

Draft Environmental Assessment

Green-Duwamish General Investigation Ecosystem Restoration

Lake Meridian Outlet (Cow Creek) Relocation/Restoration

**City of Kent Lake Meridian Park to Confluence of Soos Creek
King County, Washington**



March 2006



**US Army Corps
of Engineers®**
Seattle District

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Responsible Agencies: The agencies responsible for this project are the U.S. Army Corps of Engineers, Seattle District (Corps), and the City of Kent.

Summary: The current Meridian lake outlet channel is approximately 9,000 feet long and enters Soos Creek outside the city limits where the Kent/Black Diamond Road crosses Soos Creek. The majority of the current alignment is a linear ditched channel located adjacent to 152nd Avenue SE. There are multiple culverts, a cistern, and almost no riparian vegetation or habitat features. The lower reaches of the conveyance channel are a combination of engineered open channel, (relatively) natural stream, in-line stormwater detention facilities, and dispersed flow through wetlands. In its current location, the channel has been heavily altered and degraded by continued development. The current channel provides little to no functional value as fish habitat.

The primary goal of this project is to create anadromous fish habitat in the outlet channel to Lake Meridian. The project when complete will also enhance rearing conditions in the Soos Creek floodplain. Coho salmon (*Oncorhynchus kisutch*) and cutthroat trout (*Oncorhynchus clarki*) are the target species for this restoration project. These species have been documented to occur in the watershed prior to urbanization (Williams et al. 1975). These species are adapted to systems with intermittent flow regimes such as that found in the Lake Meridian drainage. The proposed flow regime provides conditions suitable to spawning and egg incubation for these late winter and spring spawning species. Decrease in streamflow during the months of July through September will influence habitat use. However, it is anticipated that the combination of decreasing streamflow and increasing water temperature will trigger juvenile fish to exit the outlet channel in search of more favorable rearing conditions elsewhere, presumable in Soos Creek. This type of migratory behavior is seen in similar intermittent systems in the Soos Creek subbasin (Trotter et al. 1996).

The Corps and the City of Kent are proposing to realign the Lake Meridian Outlet Creek from its present north-south route to a more easterly alignment through the Gary Grant Soos Creek Park (GGSCP). The proposed confluence of the new channel (to be named Cow Creek) with Soos Creek would be approximately 1.8 miles upstream of the current confluence. In order to effectively restore physical habitat and fish runs, a new stream will be created by establishing an appropriate geomorphic template that mimics a natural stream system. The key to success in creating the new stream where none currently exists is to establish geology and topography that will support a self-sustaining stream and riparian corridor. This includes locating the new creek in natural topographic lows, designing the streambed to prevent loss of flow in permeable soils, and building geology to support table step-pool and pool-riffle structure and promote fish passage. In addition, the realignment will regulate water level elevations along the shoreline of Lake Meridian and provide for continued water supply and retention in wetlands downstream of the existing channel. The current lake outlet is an unregulated open channel that goes dry during the summer months. The outlet would be modified by replacing two undersized culverts and the

addition of an outlet control structure. The addition of the control structure would allow for prolonged storage of water with regulated releases to meet in-stream needs during the summer and control flooding along the shoreline.

The project will not constitute a major Federal action and will not significantly affect the quality of the human or natural environment. The Corps will use best management practices to minimize potential adverse effects to aquatic and terrestrial resources. Impacts to air quality, noise, and water quality will generally be highly localized and short in duration, and wetland impacts will be mitigated to a level of insignificance by providing enhanced aquatic functions and values in the project area as a result of the creek relocation.

This document is available online at: <http://www.nws.usace.army.mil/ers/envirdocs.html>

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1 INTRODUCTION

The Corps and the City of Kent propose to replace the existing Lake Meridian outlet alignment with a naturally functioning waterway between Lake Meridian and Soos Creek. The work is scheduled to occur during the summer of 2006. The existing outlet channel is highly disturbed and consists of a series of excavated ditches, cisterns, culverts, and stormwater detention facilities with periodic crossings of disturbed wetlands. In its current location, the channel has been heavily altered and degraded by continued development. The current channel provides little to no functional value as fish habitat.

The primary goal of this project is to create anadromous fish habitat in the outlet channel to Lake Meridian. The project when complete will also enhance rearing conditions in the Soos Creek floodplain. Coho salmon (*Oncorhynchus kisutch*) and cutthroat trout (*Oncorhynchus clarki*) are the target species for this restoration project. These species have been documented to occur in the watershed prior to urbanization (Williams et al. 1975), and they occur presently in Big Soos Creek in the project vicinity. These species are adapted to systems with intermittent flow regimes such as that found in the Lake Meridian drainage. The proposed flow regime provides conditions suitable to spawning and egg incubation for these late winter and spring spawning species.

1.1 Green/Duwamish Restoration Program

This restoration activity is being conducted as part of the Green/Duwamish River Basin Ecosystem Restoration Program (ERP). In this program, the Corps has served as the lead in developing the restoration program for the Green/Duwamish River, working with local agencies to identify, evaluate, prioritize, and coordinate implementation of potential restoration projects to assure that the restoration programs and projects from the various agencies complement each other. As part of the Green/Duwamish River Basin ERP, two major documents have been prepared that provide general information regarding the Green/Duwamish River basin and its associated existing conditions, fish and wildlife populations, and potential impacts on federally listed endangered or threatened species. The documents are as follows:

- Final Programmatic Environmental Impact Statement and Restoration Plan (FPEIS) for the Green/Duwamish River Basin Ecosystem Restoration Program, prepared by the Seattle District Corps and King County DNR in November 2000.
- Programmatic Biological Assessments for Green/Duwamish Ecosystem Restoration Program, King County, Washington. Separate documents were prepared for species under National Marine Fisheries and US Fish and Wildlife jurisdictions for the Seattle District Corps by Jones & Stokes, June 2000.

Information from these reports is incorporated into this document largely by reference.

The purpose and need statement for the Final Programmatic NEPA/SEPA Environmental Impact Statement (EIS) and Restoration Plan is to improve the overall health of the Green/Duwamish River basin ecosystem for fish and wildlife species by increasing the quantity, quality, diversity, and connectivity of available habitat.

The need for such improvement to the ecosystem was well established from years of study conducted by the U.S. Army Corps of Engineers (Corps), King County, the Port of Seattle, the Muckleshoot Indian Tribe Fisheries Department, the Washington State Department of Fish and Wildlife, and others.

The overall objective of the restoration program is to restore significant ecosystem function, structure, and dynamic processes that have been degraded within the river basin. To accomplish this objective, the following basin-wide restoration goals were identified:

- Improve the physical nature of existing degraded habitat.
- Improve existing ecosystem functions and values. This includes improving riverine processes where reasonable.
- Address important factors limiting habitat productivity.

The Programmatic EIS assessed the Corps proposal to implement a basinwide restoration program in the Green/Duwamish River. The purpose of preparing a programmatic EIS was to expedite and provide a point of departure for future site-specific projects, and to facilitate the preparation of subsequent project-specific NEPA and SEPA documents through the use of “tiering” or “phasing.”

Restoration features at sixty-seven projects in the basin were developed and evaluated to determine the most cost effective and beneficial plan to recommend for restoration of the basin ecosystem. The recommended plan would implement a combination of 45 project-specific and programmatic restoration measures throughout the basin. This recommended National Ecosystem Restoration Plan (NER) was selected based upon cost effectiveness and incremental cost evaluation of alternative’s costs and environmental outputs. The recommended NER Plan restores aquatic and terrestrial ecosystem continuity and connectivity and addresses all limiting habitat factors for threatened and endangered salmonids within the basin.

From the suite of available projects the Green Duwamish ERP Program Manager Committee prioritized the order of implementation. The WRIA 9 Forum approved their selections. Lake Meridian Outlet (Cow Creek) Channel Realignment was identified as one of five projects that would be considered in the second year of construction. This was based on the availability of land, willingness of the local sponsor to fund the project, and advance engineering work that was done for this project.

1.2 Project Location and Setting

The project area is located in the Soos Creek subbasin of the Green River Watershed, approximately 6.4 miles upstream of the confluence of Soos Creek and the Green River (Figure 1-1). The subbasin drains an area of approximately 44,800 acres (70 square miles) and is characterized into two distinct physical settings. In the upper subbasin, where the project area is located, the terrain is relatively flat rolling hills and plateaus. In the lower subbasin, downstream of river mile (R.M.) 5.0, the gradient of Soos Creek increases rapidly as it enters a canyon. Soos Creek contains some long riffles and rapids in this section. Good pool-riffle glide sections are found in the lowermost section of the stream.

The Soos Creek subbasin consists of the mainstem Soos Creek with approximately 25 identified tributaries providing over 60 miles of stream habitat. All of the streams in this subbasin drain from the upper plateau, a flat to rolling terrain where the creeks are low gradient flowing through extensive wetland complexes. Wetland complexes are common throughout the upper plateau and include open-water, scrub-shrub, forested, emergent marsh, wet meadow, and bog wetlands. These wetlands cover approximately 2,076 acres (4.8% of the land area in the subbasin).

Lake Meridian, historically referred to as Cow Lake owing to the presence of cow elk, is one of several major lakes in this system. Glacial in origin, Lake Meridian formed during the Pleistocene about 25,000 years ago. The lake is 150 acres, with an elevation of 373 feet (NGVD 29) and a volume of 6,100 acre-feet. The mean and maximum depths are 41 and 90 feet, respectively. Oriented northwest and southeast, the lake has a maximum width of 1,770 feet and length of 5,610 feet.

The current lake outlet channel is approximately 9,000 linear feet long and enters Soos Creek outside the city limits where the Kent/Black Diamond Road crosses Soos Creek. The majority of the current alignment is a linear ditched channel located adjacent to 152nd Avenue (Figure 1-4). The City is proposing to realign the Lake Meridian Outlet Creek from its present north-south route to a more easterly alignment through the Gary Grant Soos Creek Park (GGSCP) (Figure 1-3). The proposed confluence of the new channel (to be named Cow Creek) with Soos Creek would be approximately 1.8 miles upstream of the current confluence. The project site then, refers to the eastern portion of Lake Meridian Park, Gary Grant Soos Creek Park, and the area encompassed by the existing creek alignment.

General information regarding the Soos Creek Subbasin can be found in the following documents:

Soos Creek Basin Plan and Final Environmental Impact Statement prepared by the King County Surface Water Management Division in June 1990.

“Habitat Limiting Factors and Reconnaissance Assessment Report, Green/Duwamish and Central Puget Sound Watersheds (WRIA 9 and Vashon Island).” Kerwin, J. and T. S. Nelson, (Eds.). Produced by the Washington Conservation Commission and the King County Department of Natural Resources in December 2000.

Because information specific to Lake Meridian Outlet (Cow Creek) is limited, information related to the Soos Creek subbasin, and in particular, Big Soos Creek, is used in some sections as a reference for general baseline conditions.

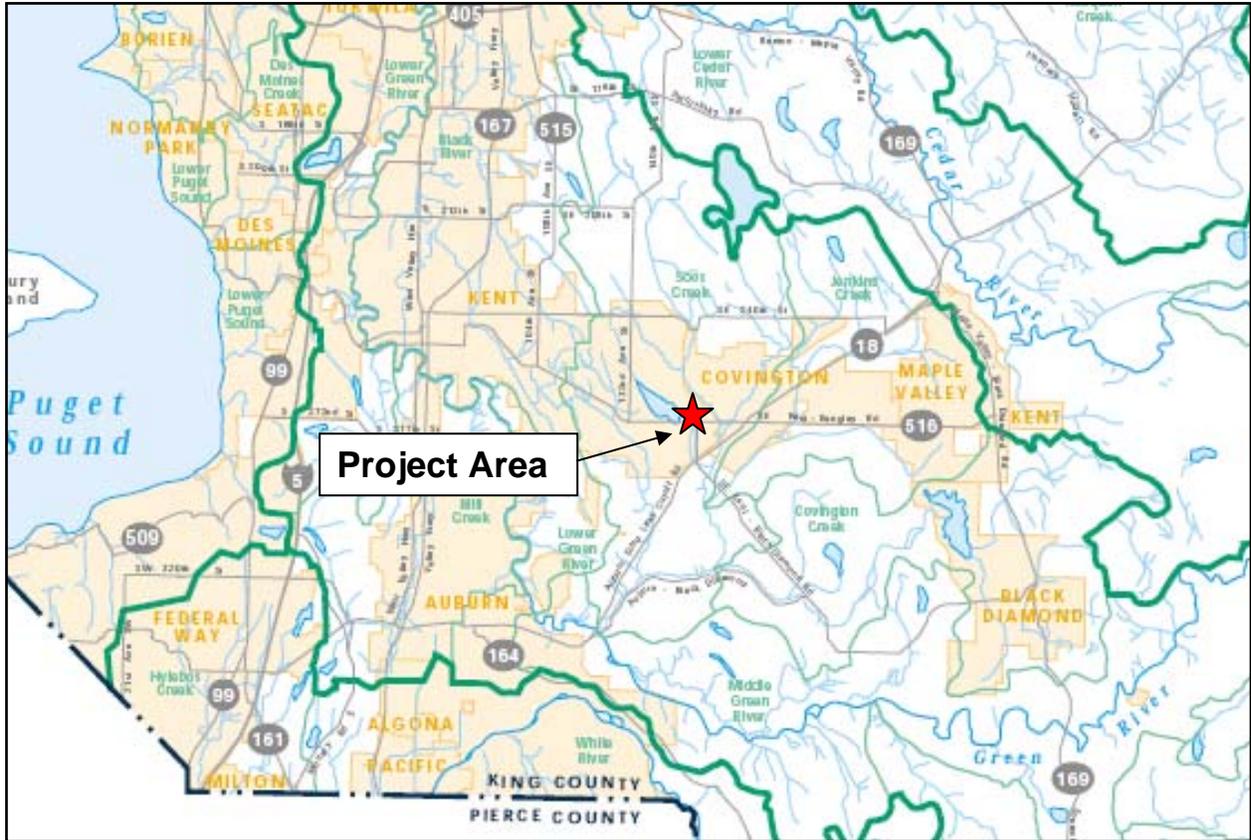


Figure 1-1: Project Vicinity

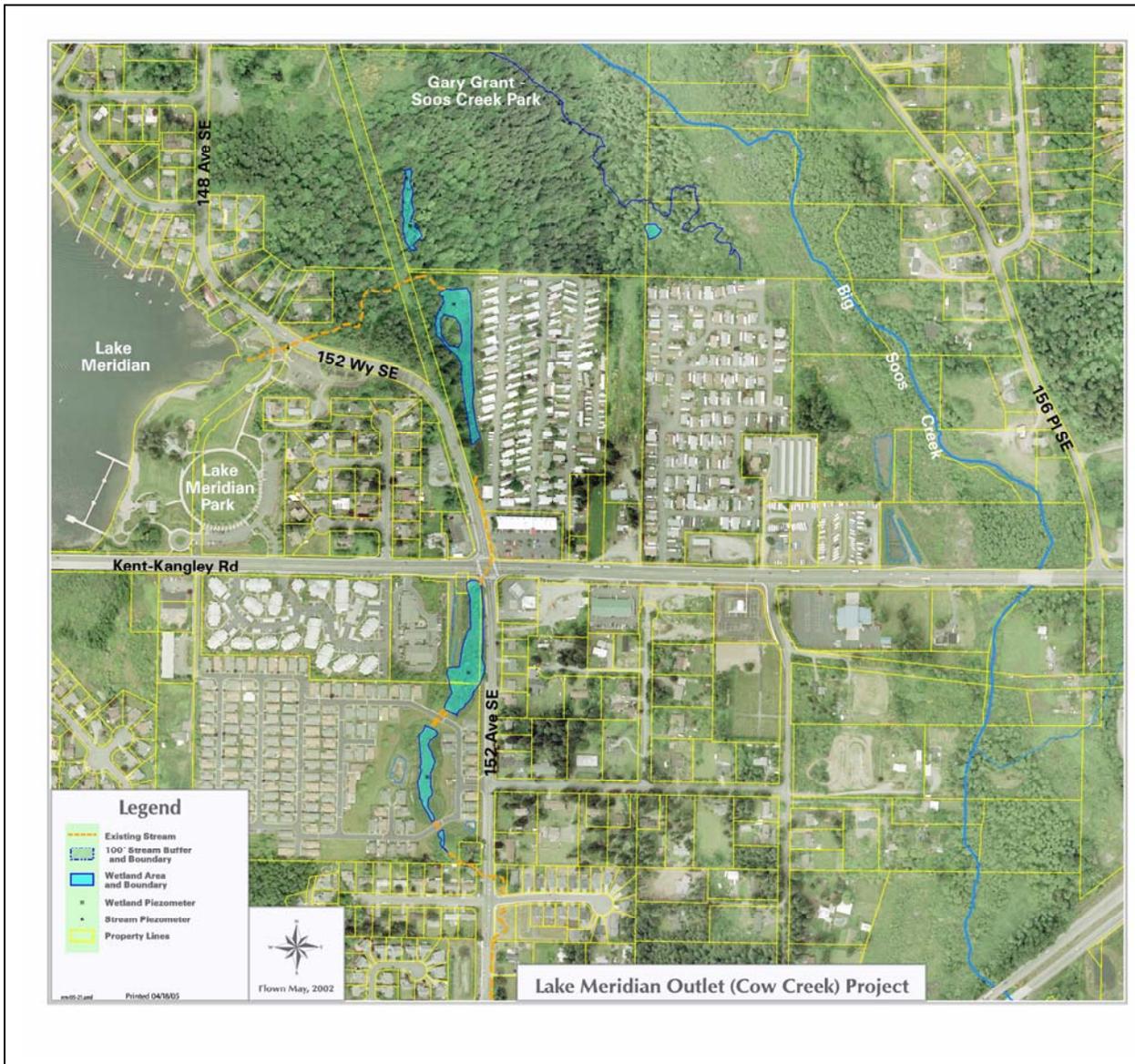


Figure 1-2. Alignment of existing outlet channel



Figure 1-3: Aerial photo of site with proposed channel configuration

1.3 Project Background

Over the past 70 years, the Lake Meridian watershed has become increasingly urbanized. Urbanization has impacted the inlet and outlet to Lake Meridian and the shoreline of Lake Meridian itself. This growth has impacted the hydrology of the basin, the delivery and routing of water, and fish use in the area. In 1996/1997, the City of Kent annexed an area including Lake Meridian and the Lake Meridian Watershed. Since that time, the City has been identifying water resource and fisheries management issues in the lake and in the outlet channel downstream.

