# FREELAND NMUGA SEWER COLLECTION AND TREATMENT SYSTEM

## Biological Assessment and Essential Fish Habitat Assessment

Prepared for: June 2010

US Department of Agriculture, Rural Development

ESA Adolfson

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# 1.0 INTRODUCTION

The Freeland Water and Sewer District (District) is proposing to construct a sewer collection system, wastewater treatment plant, and reuse system to serve the Freeland sewer service area. Freeland is an unincorporated community located on Whidbey Island, approximately 10 miles west of the Clinton ferry terminal (Figure 1). The project is located in all or part of Sections 3, 10, 11, 14, and 15 Township 29 North, Range 2 East Willamette Meridian (W.M.). The treatment plant will be located in Section 9, Township 29 North, Range 2 East W.M. The reclaimed water reuse site will be located in Section 5, Township 29 North, Range 2 East W.M. (Figure 1).

As part of its planning activities under the Washington State Growth Management Act (GMA), Island County designated the community of Freeland as a Non-Municipal Urban Growth Area (NMUGA) on December 10, 2007. One goal of the NMUGA designation was the provision of sewer service for the entire NMUGA boundary. Currently, the Holmes Harbor Sewer District provides sewer service to approximately 400 homes in the northwestern portion of the NMUGA around the Holmes Harbor golf course. The Main Street Sewer District provides sewer service to a small area in the eastern side of the NMUGA. The remainder of the NMUGA would be serviced by the District and is the focus of this document. This area will be referenced as the District's service area. The Freeland NMUGA is a critical component of Island County's efforts to properly manage growth in an area that is already developed as a major commercial and residential hub on south Whidbey Island (Island County, 2008). The community is primarily residential, with commercial and retail businesses on the main arterials including State Route 525 (SR 525), Main Street, and South Harbor Avenue. Currently, the service area is served by public water, but no sewer facilities exist in that portion of the NMUGA. On-site septic tanks and drain fields serve the existing dwellings and commercial establishments.

There are only three incorporated urban areas in Island County: Coupeville, Langley, and Oak Harbor. As a designated NMUGA, the Freeland area can accommodate higher planned densities, provided there are urban sewer services that relieve properties of the space required for septic fields and reserve areas. The proposed sewer system and wastewater treatment plant are being designed to meet the residential and commercial needs of the service area (Figure 2). Further information on the need for the project has been documented in the *Freeland Comprehensive Sewer Plan and Engineering Report/Facility Plan* (Tetra Tech, 2005), and in the *Freeland Sub Area Plan*, an Element of the Island County Comprehensive Plan (Island County, 2007).

**Project Information**

| | |
|---|---|
| Project Name: | Freeland Water and Sewer District – New Sewage Collection and Treatment System |
| State: | Washington |
| County: | Island |

| | |
|---|---|
| Location: | The project is located in all or part of Sections 3, 10, 11, 14, and 15 Township 29 North, Range 2 East Willamette Meridian (W.M.). The treatment plant will be located in Section 9, Township 29 North, Range 2 East W.M. The reclaimed water reuse site will be located in Section 5, Township 29 North, Range 2 East W.M. |
| Proponent: | Freeland Water and Sewer District (District) |
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## 1.1 Background

In 2005, the *Freeland Comprehensive Sewer Plan and Engineering Report – Facility Plan* was approved by the Washington State Department of Ecology. The document reviewed several sewer plan alternatives and selected the preferred alternative for implementation. Alternatives considered for collection system technology included conventional gravity sewers, septic tank effluent gravity sewers, vacuum sewers, and pressurized sewers (Septic Tank Effluent Pumping (STEP) or grinder pumps). Technologies considered for treatment included membrane bioreactors (MBR), oxidation ditch with filtration, extended aeration with filtration, and sequencing batch reactors with filtration. Saltwater outfalls to both Holmes Harbor and Mutiny Bay were considered for treated effluent disposal, but were removed from consideration due to a desire to protect shellfish and marine habitat and a desire on part of the community to beneficially reuse the treated effluent. Alternatives were considered for reuse to include year-round wetland enhancement, groundwater augmentation through infiltration, and industrial reuse.

