Habitat

The Pacific Fishery Management Council, with the concurrence of the Secretary of Commerce, defines *essential fish habitat* for freshwater salmon as "the aquatic component of streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to chinook, coho, or Puget Sound pink salmon (*O. gorbuscha*) (except above certain impassable barriers) in Washington, Oregon, Idaho, and California identified by USGS hydrologic units" (PFMC 1999). This includes the waters and benthos necessary to a species' spawning, breeding, feeding, or growth to maturity.

The Magnuson-Stevens Fishery Conservation and Management Act (as amended through October 11, 1996) includes a mandate that the National Marine Fisheries Service identify essential fish habitat for federally managed marine fishes. The mandate also requires federal agencies to consult with the National Marine Fisheries Service regarding all activities or proposed activities that are authorized, funded, or undertaken by the agency that may adversely affect essential fish habitat.

There are 83 marine species managed by the National Marine Fisheries Service for which essential fish habitat is considered, including chinook and coho salmon stocks in Washington, Oregon, Idaho, and California, as well as pink salmon stocks of Puget Sound (PFMC 1999).

In the short term, essential fish habitat will not likely be affected by the proposed project for the same reasons provided in the discussion under "Direct Adverse Effects" in the Effects of the Action section. In the long term, essential fish habitat will benefit from the proposed project, as water quality will be improved by treating 100 percent of the water runoff generated at the project site.

Overall, the proposed project **will not adversely affect essential fish habitat for Pacific salmon**. The proposed Fremont Bridge approach replacement project is likely to improve essential fish habitat over the long term by treating potentially contaminated stormwater runoff before it is discharged into the environment.

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