Residents along Lake Meridian have expressed concern about elevated lake levels for several years. In 2001, the City initiated a study to quantify potential property damage associated with Lake Meridian water levels (Peratrovich, Nottingham, and Drage 2001). Certain residents have asserted that problems with elevated lake levels during the wet season increased after King County modified the park at Lake Meridian in 1993. Questions also arose about the role of prior modifications to 152nd Way SE roadway in the vicinity of the outlet. In 2001, the City initiated a study to determine the history of outlet modifications and their role in controlling lake levels. Results of hydraulic modeling indicate that neither action significantly affected lake levels. Elevated lake levels remain a concern and modifications to the outlet channel, including revisions to the outlet control, are being developed to address this problem. The outlet control modifications are also intended to enhance fish passage and habitat in the outlet channel.

Downstream of the outlet, development along 152nd Avenue SE has occurred at a rapid pace over the past two decades. Bed, bank, and riparian corridor degradation and channelization have severely compromised the quality and utility of fish habitat. Complete loss of streamflow in the vicinity of Highway 18 represents a fish passage barrier. Reappearance of flow approximately 200 feet downstream of Highway 18 suggests that flow is transmitted above a subsurface confining layer. In 1996, a habitat and fish population assessment indicated poor habitat conditions, with no fish present in the outlet channel (HARZA 1996). However, personal communication with former Muckleshoot Tribe biologist Rob Malcolm confirmed that small numbers of juvenile coho in the mid reaches of the outlet channel in 1997 (pers. comm. 2005). These findings are supported by the Washington Department of Fisheries and Wildlife (WDFW) Stream Catalog of Streams and Salmon Utilization (Williams et al. 1975) which identified the outlet to Lake Meridian (WRIA 09.0091) as a salmon-producing stream. In that survey, only coho salmon were listed as using the outlet stream. However, cutthroat trout, while not targeted in historic WDFW surveys, likely used the outlet stream historically for spawning and early rearing. Due to continued degradation of this system, the City has imposed stream buffers at new development and redevelopment sites along the outlet channel corridor.

In light of degraded conditions and the prospect for continued development along the existing alignment, the City contracted to conduct a feasibility study to identify issues and explore alternatives for realigning the outlet channel through the GGSCP (Kent 2000). This study provided information on geotechnical and hydrologic conditions in the proposed project area and presented a conceptual plan for realignment. This study was also a key document supporting current design efforts.



Figure 1-4: Existing alignment, outlet culvert at Wetland C

1.4 Project Need

Many populations of native Western Washington fish species, particularly anadromous species, are depressed or are declining at a rapid rate. Two anadromous salmon species, Chinook Salmon (*Oncorhynchus tshawytscha*) and bull trout (*Salvelinus confluentus*) have already been listed as threatened or endangered under the Endangered Species Act (ESA). A third species, Coho Salmon (*Oncorhynchus kisutch*), is currently a candidate species. The Green/Duwamish supports a wild complex of coastal cutthroat trout, but their status is unknown (WDFW 2000). Without restorative action, many of the fish and wildlife resources of the Green/Duwamish system will continue to decline (FEIS 2000). This project focuses on increasing available spawning and rearing habitat for Coho salmon and cutthroat trout.

The Soos Creek Subbasin is an important tributary to the Green/Duwamish system. It contains diverse and abundant salmonid habitat, and the Washington Department of Fish and Wildlife (WDFW) maintains a Chinook hatchery in lower Big Soos Creek (King County, 1990). It lies in the Middle basin of the Green/Duwamish system, and is undergoing a rapid transition from rural forested and agricultural land to an urbanized environment. This rapid urbanization has resulted in stream and wetland habitat degradation in the form of stream channelization, increased sedimentation, impaired water quality, minimal wetland and riparian buffers, and disturbed hydrological regimes. These factors, among others, have contributed to decreased fisheries production from this subbasin, and focused restoration efforts on its tributaries.

The existing Lake Meridian outlet channel is highly disturbed.. The stream measures approximately 9,000 feet from Lake Meridian downstream to its confluence with Soos Creek. At the downstream end of the first 1000 feet, there is a 300-foot stormwater detention pond in a mobile home park. The stormwater pond was created in jurisdictional wetland (Wetland C). The outlet of this pond has been identified as a barrier to upstream fish migration (HARZA 1999). The remaining approximately 6350 feet of the stream runs from the mobile home park downstream to the confluence with Soos Creek. Of this length, 80 percent (approximately 5000 feet) is immediately adjacent to 152nd Way Southeast. Over much of this distance, there are single-family residences in close proximity to the stream. A total of 31 culvert crossings are present in the stream system. Of this total, 28 culverts are located downstream of the migration barrier identified in the outlet of the pond in the mobile home park (HARZA 1996). These culverts vary in length from simple single culverts under residential driveways to longer culverts crossing four lanes of traffic. In a recent inventory, the condition of the existing habitat for salmon and trout was rated “poor” (HARZA 1996). No fish of any species were found in the stream. From a fishery perspective, the habitat potential for restoration of the existing stream is limited. These limitations include the highly disturbed condition, as well as general feasibility limitations related to real estate and costs.

1.5 Project Purpose

The project purpose is to restore and create a natural functioning corridor to the Meridian Lake Outlet (Cow Creek) channel. The project should improve in, and near-stream habitat quality and complexity, improve fish passage conditions for adult anadromous fish, improve rearing habitat for juvenile fish. The project should also provide spawning habitat, maintain or improve water quality for use by all life stages of salmonid fish or other aquatic or terrestrial wildlife and help minimize flooding along the lake shoreline.

1.6 Authority

Federal involvement in ecosystem restoration is supported in law and Executive Order. The Corps Civil Works Ecosystem Restoration Policy (ER 1165-2-501), the Fish and Wildlife Coordination Act of 1958, Federal Water Project Recreation Act of 1965, National Environmental Policy Act of 1969, Water Resource Development Act (WRDA) of 1986, and the WRDA of 1990 provide national policy directing consideration of projects that benefit ecological resources.

Specifically, Section 306 of the WRDA of 1990 authorized the Secretary of the Army to include environmental protection as one of the primary missions of the Corps. The Green/Duwamish Ecosystem Restoration Study stems from the Corps’ authority under Section 216 of the River and Harbors and Flood Control Act of 1970, which enables the Corps to undertake restoration related to the hydrologic regime of aquatic ecosystems. Congress specifically authorized the Green/Duwamish River Basin Feasibility Project (of which this project is a part) in Section 101(b)(26) of WRDA 2000.

1.7 Project Description

The proposed project would realign the Lake Meridian Outlet Creek from its present north-south route to a more easterly alignment through the Gary Grant Soos Creek Park (GGSCP). The

proposed confluence of the new channel (to be named Cow Creek) with Soos Creek would be approximately 1.8 miles upstream of the current confluence. In order to effectively restore physical habitat and fish runs, a new stream will be created by establishing an appropriate geomorphic template that mimics a natural stream system. Urbanization has severely compromised the quality of stream and riparian habitat in the existing outlet system. The goal of the realignment focuses on providing high quality spawning, incubation, and early rearing habitat for coho and cutthroat. The key to success in creating the new stream where none currently exists is to establish geology and topography that will support a self-sustaining stream and riparian corridor. This includes locating the new creek in natural topographic lows, designing the streambed to prevent loss of flow in permeable soils, and building geology to support table step-pool and pool-riffle structure and promote fish passage. In addition, the project includes a new outlet hydraulic control structure, which features an adjustable v-notch and labyrinth weir. The current lake outlet is an unregulated open channel that goes dry during the summer months. The addition of the control structure would allow for prolonged storage of water with regulated releases to meet in-stream needs and retain wetland hydrology during the summer, and also control flooding along the shoreline. In order to provide necessary volumes of water for the new channel, a low-flow splitter, located at the upstream end of the new channel, will divert approximately 80% average annual flow of the surface water flow from the existing outlet to the new channel. Approximately 20% of the average annual flow will be retained in the existing channel to provide surface water to downstream wetlands.

For channel design, the project area has been characterized by four distinct zones:

- The Existing Channel Zone, this zone extends from Lake Meridian along the existing creek alignment to the wetland swale adjacent to the trailer park,
- The Transition Zone, is a small segment of new channel that starts after the flow split in the glacial outwash terrace,
- The Upper Bench Zone, this zone extends from the eastern edge of the power line easement (that runs north from 152nd Ave. SE) across the glacial outwash terrace,
- The Steep Slope Zone, this zone is the steep drop from the glacial outwash terrace to the Soos Creek floodplain (slopes along this zone range from 26% to greater than 40%), and
- The Floodplain Bench Zone, this zone extends from the toe of the steep slope across the Soos Creek floodplain to Soos Creek.

Project design drawings for the zones described above are provided in Appendix B.

Specific goals have been developed for each of the zones previously described. For the Existing Channel Zone, the goal is to provide moderate gradient rearing habitat with hydraulic diversity and structural complexity. The Existing Channel Zone will be enhanced by LWD placements. Structural modifications to the outlet are being designed with the objectives of providing a reduction in winter maximum lake levels and to maintain outflows consistent with downstream channel relocation/restoration fisheries management objectives and extending flows further into the summer months. This will be accomplished by the addition of an outlet control structure consisting of a low flow v-notch and high-flow labyrinth weir.

All other zones will entail construction of new creek channel and floodplain. For the Bench Zone, the goal is to provide spawning habitat and incubation conditions and rearing habitat consistent with flow availability and temperature conditions. The channel formed on the Bench Zone will be a low gradient channel with large volumes of LWD within the channel and the floodplain.

For the Steep Slope Zone, the goal is to provide effective upstream passage for spawning adults (coho salmon and cutthroat trout) and to provide upstream and downstream passage for juveniles. The Steep Slope Zone channel will be a step pool channel created using imported boulders, cobble, and gravel to make up the channel bottom. Channel dimensions will be smaller and more confined than the upstream or downstream channel segments. Materials selected have been selected to withstand the maximum design flood.

Finally, for the Lower Bench Floodplain Zone, the goal is to provide complex spawning and rearing habitat and to provide passage to upstream zones in Lake Meridian Outlet (Cow Creek). The Lower Bench Zone segment will be a transitional channel between the downstream end of the Steep Slope Zone and the moderate slope of the Soos Creek floodplain. Profile gradient ranges will be between 1.8 and 2.3 percent, and will allow the creation of a stable channel with pools spaced at intervals of 3-7 channel widths.

Additional work will be done to enhance the affected wetlands. Native vegetation will be planted in Wetland A and its buffer to eliminate an informal trail. Wetlands C, D, E, and F will be converted from reed canary grass-dominated communities to native scrub/shrub communities. The low flow splitter described above will divert water from Wetlands C, D, E, and F to provide water to the new channel. To retain hydrology in these wetlands, the shallow subsoil layer will be replaced with imported soil amended with bentonite clay. A layer of topsoil will then be placed on top of this layer, followed by native plantings. Low-height berms or coir logs will be placed across Wetland DEF, in combination with excavation, to facilitate the formation of shallow pool areas. Additional work in Wetland C includes modification of the existing standpipe that will facilitate retention of water within the wetland and would provide water to downstream wetlands D, E, and F. Restoration of native grading will also occur in Wetland C, where fill was previously excavated to create the existing pond.

The final element of the proposed channel relocation is the establishment of an interpretive trail. Portions of the existing GGSCP trail will be retained and a new trail will be constructed to provide viewing access to Big Soos Creek. A segment of the existing trail will be abandoned to restrict access to Big Soos Creek. The earthen trail will start from Lake Meridian Park and proceed through GGSCP, ending in a viewing platform near the edge of the stream.

1.8 Project Construction

Construction for the zones described above and the outlet structure and labyrinth weir is planned for the summer and early fall of 2006 and 2007 when soils will be the driest. Phase 1, which includes the work near Lake Meridian and on the upstream 900 ft of the existing channel, will take place in 2006. Construction of the new channel and wetland enhancement work will be done as Phase 2 of the project, which will take place in 2007. Staging areas have been identified within existing utility easements that will reduce the need for clearing vegetation and ground

disturbance. Each zone will be constructed in stages. For the Existing Channel zone, no staging area is needed. Large Woody Debris (LWD) and rock can be moved and placed by a small track hoe or spider hoe. In order to access the additional construction zones, access could be provided through the trailer parking lot, or construction of a new road from Gary Grant Soos Creek Park parking lot. Once access is provided, the road will be constructed over the centerline of the planned stream alignment on the Bench, Slope and Floodplain zones. The road may be laid on geo-textile grid and/or a timber lattice or mat that is able to support the necessary construction equipment and material loads. Quarry spalls or a similar material will be used to construct the road. All work that can possibly be done “in the dry” will be executed outside the existing channel to minimize water quality impacts. For all work in the existing channel, efforts will be taken to perform activities while the creek bed is dry, or coffer dams and sand bags will be used to divert water away from disturbance. As the stream channel is excavated, the road materials will be removed, back cast, and stockpiled for off-site disposal. In the wetter portions of the Floodplain zone, load dispersing mats and “spider” type construction equipment will most likely be used in an effort to minimize vegetative and soil disturbance, reduce water quality impacts, and to reduce the use of imported materials. Trees removed for construction activities would be stockpiled and used as LWD features. Construction equipment will involve large and small excavators, dump trucks or conveyor systems and bulldozers. When the channel is complete and the flow splitter is in place, water will be diverted into the new channel. Upon completion of the earthwork activities, the constructed riparian corridor will be planted with an assemblage of native vegetation suitable for the constructed hydrologic regime.

2 ALTERNATIVES ANALYSIS

Following is a summary of programmatic alternatives presented and evaluated in the 2000 FEIS:

Alternative 1: No Action

The No Action Alternative consists of the continuation of a variety of restoration activities under existing regulations and tribal, agency, and non-governmental organization restoration programs. Current independent management of the river basin by various agencies would continue, implementing activities under existing policies. Restorations would be implemented and would also be tied to the individual programs.

Alternative 2: Multi-Species Approach (Preferred Alternative)

The Preferred Alternative would be a program to restore ecological resources and processes that would benefit multiple fish, riparian, and riverine-associated wildlife species. This alternative would focus on implementing a balance of activities that would not be at the expense of maintaining or improving successful populations of other species. This approach assumes restoration of larger areas of aquatic environment and riparian corridors, and providing connections to existing productive habitat that might otherwise not occur under the No Action Alternative.

Alternative 3: Single Species Restoration (Chinook Salmon)

This alternative focuses on restoring fish habitat to benefit a single species, the threatened Chinook salmon as identified by the National Marine Fisheries Service under the Endangered Species Act, rather than a multi-species approach.

Further information on the three alternatives considered can be found in Chapter 2 of the EIS. Site specific alternatives were evaluated for Lake Meridian Outlet (Cow Creek) and analyzed to see how they meet the objectives of the preferred alternative identified in the EIS and feasibility report. In considering the site specific alternatives below, a major discussion item may be the loss of stream area. It should be noted that channel area should not be confused with nor equated with existing or potential habitat. The project specific alternatives are described below:

2.1 Alternative 1: The No-Action Alternative

Under the no-action alternative, the Lake Meridian Outlet (Cow Creek) would remain in its current alignment. The existing alignment is a linear ditched channel located adjacent to 152nd Avenue SE. There are multiple culverts, a cistern, and almost no riparian vegetation or habitat features. The lower reaches of the conveyance channel are a combination of engineered open channel, (relatively) natural stream, in-line stormwater detention facilities, and dispersed flow through wetlands. In its current location, the channel has been heavily altered and degraded by continued development. Under the No Action alternative the channel would continue to provide little to no functional value for fish habitat. These habitat problems would continue to contribute to the decline of the fisheries in the Soos Creek Subbasin, and ultimately, to the Green/Duwamish Ecosystem. It would also counter the goals identified in the FPEIS and the purpose and need of the project at hand.

2.2 Alternative 2: Rehabilitate the Existing Stream Channel

In this scenario, the existing stream channel would be rehabilitated along an alignment in close proximity to the current alignment. While feasible, this alternative would not meet several of the restoration objectives, including moving the stream away from the road, which serves as a potential source of pollutants to the stream. Within its current alignment, there is little protection from untreated stormwater, spills, or disturbance. Over much of the existing stream length, habitat is of limited value. There is limited spawning potential (limited to the first 1000 feet downstream of the lake). Fish passage may be hindered (there are 31 total culverts and a cistern). Another major disadvantage is the lack of summer surface flow in the channel along the southern portion of 152nd Ave. SE in the vicinity of the Highway 18 bridge. The limited to non-existent flow in this reach represents a fish passage barrier. The current riparian corridor is limited in extent and quality. Land for a wider corridor would have to be purchased or otherwise obtained. Hence, the new creek alignment along 152nd Ave SE would likely be constructed in piece-meal fashion in conjunction with each new development constructed east of the road. A long interim period in which the creek alignment varied from the current channel to a new channel set back from the road would result in an on-going stress to the system. Costs would be much greater for this alternative due to the greater length of creek, the large number of culverts that would need to be replaced, and greater cost of property acquisition. Although this alternative would reach the goal of the FPEIS, the feasibility of implementing this alternative due to the factors presented above is limited. A cost estimate of \$5 million was calculated in 2000 (Corps 2000), therefore making this alternative unattainable for the City to further pursue. For the above reasons, this alternative was abandoned in favor of the preferred alternative.