The *Freeland Comprehensive Sewer Plan and Engineering Report/Facility Plan* (Tetra Tech, 2005) analyzed alternatives for wastewater collection systems, effluent discharge/reuse, wastewater treatment, disinfection, and solids handling and treatment/reuse in an effort to find the most feasible alternative that would meet the needs of the service area over the long- and short-term. The preferred alternative for each category is shown below and is the focus of this document.

1. Wastewater Collection System: developing a pressurized sewer system; either a STEP or a grinder pump system.
2. Effluent Reuse: land application and groundwater recharge by surface percolation and application to vegetation through sprinklers or an equivalent technology.
3. Wastewater Treatment: Membrane bioreactor (MBR) system (produces reliable Class A reclaimed water);
4. Disinfection: Ultraviolet (UV) with chlorine addition.

5. Solids Handling and Reuse: Solids will be decanted and/or temporarily stored on-site. Solids and/or decanted solids will be hauled off-site for treatment and re-use.

The proposed action is currently in the pre-design phase. Additional details will be developed as the design progresses.

### 1.1.1 Pressurized Sewer System

Wastewater will be collected from each connection by using either a STEP system or a grinder pump system. These systems are similar in that they are both pressure collection systems that use small-diameter pipe and small pumps at each service connection. STEP systems transport only the liquid stream to the treatment plant. The solids are collected in the existing septic tank, which requires periodic pumping for removal. Grinder pumps convey both the liquid and solids to the treatment facility. Both would require an easement at each service location for the District to allow for maintenance. The pipes associated with pressure systems are installed at relatively shallow depths that generally follow the ground contours. Pressure systems do not have high maintenance requirements, and all maintenance would be conducted by the District. Figure 3 illustrates the anticipated collection and conveyance system pipelines in the service area.

### 1.1.2 Membrane Bioreactor

Treatment plant effluent which is reused needs to be treated to standards defined by the Departments of Health and Ecology in the *Water Reclamation and Reuse Standards* (Ecology and DOH, 1997). The highest reuse standard, Class A, involves advanced wastewater treatment. Advanced wastewater treatment can be an additional filtration process after secondary treatment or an advanced wastewater treatment process such as a membrane bioreactor (MBR) plus additional disinfection.

Reclaimed water standards vary depending on the type of end-use and the potential for human contact with the reclaimed water. The requirements vary from Class A (highest quality) to Class D (lowest quality). Reclaimed water of each quality level can be achieved through appropriate levels of secondary or advanced treatment and disinfection. The District will utilize an MBR system for wastewater treatment to provide Class A reclaimed water.

The membrane bioreactor (MBR) process combines the extended aeration activated sludge process with a physical separation process using membranes immersed in the aeration basins. The membranes replace separate downstream clarifiers. By providing a positive barrier to virtually remove all particulate, colloidal and dissolved solids above the 0.1 micron range, the membranes produce an exceptional effluent quality, superior to that of extended aeration of activated sludge followed by conventional clarifiers and filters. Wastewater is filtered through the membrane, and filtered effluent passes through the membrane onto the next step of the treatment process.

### 1.1.3 Ultraviolet (UV) Disinfection

This technology involves disinfecting the wastewater treatment plant effluent by exposing the wastewater to high levels of ultraviolet light. Ultraviolet light mutates microorganism DNA, preventing cell reproduction, which effectively kills the microorganism population since the organisms’ life expectancies are short.

Ultraviolet disinfection systems use several types of technology: low-pressure open-channel systems; medium-pressure systems; and low-pressure, high-intensity systems. The system pressure refers to the gas pressure within the UV tubes ("bulbs").

One consideration of using UV disinfection in reuse applications is the requirement by the Department of Ecology (Ecology) to have a chlorine residual at the point of reuse. This would require the use of chlorine after UV disinfection resulting in the need to provide chlorination equipment and facilities or equipment to provide contact time.