2.3 Alternative 3: Create a New Channel (preferred)

In this scenario, a new channel would be created along a new alignment through Gary Grant Big Soos Creek Park. Several alternative alignments from Lake Meridian to Soos Creek were evaluated. Specific alignments were constrained by topography, geology, real estate and butterfly habitat preservation on adjacent Muckleshoot Tribal land.

The proposed (preferred) alignment would involve construction of a water control structure at the Lake Meridian Outlet zone to augment low flow conditions of Cow Creek. The existing stream channel zone from Lake Meridian downstream approximately 900 feet (trailer park) would be rehabilitated in its current alignment. The majority of flow from the stream would be diverted near an existing mobile home park into a new channel. Construction of the new channel would require some unavoidable tree removal, excavation and stabilization to achieve proper grade, and extensive riparian plantings throughout the disturbed areas. The rehabilitated stream and new channel would have habitat features favorable for spawning and rearing of coho salmon and cutthroat trout. A riparian corridor with mature vegetation already exists along the entire route and the new stream would be located inside an environmentally protected area. The new stream would be better protected from untreated stormwater, spills, and disturbance. The monetary costs of constructing a new outlet channel alignment (Alternative 3) would be smaller and the environmental benefits would be greater than Alternative 2. The preferred alternative would improve in- and near-stream habitat quality and complexity, improve fish passage conditions for coho salmon and cutthroat trout, improve rearing habitat for juvenile fish, provide spawning habitat, and maintain or improve water quality for use by all life stages of salmonids or other aquatic or terrestrial wildlife, thereby meeting the goals of developed in the EIS.

3 EXISTING ENVIRONMENT

Characteristics of the existing environment have been addressed in detail within a number of documents previously prepared as part of the Green/Duwamish River Basin Restoration Program (see section 1.1). Characteristics of the existing environment that are specific to Lake Meridian Outlet (Cow Creek) and the proposed project site are described in detail below based on reconnaissance work and review of available documentation. Rather than repeating information for the general Green/Duwamish River system here, that information is incorporated largely by reference to the documents listed below:

3.1 Physical Characteristics

The history and physical characteristics of the Green/Duwamish River basin are described in detail in Sections 3.1 and 3.2 of the FPEIS (USACE and King County DNR 2000). Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (1990) in the section titled "Earth." A description of the physical characteristics and historic conditions relevant to the proposed restoration project site is presented below.

Lake Meridian covers an area of approximately 165 acres and is located in the Big Soos Creek watershed. The current lake outlet is approximately 9,000 feet long and enters Big Soos Creek at a location outside the City of Kent limits where Big Soos Creek crosses Kent-Black Diamond Road. The area is currently undergoing urbanization. The current comprehensive plan

designation for the majority of the land adjacent to the outlet creek is for single family residential development with six units per acre.

A review of historical mapping and reports from the area indicates that the current alignments of the lake inlet and outlet are alterations of historical locations (Figure 3-1). Clark Lake and an inlet creek to it may have formed the original headwaters of Lake Meridian. Clark Lake is currently a tributary to Meridian Valley Creek. The lake outlet may have followed a more easterly course to Big Soos Creek, with the current north-south alignment likely resulting from the construction of 152nd Ave. SE/Kent Black-Diamond Road. Lake Meridian discharges into the outlet channel from approximately October through June each year. As a result, the existing outlet channel contains a seasonal stream that typically flows through the winter and spring and lacks flows from early summer through fall. Surface water flows are supplemented by groundwater and by stormwater runoff from impervious surfaces.

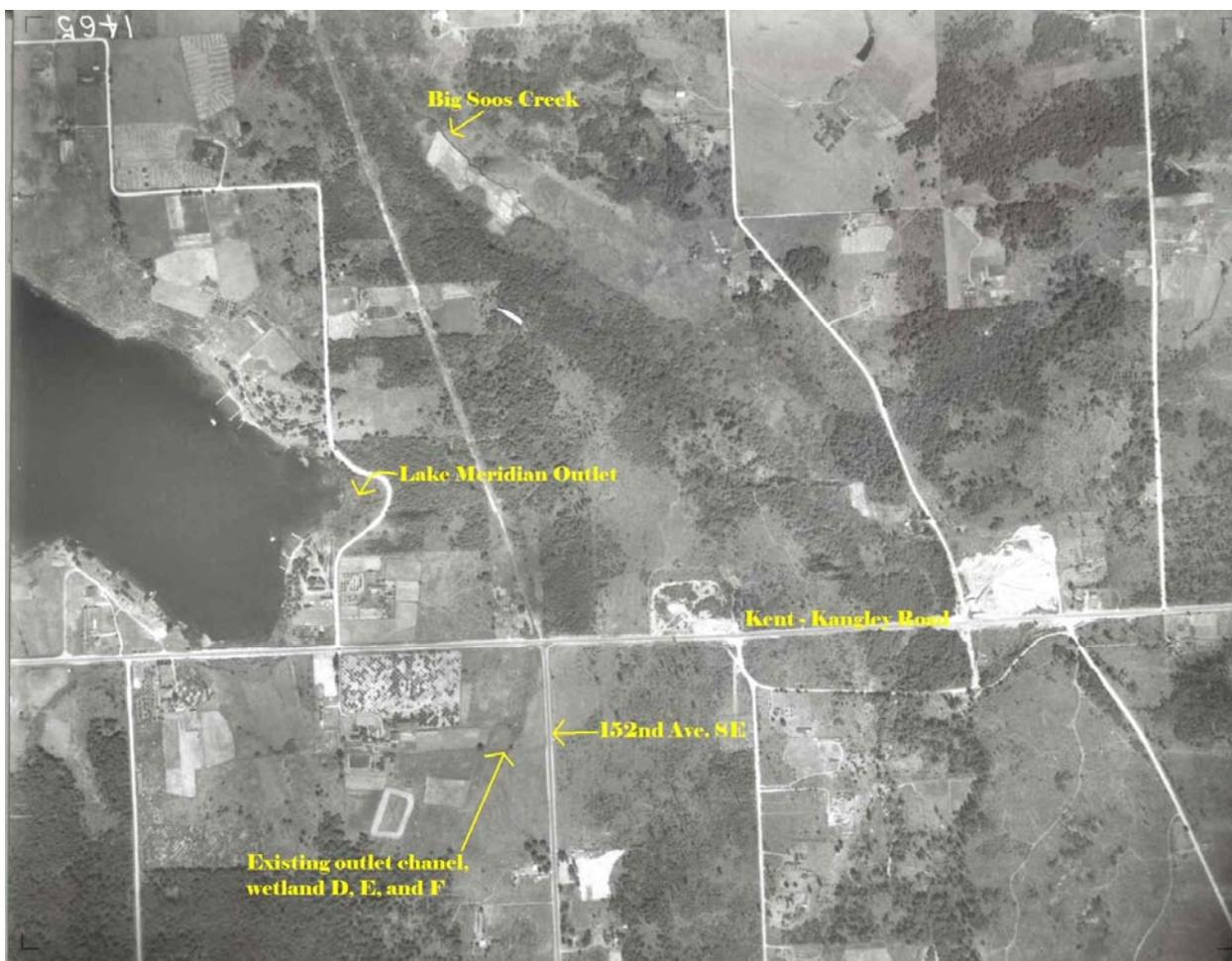


Figure 3-1: 1936 aerial photo with major features labeled.

The current outlet creek alignment (Figure 1-2) consists of easily distinguishable reaches. The first 300 feet of channel are located within the City of Kent Lake Meridian Park. Flow is conveyed through several culverts with adjacent riparian corridor limited in area and vegetated by low shrubs.

Once the Creek flows under 152nd Way SE, it is located within Gary Grant Soos Creek Park. Habitat in this approximately 500-foot long reach is good with a fair amount of overhead cover, small woody debris, and abundant gravel substrate. The downstream end of this reach is located where the creek enters a 700-foot long wetland swale (Wetland C) that functions as a stormwater detention pond during winter months. The swale/pond is located adjacent to a Cascade Villa mobile home park and provides some waterbird/duck habitat during winter months when inundated. Surface water exits this reach via a cistern draining south under Kent-Kangley road to a series of disturbed wetlands (Wetlands D, E, F). The cistern presents a fish passage barrier.



Figure 3-2: Wetland C - stormwater detention pond and cistern outlet

The wetlands south of Kent Kangley and west of 152nd Ave SE are characterized by a combination of scrub-shrub and emergent/wet meadow wetlands. The wetlands have been disturbed from hydrologic modification and decades of agricultural/pasture use. The channel substrate is silt and grass, channel complexity is limited, and very little shading is available. An undersized channel reach conveys water from the south end of the wetland to a concrete culvert under 152nd Ave SE.

3.2 Wetlands

A wetland inventory was performed to identify and evaluate all wetlands that will be affected by project activity. A total of nine wetlands were identified (See Figure 3-3). Three wetlands are located in the Gary Grant Soos Creek Park site and four wetlands located downstream of the site within the existing outlet alignment. Acreages for each wetland are shown in Table 3.1. Wetlands 'D,E,F are referred to as DEF in this report since they are essentially one system only separated by two private roads with culverts. The remaining wetland, Wetland B, is a very large system associated with Big Soos Creek that extends offsite to the north, south and east.

The following information describing each wetland is taken in part from the City of Kent Public Works Lake Meridian Outlet Channel Realignment Project Wetland Functional Assessment (Springwood & Assoc. 2003). The Functions Assessment followed the methodologies of the Washington Department of Transportation Wetland Functions Characterization Tool for Linear Projects (WSDOT 2000). The report provides a brief description and statement of the major functions that each identified wetland performs. See Table 1 for summary of each wetland's size.

Wetland A. Wetland A is a 0.34-acre closed, seasonally wet depression that supports a mid-successional forested community dominated by black cottonwood, red alder, salmonberry, slough sedge, and piggyback plant (Cooke Scientific Services, 2001). The wetland is located within the second-growth mixed forest community covering much of Gary Grant Soos Creek Park, and the upland forest community in the buffer area surrounding the wetland is intact and in good condition. Due to its relatively isolated and undisturbed condition, and to the presence of a forest community, Wetland A provides three major functions. These include General Habitat Suitability, Native Plant Richness, and Educational or Scientific Value.

Wetland B. Wetland B is a perennially wet riparian wetland adjacent to Big Soos Creek that supports forested, scrub/shrub, and emergent wetland communities. The area delineated for this project is a small portion of a 185 acre wetland identified in the King County Wetland Inventory (King County 1990) as Soos Creek 30. Characteristic plant species growing in the wetland include red alder, western red cedar, salmonberry, lady fern, and skunk cabbage (Cooke Scientific Services, 2001). A Bonneville Power Administration (BPA) transmission line right of way (ROW) passes through the portion of Wetland B where the City proposes to create the new Cow Creek Channel. Periodic vegetation management activities within the BPA ROW include tree topping and removal, and maintain a shrub community dominated by hardhack and willow.

Due to its relatively remote location, large area, and association with Big Soos Creek, this wetland provides several major functions. These include Flood Flow Alternation, Erosion Control & Shoreline Stabilization, Organic Matter Production and Export, General Habitat Suitability, Amphibian Habitat, Habitat for Wetland Associated Mammals, Native Plant Richness, and Uniqueness and Heritage.

Wetland C. Wetland C is a 0.94 acre stormwater retention and detention basin that was excavated within an existing wetland (the area considered jurisdictional by the Corps is 0.16 acre smaller than the area identified in the project's wetland delineation report). A vertical culvert forms the outlet from the wetland and retains surface water to a depth of approximately two feet before it spills into the outlet culvert and flows through a series of culverts and ditches before resurfacing in Wetland DEF. Despite the fact that Wetland C has both an inlet and an outlet, it was identified as a depressional outflow wetland due to the lack of a defined stream channel within the wetland. The portion of Wetland C considered jurisdictional by the Corps supports an emergent plant community dominated by reed canary grass (Cooke Scientific Services, 2001). Major functions provided by Wetland C include Flood Flow Alternation, Nutrient and Toxicant Removal, Organic Matter Production and Export, General Habitat Suitability, and Wetland Associated Bird Habitat.

Wetland DEF Wetland DEF covers 1.64 acres and supports emergent and scrub/shrub plant communities composed of native and non native species (Cooke Scientific Services, 2001). Although the project's delineation report describes three separate wetland areas, the functional assessment team evaluated all three areas as a single wetland. This

decision was based on the location of the three areas within the same landscape feature, their proximity to each other, the similarity of their vegetation communities and soils, and their hydrologic connection.

The functional assessment team also changed the wetlands depressional outflow hydrogeomorphic classification identified in the delineation report to riverine impounding. This change was based on the wetlands location in a topographic valley, the presence of a stream channel and observations of flooding within the wetland, and the presence of road berms and culverts that restrict flows within and from the wetland during the wet season. In addition, the presence of both a defined inlet and a defined outlet removes this wetland from the depressional wetland class defined by WSDOT (2000), which requires that depressional systems exhibit closed contour intervals on at least three sides.

Major functions provided by Wetland DEF include Flood Flow Alteration, Nutrient and Toxicant Removal, Erosion Control and Shoreline Stabilization, Organic Matter Production and Export, and General Habitat Suitability.

Wetland G. Wetland G covers 0.25 acre and supports a forest community composed primarily of native species (Springwood Associates 2003). Wetland G is a depressional wetland lacking a defined inlet and outlet, and is located on the slope between the bench zone and the Big Soos Creek floodplain. Functions provided by Wetland G include General Habitat Suitability, Native Plant Richness, and Educational or Scientific Value.

Wetland H. Wetland H is 891 square feet (.02 acre) emergent lacustrine wetland that exists along the shore of Lake Meridian. Functions provided by Wetland H include Stormwater Retention, Erosion Control and Shoreline stabilization and General Habitat Suitability.

Wetland I. Wetland I is a 1,715 square foot (0.4 acre) scrub/shrub riverine wetland along the lake outlet stream channel between the lake and 152nd Way SE. Major functions provided by Wetland I are General Habitat Suitability and Erosion Control and Shoreline stabilization.

TABLE 3-1. WETLANDS WITHIN THE PROJECT AREA, THE TOTAL AREA OF EACH, AND THE AREA THAT WILL BE AFFECTED BY THE PROJECT.

Wetland	Total Area (acres)	Area Affected (acres)
Wetland A	0.34	0.34
Wetland B	185	0.3
Wetland C	0.94	0.94
Wetland DEF	1.64	1.64
Wetland G	0.25	0.25
Wetland H	0.02	0.02
Wetland I	0.4	0.4

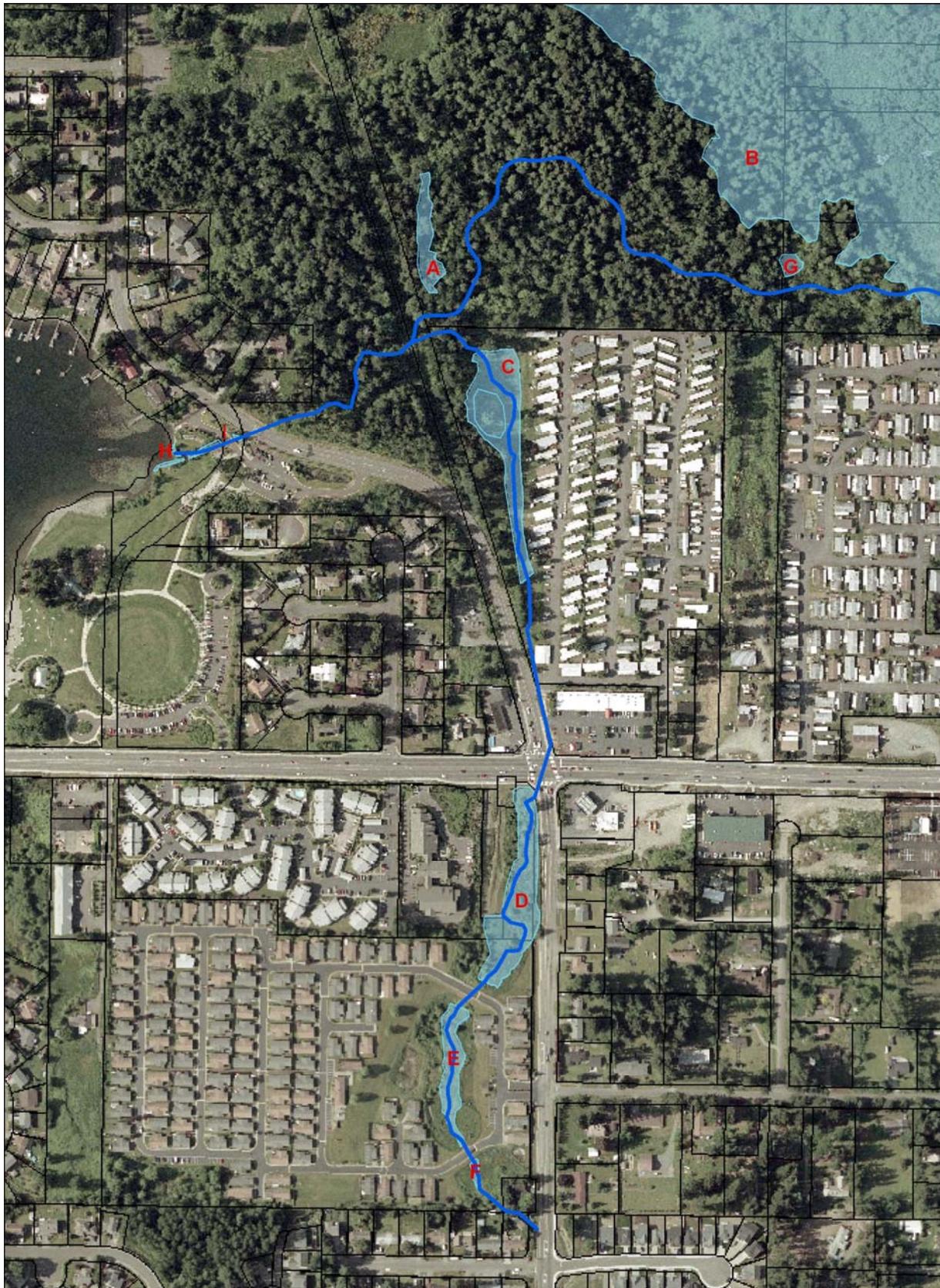


Figure 3-3. Wetland inventory map with drainage and proposed creek alignment

3.3 Topography, Geology, and Soils

The site's topography consists of a plateau at an elevation of 375 to 360 feet above sea level in the northwestern portion of the site. It then slopes steeply down to the east toward the Big Soos Creek valley in the eastern part of the site at about 320-360 feet above sea level. The existing outlet channel topography slopes gently to the southeast from the plateau through a series of wetland swales. The elevation at the confluence of the outlet channel and Big Soos Creek is 311, representing 69 feet of elevation change from the outlet of the lake.

The area that will be affected by project activity is underlain by glacial deposits from the latest glacial advance and retreat that occurred about 13,000 years ago. There are two geologic units in the vicinity of the project area including Ground moraine deposits (Qgt) and Ice contact stratified drift of valley train deposits (Qiv). The Qgt unit is characterized by thin ablation and lodgment till deposits and is mapped in the upland portions of the project area, including the Lake Meridian Park and Gary Grant Soos Creek Park. The Qiv unit is characterized by mostly sand and gravel deposited by melt water streams in the Big Soos Creek valley in the eastern portion of the project area. The Qiv unit is also mapped in the southwest portion of the project area in the vicinity of identified project wetlands DEF (GeoEngineers, Inc 2005).

A geologic characterization study in the immediate project area indicates that six glacially derived geologic units underlie the project area (GeoEngineers 2005). The evaluation was partially performed to document surface conditions in the wetlands to determine the ability of existing soil conditions to retain reduced surface water flows. The following information is taken directly from the study. From youngest to oldest these units include:

Recessional Outwash. Recessional Outwash consists of medium dense sand with gravel and variable silt content deposited by melt water flowing off the receding glacier. This unit is generally highly permeable and sensitive to erosion. This unit was encountered at the ground surface along the western upland portion of the site.

Recessional Glaciolacustrine deposits. Recessional Glaciolacustrine deposits consist primarily of silt, deposited in ponds and lakes left by the receding glacier. This unit is generally medium stiff and compacted from the weight of the overlying recessional outwash. This unit has a lower permeability than the overlying Recessional Outwash and thus serves as an effective aquitard.

Lacustrine deposits. Lacustrine deposits consist of a medium stiff silt encountered at ground surface within the Big Soos Creek floodplain. This relatively thin unit has a lower permeability than the underlying Advance Outwash. Water ponds and forms wetlands on the surface of this unit.

Ablation Till. Ablation Till consists of a medium dense to very dense silty sand with gravel deposited directly by glacial ice. This unit has a much lower permeability than the overlying Recessional Outwash and thus serves as an effective aquitard. Ablation Till was encountered in the eastern portion of the site underlying the Recessional Outwash.

Lodgment Till. Lodgment Till varies from a dense to very dense silty sand with gravel to gravel with silt deposited at the foot of, and then overridden by, the advancing glacier. This unit has a much lower permeability than the overlying Recessional Outwash and thus serves as an effective aquitard. Lodgment Till was encountered in the western portion of the site underlying the Recessional Glaciolacustrine and Recessional Outwash deposits.

Advance Outwash. Advance outwash consists of a dense to very dense sand and gravel with variable silt content deposited by melt water streams flowing off of, and then overridden by, the advancing glacier. This unit is relatively thick and laterally continuous with a high permeability, making it an excellent aquifer unit. This outwash unit was encountered beneath the Lacustrine deposits and Ablation till, but presumably underlies the entire project area.

According to the King County Soil Survey (Snyder et al., 1973), there are three different soil series in the project area. From north to south, the on-site soils include Alderwood Gravelly Sandy Loam (AgC), six to fifteen percent slopes and (AgD) with fifteen to thirty percent slopes; Everett Gravelly sandy loam (EvC), five to fifteen percent slopes with (AgB) with zero to five percent slopes, and Bellingham silt loam (Bh), with slopes less than two percent. The Bellingham series occurs within the Big Soos Creek corridor.

The Alderwood soils are moderately well drained soils found on upland areas. The soils formed under conifers in glacial deposits. The permeability of these soils is moderately rapid in the surface layer and subsoil, and very slow in the substratum. Alderwood gravelly sandy loam, six to fifteen percent slopes, has slow to medium runoff, and moderate erosion potential. Alderwood gravelly sandy loam, 15 to 30 percent slopes, has medium runoff, but the erosion hazard is severe. These soils also have a moderate potential for slippage. Numerous inclusions are found in these soils, but inclusions make up no more than 30 percent of the mapped unit. Alderwood soils are not typically hydric soils.

Everett Gravelly Sandy Loam, 15 to 30 percent slopes occurs in long, narrow swathes along drainage ways or on short slopes between terrace benches. These soils formed in gravelly glacial outwash deposits on terraces and terrace fronts. These soils are typically excessively drained with medium to rapid runoff, and a moderate to severe hazard of erosion. Everett Gravelly Sandy Loam is not a hydric soil. Inclusions make up less than 30 percent of the mapped unit.

Bellingham Silt Loam is a poorly drained, hydric soil that formed in alluvium. It is typically found in depressions on the upland glacial till plain. Permeability and runoff are slow, and erosion hazard is slight. Inclusions make up less than 15 percent of the mapped soil unit.

3.4 Hazardous and Toxic Material

A Preliminary Assessment Screening (PAS) was prepared by the Corps to determine whether any hazardous or toxic material is present on or around the site that could affect project activities (Corps 2005). Soil and petroleum contamination occurs at the Circle K gas station (16405 S.E. 272nd) that is ¾ mile from the boundary of the project area and is part of a voluntary cleanup program. Therefore, the site is not expected to affect the proposed project. Confirmed soil and

suspected groundwater contamination from petroleum products, heavy metals, and cyanide was also documented at former Covrox, Inc. (27230 162nd Ave. SE). As with the gas station though, the site is ¾ mile away from the project area and is undergoing an independent cleanup action, and thus is not expected to affect the proposed project.

3.5 Hydrologic Regime

The historic and current hydrological characteristics of the Green/Duwamish River basin are described in detail in Section 3.3 of the FPEIS (USACE and King County DNR 2000). Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (1990) in the section titled “Water,” and the WRIA 9 Habitat Limiting Factors and Reconnaissance Report – Part II in the section titled “Hydrology” (Kerwin and Nelson, 2000). A discussion of hydrological conditions relevant to the proposed restoration project site is presented below.

The Lake Meridian drainage basin has an area of 1.16 square miles. The inlet located at the northwest end of the lake typically discharges at a peak rate of 3.8 cubic feet per second (cfs) during periods of high precipitation and averages 0.3 cfs during most of the year (Metro 1977). Two-, 25-, and 100-year flows at the inlet have been calculated as 13, 26, and 33cfs, respectively (Aqua Terra 1999). Subsurface springs also discharge into the lake. Surface water leaves the lake through the current lake outlet channel at the southeast end of the lake.

The outlet channel of Lake Meridian runs through a short segment of coniferous forest before entering a heavily modified reach and terminating at Soos Creek. Within the heavily modified reach, the channel flows through an excavated swale/wetland, a total of 31 culverts, and 3 wetlands near the Glen Brook Condominiums development. In addition to flow from Lake Meridian, this reach receives runoff from adjacent housing developments and roads.

Analysis shows that the existing Cow Creek channel mean monthly stream flow fluctuates on a seasonal basis (MGS October 2005), with the highest flows occurring during the months of December through March (3.2-3.6 cfs) and the lowest flows occurring from June to October (0.04-0.5) cfs. In April, flows begin to decline, averaging 2.21 cfs in April and 1.29 cfs in May. In November, flows generally begin to increase, averaging 1.54 cfs.

3.6 Water Quality

The historic and current water quality characteristics of the Green/Duwamish River basin are described in detail in Section 3.4 of the FPEIS (USACE and King County DNR 2000). Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (King County, 1990) in the section titled “Water,” and in the WRIA 9 Habitat-limiting Factors and Reconnaissance Report – Part II in the section titled “Water Quality” (Kerwin and Nelson, 2000). A discussion of water quality conditions relevant to the proposed restoration project site is presented below.

In general, Soos Creek has some of the region’s best water quality of the smaller creeks in the urban portion of King County. It is described by Washington Department of Ecology (WA DOE) as being a Class A waterbody that has excellent water quality (Kerwin and Nelson, 2000). However, ten reaches within the subbasin are on the state’s 303(d) list of impaired water bodies

for exceeding the state criteria for fecal coli forms, dissolved oxygen, and temperature. This includes two reaches in Big Soos Creek - one in the section just above the confluence of Big Soos Creek with Meridian Valley Creek that exceeds fecal coli forms, and a reach farther upstream near river mile (RM) 10.5 that exceeds Class A standards for dissolved oxygen and fecal coli forms (Kerwin and Nelson, 2000).

In 2003 the Washington Department of Ecology (WDOE) updated their 1997 water quality standards for surface waters in the State of Washington (Washington Administrative Code [WAC] 173-201A). However, as of 2006 the Environmental Protection Agency (EPA) had not approved all of these revised standards. Therefore, WDOE uses the 2003 standards for the parts that the EPA has approved (i.e. coliforms and metals) and uses the 1997 standards for the parts the EPA has not approved (i.e. temperature, dissolved oxygen, pH, turbidity).

The outlet of Lake Meridian (Cow Creek) is an unclassified water that drains to the Green River, a tributary to Puget Sound, is considered a Class A water under the 1997 WDOE standards and a Primary Contact Recreation/Noncore Salmon and Trout Spawning water under the 2003 WDOE standards. Water quality data for Cow Creek are limited. Taylor Associates (2000) collected one baseflow sample and one stormwater sample at the Lake Meridian outlet between 1999 and 2000. The baseflow sample temperature (20.2°C) exceeded the Class A temperature standard of 18°C. However, because Cow Creek is the outlet of Lake Meridian it is not atypical for surface water temperatures to be elevated during low flow summer months. Generally, lake outlets take water from the warmer surface of the lake and not from the cooler deeper waters. Baseflow concentrations of dissolved oxygen (12.1 mg/L), pH (7.73) and fecal coliform bacteria (<2/100mL) did not exceed water quality standards. Turbidity concentrations (9.5 NTU) were elevated but were likely due to little flowing water present at the time of sampling (Taylor 2000). All metals (cadmium, chromium, copper, lead, mercury, nickel and zinc) concentrations were below the laboratory detection limits and did not exceed water quality standards.

The stormwater sample had slightly elevated fecal coliform bacteria concentrations (est. 32/100mL) compared to baseflow, but did not exceed the Class A standard of 100/100mL. Concentrations of dissolved oxygen (13.2 mg/L) and pH (7.00) fell within standards, while metals concentrations were below the laboratory detection limits and therefore did not exceed standards. Turbidity was not measured.

Additional information for Cow Creek water quality can be inferred from data collected on Lake Meridian. Volunteers have collected water quality monitoring data since 1985 on Lake Meridian with data only missing during 1996 (King County 2005). This nearly 20-year data record indicates that the lake has excellent water quality. For the period of record, mean values ranged from 6 to 16 µg/L total phosphorus, 1.1 to 2.7 µg/L chlorophyll a, and 3.7 to 6.8 meters transparency. Based on analyses of these parameters, King County (2005) classified the lake as oligotrophic (low primary productivity) and determined the water quality to be excellent. Lake Meridian surface water temperatures can exceed 24°C during the summer months, which is typical for many small lakes in King County (King County 2005).

Aquatic insects were also collected in the Taylor Associates study to evaluate the health of the creek system by using the Benthic Index of Biotic Integrity, or B-IBI, as a “report card.” A score

of 46-50 is generally considered excellent, 38-44 good, 28-36 fair, 18-26 poor, and 10-16 very poor (Fore et al., 1997). In the Taylor Associates study, Lake Meridian Outlet (Cow Creek) scored a B-IBI score of only 14 (very poor), and an RBP (aquatic habitat) ranking of 97 out of an optimal 180.

3.7 Vegetation

The historic and current characteristic vegetation of the Green/Duwamish River basin are described in detail in Section 3.6 of the FPEIS (USACE and King County DNR 2000). Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (King County, 1990) in the section titled “Plants and Animals,” and in the WRIA 9 Habitat-limiting Factors and Reconnaissance Report – Part II (Kerwin and Nelson, 2000) in the section titled “Riparian Condition.” A discussion of vegetative conditions relevant to the proposed restoration project site follows.

In general, there is very little mature native vegetation in the riparian zone along the existing outlet channel. After leaving Lake Meridian, the existing outlet channel runs eastward for approximately 900 feet through second-growth mixed forest, then turns and flows southward to its confluence with Big Soos Creek. The south-flowing portion of the stream passes through an urban residential landscape where removal of native riparian vegetation and woody debris have degraded most of the stream channel and its remaining adjacent natural areas. Wetland habitats are comprised of disturbed emergent and scrub-shrub communities. Downstream of the wetlands, the majority of the drainage corridor occurs in a grass-lined roadside ditch with the exception of a 100 foot reach of restored stream channel.

3.7.1 Upland Areas

The upland portion of the project site where the new channel is proposed occurs in Gary Grant Soos Creek Park. The area is situated on a plateau, then slopes moderately east to the Big Soos Creek Corridor. The site is predominantly forested with extensive scrub-shrub communities and some herbaceous habitats. The forested community is dominated by Douglas fir (*Pseudotsuga menziesii*), big-leaf maple (*Acer macrophyllum*) and black cottonwood (*Populus balsamifera*), with red alder (*Alnus rubra*) western red cedar (*Thuja plicata*), and western hemlock, (*Tsuga heterophylla*) occurring commonly. The shrub layer includes patches of red elderberry (*Sambucus racemosa*), beaked hazelnut (*Corylus cornuta*), Indian plum (*Oemleria cerasiformis*), western serviceberry (*Amelanchier alnifolia*), ocean spray (*Holodiscus discolor*), snowberry (*Symphoricarpos albus*), blackberry (*Rubus armenicus*) and salmonberry (*Rubus spectabilis*). The ground layer contains patches of sword fern (*Polystichum munitum*), creeping blackberry (*Rubus ursinus*), fringe cup (*Tellima grandiflora*), piggyback plant (*Tolmiea menziesii*), stinging nettle (*Urtica dioica*), false lily of the valley (*Maianthemum dilatatum*), Pacific bleeding heart (*Dicentra formosa*), Siberian miner’s lettuce (*Claytonia sibirica*), and mosses.

3.7.2 Wetland Areas

The wetlands identified in the study area contain palustrine forested (PFO), scrub-shrub (PSS), and emergent (PEM) wetland communities (Cowardin 1979). The forested wetlands are dominated by red alder and black cottonwood with western red cedar commonly occurring at the margins of the wetlands. Scrub-shrub species in the wetlands include vine maple (*Acer*

circinatum), willows (*Salix* spp.), spiraea (*Spiraea douglasii*), salmonberry and black twinberry (*Lonicera involucrate*). Dominant herbaceous species observed in the wetlands are false lily of the valley, skunk cabbage (*Lysichiton amercanum*), reed canarygrass (*Phalaris arundinacea*), and slough sedge (*Carex obnupta*).

3.8 Fish

The historic and current characteristic fish communities of the Green/Duwamish River basin are described in detail in Section 3.5 of the FPEIS (USACE and King County DNR 2000). Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (King County, 1990) in the section titled “Plants and Animals,” and in the WRIA 9 Habitat-limiting Factors and Reconnaissance Report – (Kerwin and Nelson, 2000) in the sections titled “Current and Historic Salmonid Populations” and “Fish Passage.” A discussion of fish species relevant to the proposed restoration project site follows.

Six species of anadromous fish are found in the Soos Creek System, including fall Chinook (*O. tshawytscha*), coho (*O. kisutch*), chum (*O. keta*), sea-run rainbow trout or steelhead (*O. mykiss*), sea-run cutthroat (*O. clarki*), and Dolly Varden char (*Salvelinus malma*) (King County, 1990). In addition, the system contains resident cutthroat and rainbow trout, and remnant populations of spring and summer Chinook may occur in the mainstem. WDFW manages a hatchery on lower Soos Creek at RM 0.7 that produces Chinook and coho, and coho hatchery fry are planted in Big Soos Creek.