### 1.1.4 Groundwater Recharge by Percolation

Groundwater recharge by slow infiltration is the recommended approach for reclaimed water reuse. Slow infiltration would consist of spray or drip discharge systems similar to those used for irrigation or land application, applied over large areas, in both sandy and till soil areas. Typically these systems use multiple dosing areas which are rotated to allow each area to absorb and dissipate the applied water. Reclaimed water infiltrates through the soil to the groundwater below. The level of wastewater treatment required for groundwater percolation is Class A reclaimed water. Additional studies are currently being conducted to determine the land area necessary for the ultimate discharge requirements for the facility to ensure that impacts do not occur to nearby surface waters (HWA Geosciences, Inc., 2010).

### 1.1.5 Solids Handling and Reuse

Solids will be removed from the wastewater treatment system by regularly removing a calculated volume of mixed liquor, or waste activated sludge (WAS), from the MBR biological treatment process. The waste activated sludge is expected to be removed from the MBR at a typical concentration of 0.8 to 1.2 percent solids. It will be stored in a sludge storage tank, thickened by decanting in the storage tank and then further thickened by a mechanical thickener. This thickening will reduce the volume of the waste sludge so it can be more efficiently stored at the treatment plant and trucked away for treatment and disposal.

Decant thickening will be provided by stopping aeration in the sludge storage tank for several hours each day so heavier solids can settle to the bottom and clearer supernatant can be removed from the top of the tank and returned to the MBR process. Decant thickening typically increases the WAS concentration only slightly to 1.5 or 2 percent solids, and this modest thickening is worthwhile because of its simplicity and low cost. The lack of aeration during decanting can create foul odors, so the sludge tank will be equipped with covers and an odor scrubber system to capture and remove odors.

Mechanical thickening will also be provided to concentrate the waste sludge. The mechanical thickener system will include additional pumps, a mechanical thickener and polymer addition, and it will require more electrical power. This system will increase the concentration of the WAS to 3 to 8 percent solids and significantly reduce the volume of sludge and the cost of sludge storage, hauling, and disposal. The thickener system will be enclosed in a building equipped with a foul air HVAC system and odor scrubber to capture and remove odors released during thickening. The thickened sludge from the mechanical thickener will be stored in a separate, aerated sludge holding tank for days or weeks, until it is trucked away for treatment and disposal.

### 1.1.6 Contracted Haul and Reuse of Biosolids

Wastewater solids will be trucked from the treatment plant to one or more facilities that are permitted to accept, process, and dispose of biosolids. The facilities are permitted by the Washington State Department of Ecology and/or Island County Health Department. The initial plan is to haul solids to the City of Langley's composting facility, the Island County Septage Facility, and/or contract with a private firm that is permitted to handle and provide beneficial use of the biosolids or disposal; the amounts trucked to each facility will depend upon total costs and the available capacity at the facility. At the City of Langley's facility wastewater solids are aerobically digested, dewatered, mixed with other materials such as yard waste, and composted. The finished product meets federal (40CFR Part 503) and Washington State standards (Chapter 173-308 WAC) for use by the general public. The finished compost is made available for the public to pick up and haul away. The Island County septage facility aerobically digests waste solids then land-applies the final product to a permitted 70-acre beneficial reuse site located roughly 2 miles east of Coupeville.

## 1.2 Federal Nexus

The District is providing this biological assessment (BA) to facilitate review of the proposed action as required by section 7(c) of the Endangered Species Act (ESA). This BA has been prepared to facilitate coordination between the federal action agency and the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS), jointly referred to as the Services. Section 7 of the ESA requires that, through consultation (or conferencing for proposed species) with the USFWS and/or NMFS, federal actions do not jeopardize the continued existence of any threatened, endangered, or proposed species or result in the destruction or adverse modification of critical habitat. The District is in the process of securing funding for the proposed Freeland Sewage Collection and Treatment System, which is the federal nexus for this project. Funding is being requested from the United States Department of Agriculture (USDA), and they have agreed to be the federal action agency.