Salmonid spawning occurs in the Soos Creek system from August through March. Smaller tributaries are utilized heavily by juvenile salmonids, particularly coho, steelhead, and sea-run cutthroat trout, as rearing habitat. The principal juvenile salmonid out-migration season occurs from mid-April through mid-July for coho, steelhead, sea-run cutthroat, and Chinook (Grette and Salo 1986, USACE 1997).

In 1996, fish populations were surveyed at the Lake Meridian Inlet at SE 256th Street and at four locations along the Lake Meridian Outlet Creek including. At all survey locations, zero fish were captured (HARZA 1996). However, personal communication with former Muckleshoot Tribe biologist Rob Malcolm confirmed small numbers of juvenile coho in the mid reaches of the outlet channel. Mr. Malcolm performed winter sampling in approximately 1997 (Malcolm 2005). These findings are supported by the Washington Department of Fisheries and Wildlife (WDFW) Stream Catalog of Streams and Salmon Utilization (Williams et al. 1975) which identified the outlet to Lake Meridian (WRIA 09.0091) as a salmon-producing stream. In that survey, only coho salmon were listed as using the outlet stream. However, cutthroat trout, while not targeted in historic WDFW surveys, likely used the outlet stream around the time of the 1975 survey for spawning and early rearing.

Lake Meridian is managed as a mixed species fishery. Lake Meridian supports an active sports fishery composed of seasonally stocked rainbow trout and kokanee salmon and persistent populations of largemouth bass and yellow perch. In fall 2000, the WDFW Warm Water Fish Enhancement Program conducted a stock assessment and assessed species composition, abundance, size structure, growth, and condition of fish in the lake (WDFW 2000). Fish were

captured by electrofishing, gill nets, and fyke nets. In terms of relative abundance, yellow perch were dominant (62%) followed by largemouth (22%) and smallmouth bass (11%) (WDFW 2000). A total of 2 rainbow trout and 6 kokanee salmon were captured comprising less than 1% of the total catch (WDFW 2000).

Past fish management policies and practices have resulted in the establishment of a kokanee salmon population within Lake Meridian. The demographics of this population are not known. Kokanee can spawn in streams, rivers, and in lakes where groundwater upwelling exists. This versatility may explain the persistence of the kokanee population in Lake Meridian. Kokanee in spawning condition were observed near the outlet of Lake Meridian during December of 1999. These fish were probably “assessing” the quality of spawning habitat conditions in the outlet creek (Kent 2002).

As federally threatened species, the occurrence and potential effects of the proposed project on Puget Sound Chinook salmon and Coastal/Puget Sound bull trout are addressed in Section 4.6.

3.9 Wildlife

The historic and current characteristic wildlife communities of the Green/Duwamish River basin are described in detail in Section 3.7 of the FPEIS (USACE and King County DNR 2000). Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (King County, 1990) in the section titled “Plants and Animals,” and in the WRIA 9 Habitat-limiting Factors and Reconnaissance Report – (Kerwin and Nelson, 2000) in the section titled “Non-native Species.” A discussion of wildlife relevant to the proposed restoration project site follows.

The riparian corridor and wetland associated with Big Soos Creek provide excellent habitat for a variety of wildlife species. Common urban wildlife such as coyotes (*Canis latrans*), Columbian black-tailed deer (*Odocoileus hemionus columbianus*), beaver (*Castor canadensis*), raccoons (*Procyon lotor*), opossums (*Didelphis virginiana*), rats (*Rattus sp.*), mice (*Mus sp.*), and voles (*Microtus sp.*) are likely to be found in the area. Numerous bird species including great blue herons (*Ardea herodias*), white-crowned sparrows (*Zonotrichia leucophrys*), song sparrows (*Melospiza melodia*), common yellowthroat (*Geothlypis trichas*), yellow warbler (*Dendroica petechia*), northern flickers (*Colaptes auratus*), American robins (*Turdus migratorius*), American crows (*Corvus brachyrhynchos*), spotted towhees (*Pipilo maculatus*), red-winged blackbirds (*Agelaius phoeniceus*), dark-eyed juncos (*Junco hyemalis*), black-capped chickadees (*Poecile atricapillus*), and marsh wrens (*Cistothorus palustris*) are likely to use the area that will be affected by the project. Other resident and migratory bird species are expected to inhabit and utilize available habitats on-site during some portion or all of the year. Tree frogs and garter snakes (*Thamnophis sp.*) may also utilize the site.

King County (1990) noted that some unusual species occur within the Soos Creek subbasin including the Pacific giant salamander (*Dicamptodon ensatus*), water ouzels or dippers (*Cinclus mexicanus*), kingfishers (*Cerule alcyon*), Cooper’s hawk (*Accipiter cooperii*), bobcat (*Lynx rufus*), black bear (*Ursus americanus*), and river otters (*Lutra canadensis*). The riparian corridor along the majority of the length of Big Soos Creek provides excellent, contiguous, diverse habitat that enables wildlife dispersion and movement.

Bald eagles (*Haliaeetus leucocephalus*) frequently use the Big Soos Creek corridor. As a federally threatened species, the occurrence and potential effects of the proposed restoration project on bald eagles is addressed in Section 4.10.

The outlet channel provides habitat for common urban wildlife including mallard (*Anas platyrhynchos*), gadwall ducks (*A. strepera*), and small mammals and passerines. Residential encroachment to the wetland boundary limits the occurrence of more sensitive species.

3.10 Threatened and Endangered Species

The potential occurrence of federally listed threatened and endangered species within the Green/Duwamish River basin are described in detail in Section 3.7.2 of the FPEIS (USACE and King County DNR 2000). A synopsis of this information relevant to the proposed restoration project site is presented below.

In accordance with Section 7(a)(2) of the Endangered Species Act of 1973, as amended, federally funded, constructed, permitted, or licensed projects must take into consideration impacts to federally listed and proposed threatened or endangered species. The Corps prepared two Programmatic Biological Assessments (BA) to assess potential impacts of the proposed work on species protected under the Act, one for species under the jurisdiction of the USFWS and one for species under the jurisdiction of NOAA Fisheries. Those BAs covered the federally listed threatened or endangered species listed in Table 1. Only the bald eagle, Chinook salmon, and bull trout occur within the vicinity of the Lake Meridian Outlet (Cow Creek) Relocation and Restoration site. Bald eagles frequent the Big Soos Creek corridor, and there is a known bald eagle nest within 2 miles of the project site. Chinook and bull trout distribution is assumed throughout Big Soos Creek but these species likely do not occur in the existing outlet channel.

TABLE 3-2. PROTECTED SPECIES ADDRESSED IN PROGRAMMATIC BIOLOGICAL ASSESSMENT DOCUMENTS

Species	Listing Status	Critical Habitat
Bald Eagle <i>Haliaeetus leucocephalus</i>	Threatened	—
Marbled Murrelet <i>Brachyramphus marmoratus</i>	Threatened	Designated
Northern Spotted Owl <i>Strix occidentalis caurina</i>	Threatened	Designated
Gray Wolf <i>Canis lupus</i>	Threatened	
Canada Lynx <i>Lynx canadensis</i>	Threatened	—
Coastal/Puget Sound Bull Trout <i>Salvelinus confluentus</i>	Threatened	Designated
Puget Sound Chinook Salmon <i>Oncorhynchus tshawytscha</i>	Threatened	Designated

3.11 Cultural Resources

Past researchers have placed the Big Soos Creek drainage system within the territory of the Skopamish or Green River people (Benson and Moura 1985:13; Lewarch et al. 1996). During the historic-period these people came to be known as the Muckleshoot Indians. Swanton placed the Muckleshoots within the Nisqually dialectic group of the coastal division of the Salishan linguistic family (1952:428-429). Suttles and Lane (1990) placed the Green River drainage basin as within the territory of cultural groups who spoke languages classified as the Southern Lushootseed dialect of the Lushootseed language group. The geographical position of the Skopamish required greater dependence on hunting and overland travel and the influence of the Yakima and Klickitat differentiated them from the neighboring Puget Sound groups (Lewarch et al. 1996:15-16). The nearest apparent village was reportedly located on the Green River south of the project area (Dailey 2003:Duwamish-Seattle Map). Swanton (1952:424-425), under Muckleshoot, lists the Skopamish as a subdivision living on the upper Green River, but does not mention any village sites. Ethnologist T.T. Waterman (1920:16) provided information that the Skopamish could be subdivided into numerous smaller groups that were named by village and that the people of Big Soos Creek were referred to as the “*Sus-a’bc*.”

The General Land Office (GLO) map of 1867 for township 22 N., R. 5 E., W.M., shows that at that time the project area in Section 26 was not claimed and there are no wagon roads or other development within the vicinity. The 1868 GLO map shows that the only land claimed in the entire township was at its southwest corner where all of the land along the White River was shown as claims.

3.12 Native American Interests

The Soos Creek System is within the usual and accustomed fishing area of the Muckleshoot Indian Tribe (USACE and King County DNR 2000). The Muckleshoot tribe considers the fisheries resources of the Soos Creek/Green River system to be an invaluable resource, and a primary goal of the tribe is to protect and restore each run of fish in its usual and accustomed fishing area. A traditional fishing area lies at the lower end of Soos Creek and downstream of Soos Creek in the Green River (Muckleshoot Indian Tribe Fisheries Department Comment Letter of Jan 8, 1990 in King County, 1990).

3.13 Land Use

The historic and current land and shoreline use of the Green/Duwamish River basin are described in detail in Section 3.11 of the FPEIS (USACE and King County DNR 2000). Additional details specifically related to the Soos Creek Subbasin may be found in the Soos Creek Basin Plan and Final Environmental Impact Statement (King County, 1990) in the section titled “Description of Watershed Area,” and in the WRIA 9 Habitat-limiting Factors and Reconnaissance Report – (Kerwin and Nelson, 2000) in the section titled “Land Use.” A discussion of land use relevant to the proposed restoration project site follows.

The Soos Creek subbasin has undergone rapid urbanization, particularly in the north and west portions of the basin, west of Big Soos Creek (Kerwin and Nelson, 2000; King County, 1990). This area contains a high density of urban subdivisions, commercial retail centers, and scattered single-family residences.

The project area encompasses the City of Kent Lake Meridian Park, at the lake outlet and adjacent King County Gary Grant Soos Creek Park in the vicinity of the proposed outlet channel. GGSCP is undeveloped forestland with some pedestrian paths used for passive recreation. The existing outlet channel occurs within high-density single-family residential housing, high-density trailer park, high-density apartment complex and commercial uses.

Historic aerial photos show that most of the residential and commercial areas were used for agricultural purposes prior to urbanization. No farming activities occur at this time. GGSCP remains forested.

3.14 Recreation

The historic and current land and shoreline use of the Green/Duwamish River basin are described in detail in Section 3.12 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Lake Meridian is used recreationally for fishing and boating. Access is provided by either private docks or the public boat launch at Lake Meridian Park.

Recreational use of GGSCP in the proposed project area is variable both geographically and by user type. The park is regularly used by nearby residents as well as by recreationalists as an outing destination. An extensive unimproved trail network traverses the park. Evidence of bicycle use (mountain bikes and BMX type bikes) is widespread but concentrated primarily along the southern half of the park. Use includes the “creation” of bicycle jumps along several of the major trails. A parking lot/ access point for the paved Soos Creek trail is present on the northern edge of the park. The Soos Creek Trail is 4 miles in length and features a gentle grade in a natural setting suitable for leisurely strolls, bicycles rides and equestrian activities. (Kent 2002).

3.15 Air Quality and Noise

Information characterizing the air quality and noise levels within the Green/Duwamish River basin is described in detail in Sections 3.8 and 3.9 of the FPEIS (USACE and King County DNR 2000). A discussion of current site-specific information relevant to the proposed restoration project site is presented below.

The Puget Sound region has been an attainment area for carbon monoxide since October 11, 1996; the Seattle-Tacoma area has been an attainment area for ozone since November 25, 1996. As of May 14, 2001, the Seattle, Tacoma, and Kent areas were classified as attainment areas for particulate matter (PM10). Thus, the project area is within attainment areas for all criteria pollutants. The reductions in PM10 pollution that led to attainment status are a result largely of changes enacted by the legislature in the 1991 Clean Air Washington Act (Puget Sound Clean Air Agency website: http://www.pscleanair.org/news/2001/05_14_epa.shtml). Those changes tightened up emission standards for wood stoves and fireplaces, prohibited outdoor burning in urban areas, and authorized an inspection program for diesel trucks and buses, which was implemented by the Department of Ecology. In addition, a partnership between the Clean Air Agency and the Northwest Hearth Products Association encouraged people to trade out their old wood stoves and fireplaces for cleaner natural gas, propane, pellet or EPA-certified models.

3.16 Transportation

Information characterizing traffic and transportation within the Green/Duwamish River basin is described in detail in Section 3.10 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the project site is presented below.

Traffic within the vicinity of the proposed project site occurs primarily along 152nd Ave. SE that generally divides the project area west to east. No traffic studies are available at this time, but it is likely that traffic volumes are highest during peak commuting hours. 152nd Ave. SE serves as the main access road to numerous subdivisions and single-family residences that are located south of Kent-Kangley Road (KKR) (also known as State Route 516), which is a major arterial providing access from the valley floor to the Kent plateau.

3.17 Aesthetics

Information characterizing visual quality and aesthetic resources within the Green/Duwamish River basin is described in detail in Section 3.13 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the project site is presented below.

Lake Meridian Park is a landscaped City of Kent Park with mowed lawn, some natural areas, and an assemblage of ornamental trees and shrubs. Public gathering locations, restrooms, boating access, and parking are also provided. GGSCP is a naturalistic setting with moderate aged coniferous forest sloping east towards the Soos Creek riparian corridor. An earthen path meanders through the park boundaries. South of the project along the existing outlet channel high density residential development, commercial uses, and a trailer park detract from the natural setting described above. Residences are landscaped with some retained native and ornamental trees and shrubs.

4 ENVIRONMENTAL EFFECTS

The effects of the proposed stream relocation project are compared against the baseline conditions associated with the no-action alternative.

4.1 Physical Characteristics

4.1.1. No Action

The current configuration of the channel would remain in place.

4.1.2 Preferred Alternative

Information describing the environmental effects on the physical characteristics of the Green/Duwamish River basin is presented in Section 4.4 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Relocation of Lake Meridian Outlet (Cow Creek) into a more natural streambed would result in improved fish habitat over that in the roadside ditch, stormwater ponds, and disturbed wetlands. The meandering stream channel would mimic natural streams. A minimum of one foot of streambed gravel would line the channel, and numerous pieces of large woody debris (LWD), including root wads and debris piles, are incorporated into the design. Native trees and shrubs planted along the banks of the stream channel would provide a source of shade and organic material to the stream. The presence of the LWD would provide refuge for juvenile fish, and both the LWD and native trees and shrubs would enhance detrital production for juvenile fish prey. In addition, the relocated stream channel would be farther away from the road in all reaches, with an extensive undeveloped buffer protected within the boundaries of GGSCP. This buffer would reduce the exposure of the stream to potential pollutants from roadside runoff into the stream. Although the preferred alternative would result in the loss of 5000 linear feet of existing outlet channel, the new streambed would increase habitat complexity and diversity, ultimately increasing the aquatic functions and values of the site.

4.2 Wetlands

4.2.1 No Action

There would be no direct alteration of the wetlands along the existing outlet channel. The wetlands would remain in their current state. Although hydrology would not be intentionally modified, additional development in the basin would likely alter runoff quantity, timing, and quality, which would likely continue to degrade the existing wetlands.

4.2.2 Preferred Alternative

Unavoidable wetland impacts will result from the project construction activity in close proximity to Wetlands A, B, C, H, and I, and will also result in excavation of approximately 0.3 acres of Wetland B to accommodate the new stream channel. Additional impacts will occur as a result of water diversion from Wetlands C, D, E, and F. These impacts would be mitigated through enhancement of existing wetlands, creation of new wetland area, and restoration of temporarily disturbed wetlands. The overall goal of the mitigation effort is to offset unavoidable impacts by maintaining water quality and water quantity functions, and increasing habitat functions of the wetlands within the project area. As a result, mitigation designs for each of the existing wetlands are based on the results of a functional assessment completed prior to design development. Physical and biological characteristics that currently limit the potential to provide functions would be improved to increase the level of wetland function.

Specific functions that are targeted for improvement include:

- General Habitat Suitability
- General Fish Habitat
- Native Plant Richness
- Educational or Scientific Value

4.2.2.1 Wetland Mitigation Concept Plan

Nine wetlands exist within the project area: wetlands A, B, C, D, E, F, G, H, and I (figure 3-3). Wetlands B, C, D, E, F, H, and I would be impacted by project construction and operation. To maintain and improve wetland functions, hydrology sufficient to support wetland conditions would be maintained in each impacted wetland, and non-native vegetation would be removed and replaced with native plant communities. In addition, new wetland area would also be created. Mitigation actions that have been, or would be completed in each of the project area wetlands and along the new stream channel are described in the following discussion.

4.2.2.2 - Impact Avoidance and Minimization

The route of the proposed outlet channel at its closest point to Wetland A is located approximately 60 feet from the wetland boundary. As a result, direct impacts to Wetland A due to project construction would be minimal, and there would be no direct impacts due to project operation. An existing, informal trail created by park users through Wetland A will be removed to reduce disturbance from human activity.

The project also avoids direct impacts to Wetland G by locating the proposed stream channel about 35 feet from the wetland boundary. Noise and activity resulting from project construction may temporarily reduce the habitat functions provided by Wetland G. Project construction and operation would not affect other functions provided by Wetland G.

4.2.2.3 - Mitigation of Unavoidable Impacts

The loss of functions associated with Wetland H, an 891 square-foot (.02 acre) emergent lacustrine wetland that exists along the shore of Lake Meridian, and Wetland I, a 1,715 square-foot (.04 acre) scrub/shrub riverine wetland along the lake outlet stream channel between the lake and 152nd Way SE, would be directly mitigated by the re-establishment of a new, wider stream channel and open water embayment (as an extension of the lake) within Lake Meridian Park. Wetland hydrology similar to existing conditions (and with added open water area) would be maintained for the mitigated condition, and native wetland vegetation will be established around the embayment periphery and along the channel banks following project construction.

The changes in hydrologic characteristics in Wetlands C through F associated with the new Cow Creek channel construction and operation would be minimized by maintaining a portion of the Cow Creek streamflow to the existing stream channel downstream from the confluence with the new channel, by re-regulating storage and outflow from Wetland C, and by the proposed soil-bentonite lining of Wetlands C through F. To accomplish this, lake outflows above the minimum seasonal streamflows that are required to maintain fish passage and habitat in the new channel would be partially diverted into Wetland C (when available, since the channel is ephemeral). Flow diversion to the existing channel would begin when lake outflows exceed approximately 0.4 cubic foot per second (cfs), which is the approximate capacity of the new channel low flow section. This flow diversion would normally be limited to approximately 2 cfs (diversion flume capacity), except for occasional large storm event diversion discharges of up to 4 cfs (at 100-year lake discharge). Diversion flow volumes will range up to 25% of the total

streamflow, depending on the main channel streamflow level. The outlet of Wetland C would be modified such that water level and storage within Wetland C and discharge from it would maximize the hydrologic benefits to downstream Wetlands D, E, and F.

Wetland mitigation and enhancement would occur primarily in Wetlands C through F. The mitigation proposal includes installation of a soil-bentonite liner under Wetlands C, D, and E (and possibly F) after excavation and removal of surficial soils and non-native vegetation, and placement of suitable fill material in selected areas to create desired wetland grades. Although flow rate and runoff volume inputs to Wetland C (and D, E, and F) would be reduced with the new Cow Creek channel, the proposed soil-bentonite liner would minimize hydrologic input losses due to infiltration (currently there are significant streamflow losses within Wetland D (Springwood 2003)). Wetland C will maintain its existing seasonal open water functions in its southern portion. Wetland grades in the northern portion of Wetland C would be raised to restore grades that existed prior to the historical excavation that occurred within the wetland. Logs and excavations will be placed in the upper portion of Wetland C to spread and detain flows, allowing stormwater detention functions to be maintained.

Water stored in Wetland C and slowly released downstream would maintain surface hydrology flows to Wetlands D, E, and F typically for up to two weeks after inflows to Wetland C cease. Low-height berms or coir logs would be placed across Wetlands D and E in combination with excavation to create shallow pool habitat areas. These depressions would assist in detaining surface water to ensure that the largest possible wetland area captures the available hydrologic inputs, and would result in increased wetland habitat diversity by creating suitable conditions for the establishment of native emergent vegetation communities. Areas supporting non-native, invasive vegetation in Wetlands C through F would be cleared and planted with native tree, shrub, and herb species adapted to the wetlands' anticipated water depths and durations. Buffer zones around these wetlands include areas currently maintained as mowed turf. Native trees, shrubs, and herbs would be established to restore buffer functions. In addition, the City would establish permanent Native Growth Protection Easements that include the wetlands and their buffers.

It is expected that a portion of the streambank associated with the new Cow Creek channel in the upper bench zone would be saturated at a depth and duration adequate to meet city, state, and federal criteria for wetland hydrology. As a result, native plant species rated "facultative", "facultative wetland", or "obligate" would be established to provide sufficient cover to dominate the plant community in the floodplain zone. This will result in the creation of approximately 0.25 acres of forested riverine wetland with associated functions.

Construction of the new stream channel through Wetland B would result in the conversion of approximately 0.30 acre of the existing shrub-dominated riverine wetland community to a forested riverine wetland community. The new channel would be designed to maximize fish habitat, and would include embayment backwater areas and logs, and the channel banks would be planted with native trees, shrubs, and herbs. These physical and biological features would restore similar features unavoidably impacted during channel construction, and would enhance the fish habitat functions of Wetland B.

The proposed action would be consistent with the requirements of Nationwide Permit (NWP) 27 for stream and wetland restoration activities. Under this permit, compensatory mitigation is not required if the authorized work results in a net increase in aquatic resource functions and values in the project area. While the project would result in modification of the hydrologic regime of wetlands C, D, E, F the newly constructed streambed will provide enhanced functional value of the area for fish, and similar function and value for mammals, amphibians, aquatic insects, other invertebrates, and birds. Planting native trees and shrubs along the streambank would increase the extent and species diversity of wetland, riparian, and upland vegetation on the restoration site. In addition, these plants would increase the habitat value of the site by creating additional opportunities for foraging, nesting, cover, and refuge for a wide variety of species.

4.3 Topography, Geology, and Soils

4.3.1 No Action

As described above in section 4.1.1, there would be no alteration of the topography of the area or ground disturbances related to this project. The creek would remain in its current configuration until 152nd Ave. SE is eventually widened.

4.3.2 Preferred Alternative

Information describing the environmental effects on the topography, geology, and soils of the Green/Duwamish River basin is presented in Section 4.4.1 of the FPEIS (USACE and KingCounty DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

The construction of restored stream segment from the lake outlet to the low-flow splitter would occur largely within the existing channel footprint. The proposed new stream channel would require excavation into the steep slope in the eastern portion of the project area. Approximately 16,000 yards of excavated earthen material would be removed and hauled off site. A conveyor system may be used to import/export material to and from the project site. A road would be built in the alignment of the channel to sub-grade. Once excavation grade is met, stream gravel and LWD would be placed as machinery retreats out of the new channel area. Streambed materials have been selected to resist erosion and downstream transport (Geo-Engineers 2005).

Disturbance from construction would be short-term and temporary. The proposed project would change the topography in the vicinity because of the cut into the hillside and the creation of the stream channel. However, impacts to the site topography, geology, and soils would be minor. No substantial long-term increase in erosion or soil instability would occur. There will be a pulse of sedimentation following diversion of the stream into the created streambed, resulting in short term turbidity increases as the streambed adjusts to the new flow, and localized shifting of sediments would continue sporadically as the new stream heals and adjusts. High flows during the winter and spring following construction would continue to mobilize sediments in the areas where construction occurred, potentially contributing to small increases in turbidity over that normally seen during high flow events. However, the proposed project would not significantly affect the topography, soils, or geology of the proposed streambed location. Potential short-term

disturbance of surface sediments would be mitigated to a level of insignificance by control measures such as mechanical retardation, runoff control, sediment basins, and re-vegetation.

4.4 Hazardous and Toxic Materials

4.4.1. No Action

Petroleum products and possibly other hazardous materials would continue to be discharged into the creek in stormwater runoff due to it being adjacent to 152nd Ave. SE.

4.4.2. Preferred Alternative

Information describing the environmental effects on hazardous and toxic materials of the Green/Duwamish River basin is presented in Section 4.4.2 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

During construction and installation activities, fuels, oils, lubricants, and other hazardous materials would be used during equipment operations. An accidental release or spill of any of these substances could occur. A spill could result in potentially adverse impacts to on-site soils. However, the amounts of fuel and other lubricants and oils would be limited, and the equipment needed to quickly limit any contamination would be located on site.

To minimize the likelihood of potential spills and leaks of petroleum and hydraulic fluids during project construction, construction equipment would be inspected daily for leaks and petroleum contamination. Additionally, a spill prevention control and containment plan designed to reduce impacts from spills (fuel, hydraulic fluid, etc.) would be in place prior to the start of construction. Finally, the project would not use hazardous materials for any physical elements of the new channel.

4.5 Hydrologic Regime

4.5.1 No Action

Changes might occur to the hydrologic regime due to build out in the basin causing increased peak flows and reduced base flows. However, possible changes would be ameliorated by new developments conforming to current stormwater control standards.

4.5.2 Preferred Alternative

Information describing the environmental effects on the water resources of the Green/Duwamish River basin is presented in Section 4.5 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

The primary goal of this project is to provide high quality spawning, incubating and early rearing habitat for coho salmon and cutthroat trout. To meet these goals there are certain aspects of the hydrologic regime that need to be looked at - the principal one being seasonality and adequacy of stream flows. Temporal and spatial continuity of flow is important in that extreme variations in flow over the course of the spring or fall seasons and/or along the length of the stream channel would be less beneficial for fish use. Since the proposed stream would most likely have intermittent flow, salmonid rearing habitat would not be available throughout the entire year. The upstream passage of adult coho salmon is a critical issue since coho typically spawn during the November through early January period.

A hydrologic analysis of Cow Creek was performed by MGS Engineering Consultants to characterize the hydrologic regime that a flow splitter would encounter. The analysis evaluated the anticipated performance or impacts of the flow splitter: 1) under varying recurrence intervals flood events and 2) under seasonally variable flows.

During more frequent flood events with recurrence intervals between 1.01-5 years the flow splitter will divert 22-25% of the Cow Creek flow into the existing channel. As the flood events get higher, recurrence intervals from 10-100 years, the flow splitter will send approximately 14-16% of Cow Creek flows into the existing channel.

According to the hydrologic analysis performed by MGS Consultants, the discharge into the new channel downstream of the flow splitter will average 2.5-2.9 cfs during the high flow months of December through March, and 0.1-1.3 cfs during the low flow months of April through November.

4.6 Water Quality

4.6.1 No Action

Water Quality would continue to be degraded in the creek due to the proximity to 152nd Ave. S.

4.6.2 Preferred Alternative

Information describing the environmental effects on the water quality of the Green/Duwamish River basin is presented in Section 4.6 of the FPEIS (USACE and King County DNR 2000). A synopsis of site-specific information relevant to the proposed restoration project site is presented below.

There would be small-scale, temporary increases in turbidity within Wetland 'B' and Big Soos Creek as a result of construction activities, particularly those in the lower reach of the channel alignment through Wetland 'B'. The largest impact would occur during the connection of the relocated channel and Big Soos Creek. In addition, there would be a pulse of sedimentation following diversion of the stream into the restored streambed, resulting in short term turbidity increases as the streambed adjusts to the new flow. Localized shifting of sediments would continue sporadically as the new stream heals and adjusts. High flows during the winter and spring following construction would continue to mobilize sediments in the area where

construction occurred, potentially contributing to small increases in turbidity over that normally seen during high flow events.

In order to reduce temporary increases in turbidity and potential related effects on juvenile salmonids in Big Soos Creek, all 'in-water' construction work would take place during the appropriate fish window (August 1 to August 31, or as otherwise determined by WDFW) and during the driest time of the year. Construction best management practices (construction mats, silt fences, settling ponds), sequencing, and timing would minimize soil disturbance to the extent practical to reduce the generation of turbidity during connection of the new channel to the Big Soos Creek. Water would be pumped from site to a designated upland area for settling and spreading. Similarly, the design and implementation of the erosion-control and the Storm Water Pollution Prevention (SWPPP) plans would incorporate best management practices (BMPs) to further reduce the duration and magnitude of the temporary increases in turbidity. Turbidity monitoring during construction would ensure that these temporary increases are in compliance with State Water Quality Conditions.

Overall, water quality in Lake Meridian Outlet (Cow Creek) should slightly improve as a result of the project. Stormwater from 152nd Ave. S would no longer run off directly into the creek, and the stream buffer will act to filter pollutants from the runoff before it enters the creek. In addition, as the native trees and shrubs along the streambank mature, they would shade the stream channel, preventing further increases in water temperature. Finally, LWD and resulting pools in the stream channel would also provide localized areas of temperature refuge for foraging salmonids utilizing the restoration site.

4.7 Vegetation

Information describing the environmental effects on vegetation in the Green/Duwamish River basin is presented in Section 4.8 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

4.7.1 Upland Vegetation

4.7.1.1 No Action.

Under the no action alternative no vegetation would be disrupted in the project area.

4.7.1.2 Preferred Alternative.

Throughout the proposed stream channel, numerous Douglas fir, western red cedar, several big-leaf maple, black cottonwood trees, and red alders, as well as numerous understory plants would be removed to accommodate the new channel alignment. Most of these trees are less than 18-28 inches diameter at breast height (DBH). In addition, sapling alders, Himalayan and evergreen blackberry, various herbaceous species would be removed. Upon completion of the constructed channel, the channel banks and any other disturbed areas will be re-vegetated with native trees and shrubs. In addition, all large trees removed for the project construction would be retained and used on-site as habitat features.

4.7.2 Wetland Vegetation

4.7.2.1 No Action.

Under the no action alternative no wetland vegetation would be disrupted.

4.7.2.2 Preferred Alternative.

Removal of wetland vegetation along the constructed new channel has been entirely avoided except at the confluence of the channel with wetland B at Soos Creek. Construction of the confluence would cross Wetland B, which is comprised of mature forest and shrub wetland habitat. The confluence was dictated by topography, and therefore avoidance of all significant trees was not feasible. Large western red cedar trees, cottonwoods, and red alder would be removed and stockpiled for re-use as LWD features. Upon completion, the disturbed areas of the wetland would be re-planted with an assemblage of native trees and shrubs.

The wetland plant communities along the existing channel would be enhanced with native vegetation to improve their disturbed condition. The restoration approach is described in section 4.2.2.3. The stream channel banks and all other disturbed areas would be restored with native herbaceous plants, shrubs, and trees. Replanting of some of the disturbed areas may occur with native material salvaged from the stream channel construction (e.g. willow whips from downed trees, small-fruited bulrush); otherwise, suitable materials would be obtained from local nurseries that specialize in native plants.

Impacts to downstream wetlands (Wetland C,D,E, & F) as a result of the diversion have been evaluated (Cooke Scientific Services 2001, Springwood & Associates 2003, Springwood & Associates 2006). Major wetland functions impacted from the water diversion are incorporated into a compensatory mitigation plan. The wetland mitigation plan incorporates water retention features to compensate for the reduction of surface water flows into the wetlands and habitat enhancement features. Therefore, no net loss of wetland area would occur as a result of the surface water diversion (Springwood & Associates 2006).

4.8 Fish

4.8.1 No Action

The existing outlet channel would continue to provide very poor habitat for a limited number of fish that may use the outlet channel. In the event that fish were using the outlet channel, there would be no access past the cistern at Wetland C. These habitat conditions would continue to contribute to the decline of the fisheries in the Soos Creek Subbasin, and ultimately, to the Green/Duwamish Ecosystem and would be counter to the goals identified in the EIS.

4.8.2 Preferred Alternative

Information describing the environmental effects on the fisheries resources of the Green/Duwamish River basin is presented in Section 4.7 of the FPEIS (USACE and King

County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Relocation of Lake Meridian Outlet (Cow Creek) into a more natural streambed would result in improved habitat over the existing outlet that occurs largely within a roadside ditch. The meandering stream channel would mimic natural streams and will contain numerous off-channel habitat areas that would provide foraging and refuge opportunities. Streambed gravel would line the channel, providing spawning habitat and better substrate for the production of aquatic insects and other benthic and epibenthic organisms upon which juvenile salmonids may prey. Native trees and shrubs planted along the banks of the stream channel will provide shade, prey items (e.g. falling insects), and other organic material. LWD in the stream would provide refuge for juvenile fish, and both the LWD and native trees and shrubs will enhance detrital production for juvenile fish prey. Finally, the relocated stream channel would be farther away from roads in all reaches, with an extensive forested buffer along the entire reach. This buffer would reduce the exposure of fish in the stream to potential pollutants from road and residential runoff. The new streambed would result in increased habitat complexity and diversity that ultimately increases the aquatic functions and values of the site. Although wetland enhancement measures have been implemented to retain hydrology in downstream wetlands following diversion of the existing flow, there would not be adequate flow to support fish habitat that may presently occur downstream.

Decrease in streamflow during the months of July through September would influence habitat use. However, it is anticipated that the combination of decreasing streamflow and increasing water temperature would trigger juvenile fish to exit the outlet channel in search of more favorable rearing conditions elsewhere, presumably in Soos Creek. This type of migratory behavior is seen in similar intermittent systems in the Soos Creek subbasin (Trotter et al. 1996).

Water quality impacts such as increased turbidity and decreased dissolved oxygen during the periods of 'in-water' work could reduce the suitability of a localized area of Big Soos Creek and Wetland B for fish during construction, but this effect would be temporary and localized. All 'in-water' work would be conducted within the fish window of August 1 to August 31. Avoiding 'in-water' work during peak salmonid out migration periods (generally between February 15 and July 15) would minimize the short-term effects of the project construction on juvenile salmonids.

During the construction process at the wetland mitigation sites and at the point of diversion of water to the new channel, a biologist would be on-site to address any unanticipated issues that could arise. Additional recommendations for procedures to implement during construction may arise from consultation with WDFW or WDOE. No significant or long-term negative impacts on fish populations in either Big Soos Creek or Lake Meridian Outlet (Cow Creek) are expected because of the construction activities.

4.9 Wildlife

4.9.1 No Action

No changes to wildlife use would occur in the area.

4.9.2 Preferred Alternative

Information describing the environmental effects on wildlife of the Green/Duwamish River basin is presented in Section 4.9 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Wildlife that is foraging or resting in the vicinity of the project at the time of construction may be temporarily displaced due to the noise and movement of the machinery. However, these effects will be temporary, and displaced animals would likely return to the area after construction is completed. As urban-adapted predators, bald eagles and other raptors that may be foraging over the area are unlikely to be affected by the construction activities as they forage for fish and birds over Big Soos Creek. No active breeding or nesting areas would be directly impacted.

Construction is not expected to result in a long-term reduction in the abundance or distribution of any prey items that local wildlife may be seeking. Planting native trees and shrubs along the streambank would increase the extent and species diversity of wetland, riparian, and upland vegetation on the restoration site. These plants would increase the habitat value of the site by creating additional opportunities for foraging, nesting, cover, and refuge for a wide variety of species. In addition, Wetlands DEF and their buffers would be enhanced with a diverse assemblage of native species to improve wildlife habitat.

4.10 Threatened and Endangered Species

4.10.1 No Action

The continued degraded condition of the creek would influence prey base for Chinook salmon as well as reducing rearing habitat in the Soos Creek subbasin. Prey base for bald eagle would also remain at a reduced level. No other effects on other listed species is anticipated.

4.10.2 Preferred Alternative

Information describing the environmental effects on threatened and endangered fish species of the Green/Duwamish River basin is presented in Section 4.7.4 of the FPEIS (USACE and King County DNR 2000); the effects on threatened and endangered plant species is presented in Section 4.8.3 of the FPEIS and effects on threatened and endangered wildlife species is presented in Section 4.9.2 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Relocation of Lake Meridian Outlet (Cow Creek) into a more natural streambed would result in improved habitat over that in the existing outlet channel. The meandering stream channel would mimic natural streams and will contain numerous off-channel habitat areas that would provide foraging and refuge opportunities. Streambed gravel would line the channel, providing spawning habitat and better substrate for the production of aquatic insects and other benthic and epibenthic organisms upon which juvenile salmonids may prey. Native trees and shrubs planted along the banks of the stream channel would provide shade, prey items (e.g. falling insects), and other organic material. LWD in the stream would provide refuge for juvenile fish, and both the LWD

and native trees and shrubs would enhance detrital production for juvenile fish prey. Finally, the relocated stream channel would be farther away from roads and residences, with an extensive forested buffer along the entire reach. This buffer would reduce the exposure of fish in the stream to potential pollutants from roadside runoff. The new streambed would result in increased habitat complexity and diversity that ultimately increases the aquatic functions and values of the site.

These habitat improvements would increase prey for Puget Sound Chinook salmon, Coastal/Puget Sound bull trout, and bald eagles by increasing habitat for the fish and invertebrates that they feed on.

The in-water construction of this project would occur when juvenile and adult Puget Sound Chinook salmon and bull trout are least likely to be present in Big Soos Creek, and during the portion of the year when bald eagles are not nesting and are most tolerant of disturbance. Therefore, while the proposed construction may affect these species, it is not likely to adversely affect them.

The effect determinations made in the Programmatic Biological Assessments for this project are listed in Table 2. The USFWS concurred with the determination of “may affect, but not likely to adversely affect” for the bald eagle, marbled murrelet, northern spotted owl, gray wolf, Canada lynx, and bull trout in relation to the Lake Meridian Outlet (Cow Creek) relocation and restoration project via a concurrence letter dated March 27, 2001 (Appendix D). There is a very low likelihood of these species occurring in the project vicinity. Similarly, NOAA Fisheries concurred with the determination of “may affect, but not likely to adversely affect” for Puget Sound Chinook salmon in relation to the Lake Meridian Outlet (Cow Creek) relocation and restoration project via a concurrence letter dated April 10, 2001 (Appendix D).

TABLE 4-1. THREATENED AND ENDANGERED SPECIES EFFECT DETERMINATION SUMMARY

Species	Listing Status	Critical Habitat	Effects Determination	Services Concurrence for Lake Meridian Outlet (Cow Creek) Restoration?
Bald Eagle <i>Haliaeetus leucocephalus</i>	Threatened	—	Not likely to adversely affect	Yes
Marbled Murrelet <i>Brachyramphus marmoratus</i>	Threatened	Designated	Not likely to adversely affect species or critical habitat	Yes
Northern Spotted Owl <i>Strix occidentalis caurina</i>	Threatened	Designated	Not likely to adversely affect species or critical habitat	Yes
Gray Wolf <i>Canis lupus</i>	Threatened		Not likely to adversely affect	Yes
Canada Lynx	Threatened	—	Not likely to	Yes

<i>Lynx canadensis</i>			adversely affect	
Coastal/Puget Sound Bull Trout <i>Salvelinus confluentus</i>	Threatened	—	Not likely to adversely affect	Yes
Puget Sound Chinook Salmon <i>Oncorhynchus tshawytscha</i>	Threatened	Designated	Not likely to adversely affect species or critical habitat	Yes

4.11 Cultural Resources

4.11.1 No Action

The no action alternative would result in a determination that although the project planning constituted a Federal undertaking, that undertaking had no potential to cause effects to historic properties.

4.11.2 Preferred Alternative

The Corps has determined that the proposed project is a Federal undertaking of the type that could affect historic properties and must comply with the requirements of Section 106, as amended through 2004, of the National Historic Preservation Act of 1966, as amended through 2000 (NHPA; 16 USC 470). Section 106 requires that Federal agencies identify and assess the effects of Federal undertakings on historic properties and to consult with others to find acceptable ways to resolve adverse effects. Properties protected under Section 106 are those that are listed or are eligible for listing in the National Register of Historic Places (NRHP). Eligible properties must generally be at least 50 years old, possess integrity of physical characteristics, and meet at least one of four criteria for significance. Regulations implementing Section 106 (36 CFR Part 800) encourage maximum coordination with the environmental review process required by the National Environmental Policy Act (NEPA) and with other statutes. The Washington State Archaeological Sites and Resources Act (RCW 27.53) may also apply.

The project area of potential effects (APE) consists of a number of discontinuous areas where stream relocation and restoration work for take place, including: 1) modifications to approximately 500 feet of the Lake Meridian Outlet channel and other modifications through Lake Meridian Park; 2) creation of approximately 2,500 feet of new restored Cow Creek Channel from the existing channel to Big Soos Creek through Gary Grant Soos Creek Park; 3) low flow diversion to the existing channel with wetland restoration modifications to downstream wetlands along the existing Cow Creek Channel; and 4) multiple access routes and staging areas. The APE includes all areas where potential ground disturbance or compaction may occur.

To comply with Section 106 of the NHPA, a cultural resources investigation is in-progress. As part of the investigation Corps archaeologists have conducted a search of the DAHP electronic Historic Sites Inventory Database, other background and archival research, pedestrian surveys, and shovel testing is in-progress within APE. No properties listed in the National Register and no sites or structures listed in the state inventory were found to have been previously recorded

within the APE. As of the date of this report no evidence of either prehistoric or historic-period activity has been found within the APEs.

To further identify historic properties, Section 106 of the National Historic Preservation Act (NHPA; 36 CFR 800.4[a][3]) requires Federal agencies to seek information from tribes likely to have knowledge of, or concerns with, historic properties within the project's APE. A letter soliciting knowledge or concerns for the project area was sent to the Muckleshoot Tribe on 15 April 2003. As of the date of this report the Muckleshoot has not expressed any concern for the project APE. The Corps will continue to seek assistance from the tribe in identifying properties that may be of religious or cultural significance, including Traditional Cultural Properties (TCP), and that may be eligible for the NRHP. Specific guidance concerning the Corps' obligation to contact the Muckleshoot Tribe regarding this issue is found at 36 CFR 800.4(a)(4), which states that the agency official shall:

(4) Gather information from any Indian tribe or Native Hawaiian organization identified pursuant to Sec. 800.3(f) to assist in identifying properties, including those located off tribal lands, which may be of religious and cultural significance to them and may be eligible for the National Register, recognizing that an Indian tribe or Native Hawaiian organization may be reluctant to divulge specific information regarding the location, nature, and activities associated with such sites. The agency official should address concerns raised about confidentiality pursuant to Sec. 800.11(c).

When the cultural resources investigation is completed a report and a determination of effects will be prepared and submitted to the State Historic Preservation Officer (SHPO) for her review. At the same time a copy of the report will be sent to the Muckleshoot Tribe. Coordination with the cultural resources staff of the tribe will continue at regular intervals throughout the project.

4.12 Native American Interests

4.14.1 No Action

The no action alternative would result in no change in Native American interests.

4.14.2 Preferred Alternative

The project will improve habitat available to coho and cutthroat by improving the quality of rearing and foraging habitat available to this important resource for tribe. Coordination with the Muckleshoot Indian Tribe is ongoing to ensure tribal concerns are incorporated into the site design. Construction timing of the project should avoid impacts to both out-migrating juvenile salmonids and adults moving upstream to spawn in the Soos Creek corridor. Thus, construction would also avoid impacts to fishing rights of the Muckleshoot Indian Tribe.

4.13 Land Use

4.13.1 No Action

There would be no change in land use at the site.

4.13.2 Preferred Alternative

Information describing the environmental effects on land and shoreline use in the Green/Duwamish River basin is presented in Section 4.13 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Land use in the project vicinity would not change because of the creek relocation. The proposed project would not affect land use in areas adjacent to the project boundaries, including nearby residential properties. There would be no displacement of minority or low-income populations due to the proposed project plan. However, construction vehicles may disrupt traffic for local residents. These impacts would be temporary and highly localized, and are therefore not expected to be significant.

4.14 Recreation

4.14.1 No Action

No changes in recreation would occur on the site.

4.14.2 Preferred Alternative

Information describing the environmental effects on recreation in the Green/Duwamish River basin is presented in Section 4.14 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

The installation of the interpretive trail and its associated viewing platform may result in increased passive recreational use of the project area. Local residents and users of Lake Meridian Park and the Gary Grant Soos Creek park/trail may visit the site.

During construction, noise associated with the usage of heavy machinery may disturb recreational users of the Lake Meridian Park and Gary Grant Soos Creek Park. However, these impacts would be temporary and highly localized. No significant impacts on recreation are anticipated following construction.

4.15 Air Quality and Noise

4.15.1 No Action

No changes in air quality or noise would occur on site.

4.15.2 Preferred Alternative

Information describing the environmental effects on air quality and noise in the Green/Duwamish River basin is presented in Sections 4.10 and 4.11, respectively, of the FPEIS

(USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

During construction, heavy equipment may temporarily increase pollutant emissions and noise in the immediate project vicinity. Noise associated with the use of heavy machinery may disturb recreational users of the Gary Grant Soos Creek Park along Big Soos Creek and local homeowners. However, these impacts would be temporary and highly localized, and would not result in significant impacts. Pollutant emissions would not exceed EPA's *de minimis* threshold levels (100 tons/year for carbon monoxide and 50 tons/year for ozone) or affect the implementation of Washington's Clean Air Act implementation plan. Attainment area status for the region would not be affected.

4.16 Transportation

4.16.1 No Action

No changes to transportation patterns will occur.

4.16.2 Preferred Alternative

Information describing the environmental effects on traffic and transportation in the Green/Duwamish River basin is presented in Section 4.12 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Construction vehicles may temporarily increase the volume of traffic in the immediate project vicinity during excavation of the site. They may also disrupt traffic along 152nd Ave. SE and Kent Kangley Road as vehicles access and depart the construction site. This may cause a slight increase in congestion during peak commuting hours. However, these impacts would be temporary and highly localized, and are not expected to be significant. To minimize traffic impacts, a traffic control plan would be developed and implemented.

4.17 Aesthetics

4.17.1 No Action

No changes to aesthetics are anticipated to occur.

4.17.2 Preferred Alternative

Information describing the environmental effects on visual quality and aesthetic resources of the Green/Duwamish River basin is presented in Section 4.15 of the FPEIS (USACE and King County DNR 2000). A discussion of site-specific information relevant to the proposed restoration project site is presented below.

Relocating the existing Lake Meridian outlet channel into a more natural stream channel would greatly improve the visual and aesthetic appeal of the creek. The new channel would be protected by extensive forested buffer and replanted within the construction zone. The planned interpretive trail would enable recreational users to view the restored creek through which it would meander. Neighbors that adjoin Wetland D, E, and F will benefit from the habitat enhancement plan that proposes extensive native tree and shrub plantings in wetlands presently disturbed from past agricultural uses.

During excavation and construction of the site, the aesthetic quality of the general area could be reduced due to the noise and air emissions generated by the construction equipment, which may disturb recreational users of the Gary Grant Soos Creek Park, or local homeowners. However, these impacts would be temporary and highly localized, and are not expected to result in significant impacts.

5 UNAVOIDABLE ADVERSE EFFECTS

Unavoidable adverse effects of the proposed project are:

- (1) noise disturbance to wildlife, homeowners, and recreational users in the vicinity of operating heavy machinery during excavation and construction of the restoration site. Most wildlife are anticipated to avoid the area while work is in progress.
- (2) disruption of local traffic in the project vicinity during construction. Proper signage and flagmen would be utilized to address safety concerns and move traffic through the area as quickly as possible.
- (3) mortality of native trees, shrubs and groundcover within the project site.
- (4) excavation of wetlands DEF in order to seal the sub-surface to retain wetland hydrology.

Given the temporary, localized, and minor nature of these effects, the Corps has determined that the proposed restoration project would not result in significant unavoidable adverse environmental impacts.

6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The proposed restoration project would not entail any significant irretrievable or irreversible commitments of resources. The construction work would require use of existing machinery and export of the fill material to an existing, licensed landfill for disposal. Installation of the constructed stream channel would require the importation of stream gravel, LWD, and large rock. Replanting the newly established streambank and disturbed wetland areas would require contracting with local existing nurseries for native plant materials and hiring existing contractors to plant the site.

7 CUMULATIVE IMPACTS

Cumulative impacts result from the “individually minor but collectively significant actions taking place over a period of time” (40 CFR 1508.7). As such they include the impacts of this

restoration project considered in conjunction with current and future restoration projects constructed or planned within the lower Green/Duwamish River watershed.

Multiple restoration projects are ongoing in the Soos Creek sub-basin, and numerous projects are taking place in the Lake Meridian Outlet (Cow Creek) watershed. Specifically, the City of Kent is planning to replace the Meridian Valley Flume summer 2005 with a restored naturalistic creek channel Creek. The City also plans to daylight a portion of the Clark Lake Outlet that currently passes through a 24-inch pipe for 310 feet into a constructed stream channel enhanced with fish habitat structures and native riparian plantings. Additional projects planned or on-going in the Lake Meridian Outlet (Cow Creek) watershed include additional channel improvements, culvert replacements and the removal of other fish passage barriers, invasive plant removal, re-vegetation with native plants, limiting livestock access to creeks, and public outreach efforts to educate the public about land use impacts. All of these efforts would result in long-term, cumulative benefits to the amount and functional value of restored habitat, improvements in the overall watershed condition. They would ultimately increase the ability of the watershed to support critical life history stages of native fish and wildlife population.

Cumulative impacts would result from the limited access that the creek relocation would create for the Bonneville Power Administration (BPA). The proposed creek alignment would cut across the BPA's Covington- Creston / Covington- Duwamish 230 kV Transmission Line Rights-of-Way (ROW) from west to east removing BPA maintenance crew access to the transmission line structures 2/2 during emergencies and for routine maintenance activities.

To provide remedy the City of Kent would construct a new bridge approx. 50 feet west of BPA's present ROW access road. This present design does not have a provision for rejoining BPA's present established access way alignment.

Based on this action BPA is reviewing its long-term access needs for this area. From the north side of the proposed new crossing BPA would need to construct approx. 50 feet of access road turning to the NE then constructing 370 feet of access road N/NW to provide BPA crews access to Covington- Duwamish structure 2/2. From this structure approx. 100 feet of road would need to be constructed to the SW to reach Covington- Creston structure 2/2. With the exception of the area coming off of the new bridge to the existing BPA road alignment, the road would be in BPA's historic route of travel.

Proposed road design varies based on soil stability and hydrologic conditions. Standard BPA road design would call for a road 12 foot wide with up to 8 inches of aggregate surfacing. Where hydrological and/or weak soil conditions are present, the road would call for geo-textile fabric overlaid with between 2.5 to 4 feet of quarry material and surfaced with up to 8 inches of aggregate. It is estimated that 8 culverts would need to be installed to maintain hydrological function.

Based on the wetland delineation information presented in the City of Kent February 9, 2006 draft Cow Creek Relocation and Restoration Project Wetland Mitigation Plan, this area is classified as Category I wetland under Washington State Department of Ecology's (DOE) rating

system. Preliminary estimates put total wetland impacts at 0.215 acres. For this action BPA would need to conduct a cultural survey and prepare a wetland mitigation plan (if required).

Negative effects of the Lake Meridian Outlet (Cow Creek) Restoration project add to the cumulative negative effects generated through adverse land use practices in the watershed. However, these negative effects are largely temporary and are associated only with the actual construction of the project, concentrated mainly in the channel construction and the downstream wetlands D, E and F. The combination of mitigation measures and BMPs reduce the cumulative, short-term (i.e. construction related) impacts of these projects to an insignificant level. More significantly, the beneficial effects generated by the project compensate for these short-term negative effects. Thus, the proposed restoration project would have beneficial cumulative effects within the watershed and would help to incrementally offset adverse impacts on habitats from past, present, and future redevelopment projects along Big Soos Creek.

8 ENVIRONMENTAL COMPLIANCE AND COORDINATION

TABLE 8-1. ENVIRONMENTAL COMPLIANCE AND COORDINATION

LAWS AND REGULATIONS RELATING TO THE PROPOSED ALTERNATIVES	ISSUES ADDRESSED	CONSISTENCY OF PREFERRED ALTERNATIVE
National Environmental Policy Act (NEPA) 42 U.S.C. 4321 et seq.	Requires all federal agencies to consider the environmental effects of their actions and to seek to minimize negative impacts.	Consistent per draft FONSI and draft EA document.
State Environmental Policy Act (SEPA) RCW 43.21	Requires state agencies to consider the environmental effects of their actions and actions of permit applicants.	Consistent (Kent will produce SEPA checklist)
Clean Water Act (CWA) 33 U.S.C. 1251 et seq.; Section 404	Requires federal agencies to protect waters of the United States. Disallows the placement of dredged or fill material into waters (and excavation) unless it can be demonstrated there are no reasonable alternatives.	Consistent with terms and conditions of the NWP 27.
Clean Water Act Section 401	Requires federal agencies to comply with state water quality standards.	Consistent with terms and conditions of the NWP 27.
Fish and Wildlife Coordination Act 16 U.S.C. 661 et seq.	Requires federal agencies to consult with the US Fish & Wildlife Service on any activity that could affect fish or wildlife.	Consistent based on acceptance of Final FWCA Report prepared for the FEIS.
Endangered Species Act 16 U.S.C. 1531 et seq.;	Requires federal agencies to protect listed species and consult with US Fish & Wildlife or NMFS regarding the proposed action.	Consistent based on NMFS and USFWS concurrence with the Programmatic Biological Assessment prepared for the Green/Duwamish ERP.
National Historic Preservation Act 16 U.S.C. 461;	Requires federal agencies to identify and protect cultural and historic resources.	Consistent upon review of determination of affect by SHPO..
Shoreline Management Act	State law implementing the Coastal Zone Mgmt Act	Not applicable, as neither

(SMA) and Shoreline Management Program (SMP) RCW 90.58, WAC 173-14	requiring local jurisdictions to plan and protect shorelines.	Big Soos Creek in this reach nor Lake Meridian Outlet (Cow Creek) are shorelines of the state.
Coastal Zone Management Act (CZMA) 16 U.S.C. 1451 et seq.; 15 CFR 923	Requires federal agencies to comply with state and local plans to protect and enhance coastal zone and shorelines.	Consistent to the maximum extent practicable, per CZM conditions of NWP 27.
Washington Hydraulic Code	Requires proponents of developments, etc to protect state waters, wetlands and fish life.	Will be consistent with HPA conditions issued by WDFW.
Executive Order 11988, Floodplain Management Guidelines	Requires federal agencies to evaluate the potential effects of actions on floodplains and to avoid undertaking actions that directly or indirectly induce growth in the floodplain or adversely effect natural floodplain values.	Consistent; project will not induce growth in floodplain
Executive Order 11990: Protection of Wetlands	Encourages federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands when undertaking Federal activities and programs.	Net increase in aquatic functions and values because of restoration project.
Executive Order 12898: Environmental Justice	Requires federal agencies to consider and address environmental justice by identifying and assessing whether agency actions may have disproportionately high and adverse human health or environmental effects on minority or low-income populations.	Consistent due to lack of adverse human health or environmental effects on minority or low-income populations in local area.

Copies of the Draft Environmental Assessment and FONSI were provided to the following organizations for review and comment:

Muckleshoot Indian Tribe
U.S. Fish and Wildlife Service
National Marine Fisheries Service
Environmental Protection Agency
Washington State Department of Ecology
Washington State Department of Fish and Wildlife
Washington State Historic Preservation Office
City of Kent
King County Parks Department
King County Department of Natural Resources

In addition a Notice of Availability has been sent out to adjacent property owners as well as selected interested parties identified by the Washington State Department of Ecology, City of Kent, and the Seattle District Regulatory Branch. The draft documents are also posted on the Seattle District website. Numerous site visits with Department of Ecology, Muckleshoot Indian Tribe and Washington Department of Fish and Wildlife have been conducted since 2003. The Green Duwamish ERP Technical Committee (includes representatives from all the agencies listed above except the Washington State Historic Preservation Office) also reviewed project details during project design.

9 CONCLUSION

Based on this draft Environmental Assessment and on coordination with Federal agencies, Native American Tribes, and State agencies, the Lake Meridian Outlet (Cow Creek) Restoration project is not expected to result in significant adverse environmental impacts. The Lake Meridian Outlet (Cow Creek) Restoration project is not considered a major Federal action having a significant impact on the human environment. Therefore, the preparation of a supplemental environmental impact statement supplement is not required.

10 REFERENCES

- Associated Earth Sciences, May 2002. Wetland Identification and Stream Identification Report: Lift Station 10B, Kent, WA. Prepared for Soos Creek Water and Sewer District. Project number KB02226A.
- Aqua Terra Consultants, 1999. Meridian Annexation Area Hydrological Analysis, City of Kent.
- City of Kent Municipal Code, Wetlands Management (Title 11.05).
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Appendix A: Draft FONSI



**Lake Meridian Outlet (Cow Creek) Relocation and Restoration Project
Kent, King County, Washington**

Draft Finding of No Significant Impact

Background.

Over the past 70 years, the Lake Meridian watershed has become increasingly urbanized. Urbanization has adversely impacted the inlet and outlet to Lake Meridian and the shoreline of Lake Meridian itself. This growth has impacted the hydrology of the basin, the delivery and routing of water, and fish use in the area. In 1996/1997, the City of Kent annexed an area including Lake Meridian and the Lake Meridian Watershed. Since that time, the City has been identifying water resource and fisheries management issues in the lake and in the outlet channel downstream.

Residents along Lake Meridian have expressed concern about elevated lake levels for several years. Elevated lake levels remain a concern and modifications to the outlet channel, including revisions to the outlet control, have been developed as part of this project to address this problem. The outlet control modifications are also intended to enhance fish passage and habitat in the outlet channel.

Downstream of the outlet, development along 152nd Avenue SE has occurred at a rapid pace over the past decade. Bed, bank, and riparian corridor degradation and channelization have severely compromised the quality and utility of fish habitat. Due to continued degradation of this system, the City has imposed stream buffers at new development sites along the outlet channel corridor.

In light of degraded conditions and the prospect for continued development along the existing alignment, the City contracted to conduct a feasibility study to identify issues and explore alternatives for realigning the outlet channel through the Gary Grant Soos Creek Park (GGSCP). This study provided information on geotechnical and hydrologic conditions in the proposed project area and presented a conceptual plan for realignment. This study was also a key document supporting current design efforts.

Proposed Action.

The Corps and the City of Kent are proposing to realign the Lake Meridian Outlet Creek from its present north-south route to a more easterly alignment through the Gary Grant Soos Creek Park (GGSCP). The proposed confluence of the new channel (to be named Cow Creek) with Soos Creek would be approximately 1.8 miles upstream of the current confluence. The current lake outlet is an unregulated open channel that goes dry during the summer months. In order to effectively restore physical habitat and fish runs, a new stream will be created by establishing an appropriate geomorphic template that mimics a natural stream system. The key to success in creating the new stream where none currently exists is to establish geology and topography that will support a self-sustaining stream and riparian corridor. This includes locating the new creek in natural topographic lows, designing the streambed to prevent loss of flow in permeable soils,

and building geology to support table step-pool and pool-riffle structure and promote fish passage. In addition, the realignment will regulate water level elevations along the shoreline of Lake Meridian and provide for continued water supply and retention in wetlands downstream of the existing channel. The outlet would be modified by the addition of an outlet control structure. The addition of the control structure would allow for prolonged storage of water with regulated releases to meet in-stream needs during the summer and control flooding along the shoreline.

Summary of Impacts.

A draft Environmental Assessment (EA) has been prepared pursuant to the National Environmental Policy Act (NEPA) for the proposed action and is attached. The draft EA describes the environmental consequences of the project, which are briefly summarized below.

There will be small-scale, temporary increases in turbidity within the wetlands and Big Soos Creek as a result of construction activities, particularly those in the lower reach of the channel alignment through the wettest portion of the wetland. Localized shifting of sediments will continue sporadically as the new stream heals and adjusts. High flows during the winter and spring following construction will continue to mobilize sediments in the area where construction occurred, potentially contributing to small increases in turbidity over that normally seen during high flow events.

In order to reduce temporary increases in turbidity and potential related effects on juvenile salmonids in Big Soos Creek, all 'in-water' construction work will take place during the appropriate fish window (August 1 to August 31, or as otherwise determined by WDFW) and during the driest time of the year. Construction techniques, sequencing, and timing will minimize soil disturbance to the extent practical to reduce the generation of turbidity during connection of the new channel to the Big Soos Creek. Similarly, the design and implementation of the erosion-control and the Storm Water Pollution Prevention (SWPPP) plans will incorporate best management practices (BMPs) to further reduce the duration and magnitude of the temporary increases in turbidity.

The in-water construction of this project will occur when federally listed threatened juvenile and adult Puget Sound Chinook salmon and Coastal/Puget Sound bull trout are least likely to be present in Big Soos Creeks, and during the portion of the year when bald eagles are not nesting and are most tolerant of disturbance. The Corps has received concurrence with a 'may affect, but not likely to adversely affect' determination for listed species in relation to the Lake Meridian Outlet (Cow Creek) realignment project via a concurrence letter dated March 27, 2001 from USFWS and via a concurrence letter dated April 10, 2001 from NOAA Fisheries.

Professional cultural resources studies are being conducted for the proposed project. The studies will include an examination of the archaeological and historic site records at the Washington State Office of Archaeology and Historic Preservation (OAHP), a pedestrian survey, and archaeological testing of the project area. The field studies have not been completed as of this date and are continuing. If historic properties or archaeological resources eligible for the National Register of Historic Places are confirmed to be present in the project area, a programmatic agreement for data recovery (if necessary) will be developed in consultation with

the Muckleshoot Tribe and the OAH that describes specific measures to mitigate adverse effects resulting from the project.

Impacts to the human environment will also be temporary and localized. Construction vehicles may temporarily disrupt local traffic, increase air emissions and noise in the vicinity of the site, increase the volume of traffic on adjacent streets during excavation, and decrease the aesthetic attractiveness of the general area during excavation of the site. Noise, traffic, and air quality issues will be managed through implementation of appropriate control plans. Thus, these impacts will be temporary and highly localized.

Finding.

Based on the analysis detailed in the draft EA (attached) and summarized above, this project is not a major Federal action significantly affecting the quality of the human environment and, therefore, does not require preparation of a supplemental environmental impact statement. A 404(b)(1) evaluation is being prepared.

Appendix B: Plan Set

Plan set is included as a separate attachment



Appendix C: Public Notice CENWS-PL-06-01





US Army Corps
Of Engineers
Seattle District

Notice of Availability

Planning Branch
Post Office Box 3755
Seattle, Washington 98124-2255
Megan Petrie, Project Manager
Telephone: (206) 764-6546

Notice Date: March 3, 2006
Expiration Date: April 3, 2006
Reference: PL-06-01
Name: Lake Meridian Outlet
(Cow Creek) Relocation/
Restoration

Interested parties are hereby notified that the U.S. Army Corps of Engineers, Seattle District (Corps) has prepared, pursuant to the National Environmental Policy Act, an environmental assessment (EA) for a proposed restoration of Lake Meridian Outlet (Cow Creek) in Kent, WA as part of the Green/Duwamish Environmental Restoration Program (ERP). The proposed project looks to create a new stream channel for the Lake Meridian Outlet Channel (Cow Creek), which is currently in a degraded condition, and provides little ecological value. To create a healthier stream system, a portion of the existing stream will be restored, and a new channel will be routed through Gary Grant Soos Creek Park. The stream will provide spawning and rearing habitat for coho salmon and cutthroat trout. The purpose of this Notice is to solicit information on the environmental impacts of the proposed restoration actions and the associated environmental conditions and consequences that were previously evaluated in the 2000 Final Programmatic Environmental Impact Statement (FPEIS) for the Green/Duwamish River Basin ERP.

AUTHORITY

Federal involvement in ecosystem restoration is supported in law and Executive Order. The Corps Civil Works Ecosystem Restoration Policy (ER 1165-2-501), the Fish and Wildlife Coordination Act of 1958, Federal Water Project Recreation Act of 1965, National Environmental Policy Act of 1969, Water Resource Development Act (WRDA) of 1986, and the WRDA of 1990 provide national policy directing consideration of projects that benefit ecological resources.

Specifically, Section 306 of the WRDA of 1990 authorized the Secretary of the Army to include environmental protection as one of the primary missions of the Corps. The Green/Duwamish Ecosystem Restoration Study stems from the Corps' authority under Section 216 of the River and Harbors and Flood Control Act of 1970, which enables the Corps to undertake restoration related to the hydrologic regime of aquatic ecosystems. Congress specifically authorized the

Green/Duwamish River Basin Feasibility Project (of which this project is a part) in Section 101(b)(26) of WRDA 2000.

PROPOSED ACTION

The proposed project would realign the Lake Meridian Outlet Creek from its present north-south route to a more easterly alignment through the Gary Grant Soos Creek Park (GGSCP). The proposed confluence of the new channel (to be named Cow Creek) with Soos Creek would be approximately 1.8 miles upstream of the current confluence. In order to effectively restore physical habitat and fish runs, a new stream will be created by establishing an appropriate geomorphic template that mimics a natural stream system. Urbanization has severely compromised the quality of stream and riparian habitat in the existing outlet system. The goal of the realignment focuses on providing high quality spawning, incubation, and early rearing habitat for coho and cutthroat. The key to success in creating the new stream where none currently exists is to establish geology and topography that will support a self-sustaining stream and riparian corridor. This includes locating the new creek in natural topographic lows, designing the streambed to prevent loss of flow in permeable soils, and building geology to support stable step-pool and pool-riffle structure and promote fish passage. In addition, the project includes a new outlet hydraulic control structure, which features an adjustable v-notch and labyrinth weir. The current lake outlet is an unregulated open channel that goes dry during the summer months. The addition of the control structure would allow for prolonged storage of water with regulated releases to meet in-stream needs and retain wetland hydrology during the summer, and also control flooding along the shoreline. In order to provide necessary volumes of water for the new channel, a low-flow splitter, located at the upstream end of the new channel, will divert approximately 80% average annual flow of the surface water flow from the existing outlet to the new channel. Approximately 20% of the average annual flow will be retained in the existing channel to provide surface water to downstream wetlands.

Additional work will be done to enhance the affected wetlands. Native vegetation will be planted in Wetland A and its buffer to eliminate an informal trail. Wetlands C, D, E, and F will be converted from reed canary grass-dominated communities to native scrub/shrub communities. The low flow splitter described above will divert water from Wetlands C, D, E, and F to provide water to the new channel. To retain hydrology in these wetlands, the shallow subsoil layer will be replaced with imported soil amended with bentonite clay. A layer of topsoil will then be placed on top of this layer, followed by native plantings. Low-height berms or coir logs will be placed across Wetland DEF, in combination with excavation, to facilitate the formation of shallow pool areas. Additional work in Wetland C includes modification of the existing standpipe that will facilitate retention of water within the wetland and would provide water to downstream wetlands D, E, and F. Restoration of native grading will also occur in Wetland C, where fill was previously excavated to create the existing pond.

The final element of the proposed channel relocation is the establishment of an interpretive trail. Portions of the existing GGSCP trail will be retained and a new trail will be constructed to provide viewing access to Big Soos Creek. A segment of the existing trail will be abandoned to restrict access to Big Soos Creek. The earthen trail will start from Lake Meridian Park and proceed through GGSCP, ending in a viewing platform near the edge of the stream.

ANTICIPATED IMPACTS

No adverse impacts to water quality as a result of the restoration are expected. Construction will occur primarily in the dry at times of low stream flow. Best management practices will be used to ensure that turbidity associated with excavation of sediment is minimized. This restoration activity will ultimately lead to an increase in value as a result of improved habitat for fish and wildlife, and enhanced wetland structure and function. Input of water into certain adjacent wetlands will be reduced, but lining of the wetland and installation of outlet control structures will cause wetland hydrology to ultimately be maintained. Physical and biological characteristics that currently limit the potential to provide functions would be improved to increase the level of wetland function. Some mortality of trees and shrubs in the proposed path of the new channel may occur, but riparian planting of native species along the corridor will be established.

As stated and concurred with in the Programmatic Biological Assessments for Green/Duwamish Ecosystem Restoration Program (2000), this project is **not likely to adversely affect** the threatened and endangered species or critical habitat that may occur in the vicinity. No significant adverse impacts to water quality, flora and fauna, or threatened and endangered species are anticipated as a result of this restoration activity.

The Corps has made a preliminary determination that the environmental impacts of the proposal can be adequately evaluated under the National Environmental Policy Act through preparation of an environmental assessment (EA). A draft EA addressing potential environmental impacts associated with the proposed restoration/relocation of Lake Meridian Outlet (Cow Creek) has been completed.

The Corps invites submission of factual comment on the environmental impacts of the proposal. The Corps will consider all submissions received before the expiration date of this notice. The nature or scope of the proposal may be changed upon consideration of the comments received. The Corps will initiate a supplemental Environmental Impact Statement (EIS), and afford all the appropriate public participation opportunities attendant to an EIS, if significant effects on the quality of the human environment are identified and cannot be mitigated.

This document is available online at: <http://www.nws.usace.army.mil/ers/envirdocs.html>

Comments should reach this office, Attn: Environmental Resources Section, not later than April 3, 2006 to ensure consideration. Requests for additional information should be directed to Megan Petrie, Project Manager, at 206-764-6546 or Megan.E.Petrie@usace.army.mil.

Megan Petrie
Project Manager
Environmental Resources Section

Appendix D: Concurrence Letters for the Programmatic Biological Assessments

Included as a separate attachment