This BA evaluates the potential effects of the proposed Freeland Sewer Collection and Treatment System project on species and habitats that are federally listed under the ESA. This study has the following objectives:

- To review information on species within the Action Area. Information on baseline conditions was drawn from public resource documents as referenced in the text. In addition, regional experts with specific knowledge of habitat conditions and fish use within the Action Area were contacted. A listing of pertinent references and contacts is provided at the end of this report.
- To conduct a review of the project area to observe species habitat and site-specific conditions.
- To discuss impacts of the proposed action and effects to the species and habitats.
- To discuss permit conditions and additional impact avoidance and minimization measures.
- To provide a recommendation with regard to effect determinations. Description of the Action Area and the proposed action

The Biological Assessment (BA) describes baseline conditions and potential effects to ESA regulated fish and wildlife and critical habitat that may be present in the vicinity of the action. This document describes potential direct and indirect effects of the proposed action as well as the effects of interrelated and interdependent actions upon listed species, critical habitat, and the environmental baseline within the project area related to the construction of the proposed wastewater reclamation facility, wastewater collection lines, and effluent reuse field, and operational impacts with respect to the discharge of highly treated reclaimed water to groundwater, which interacts with local wetlands. The proposed action will be constructed, operated, and maintained by the District.

In addition, this BA addresses the proposed action's compliance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), which requires Federal agencies to consult with NMFS on activities that may adversely affect Essential Fish Habitat (EFH). The objective of this EFH assessment is to determine whether or not the proposed action "may adversely affect" designated EFH for relevant commercially, federally-managed fisheries species within the proposed Action Area. For the purpose of this assessment, the proposed action for the EFH assessment and BA incorporate the same project elements. The EFH Assessment is included as Appendix A to this document.

## 1.3 Consultation History

No communications with the Services have occurred prior to preparation of this document. All species listings were obtained from both agencies websites and are included in Appendix B.

# 2.0 PROJECT DESCRIPTION

## 2.1 Project Location

The project is located in all or part of Sections 3, 10, 11, 14, and 15 Township 29 North, Range 2 East Willamette Meridian (W.M.). The treatment plant will be located in Section 9, Township 29 North, Range 2 East W.M. The reclaimed water reuse site will be located in Section 5, Township 29 North, Range 2 East W.M. (Figure 1).

The sewer service area is depicted in Figure 2 and is approximately bordered by Holmes Harbor to the north, Honeymoon Bay Road to the west, Scenic Drive to the south, and Newman and Scott Roads to the east. The sewer service area boundary encompasses approximately 684 acres (Figure 2). In addition to the NMUGA sewer service area boundary, the planning area also includes potential sites for the proposed treatment plant and reuse field both of which are located outside the NMUGA boundary (Figure 2). The location for the treatment plant is on a 10-acre parcel located south of Bush Point Road, and the reuse area is located on an 80-acre property northwest of the NMUGA (Figure 2). Sewer service will only be provided to the service area located within the NMUGA boundary, as depicted in Figure 2.

Based upon Island County Assessors data and water use records, the estimated base year resident population in the service area is 1,425. By 2025, an estimated 3,643 people are expected to be accommodated by the sewer service area. Urban capital facilities are needed to appropriately plan for the development of the Freeland NMUGA (Island County, 2007).

Ground elevations in the Freeland area range from 0 to about 250 feet above sea level. The terrain gently slopes across most of the service area, with some areas near the coastline having slopes greater than 20 percent. Most of the study area is underlain by glacially deposited sediments. The two predominant soil types are Whidbey gravelly sandy loam and Keystone loamy sand. Whidbey gravelly sandy loam is abundant at higher elevations west of Holmes Harbor and near the golf course. Keystone loamy sand is prevalent at the south end of Holmes Harbor and throughout southern Freeland. Soils within the project area are likely to be heterogeneous, meaning that soil type and composition will vary spatially.

The existing land use pattern is characterized by commercial development concentrated along the major highway corridors of SR 525 and Main Street. Figure 3 illustrates the existing zoning designations with the project area. Currently, an estimated 161 acres are zoned as Rural Center within the service area. Over two-thirds of the gross area within the service area is currently zoned as Rural or Rural Residential development. Note that gross acreage does not account for the presence of Critical Areas, rights-of-way and other land-use constraints. The largest contiguous residential communities are located north of the commercial center in Freeland and in the northwest corner of the NMUGA. Proposed zoning for the service area is for more dense development (see Figure 4). Of the total gross acres zoned for residential development in the NMUGA, according to Island County Assessors data approximately 8 % (15 acres) is considered to be fully developed, 60 % (110 acres) is considered underdeveloped, and 32 % is vacant land. Other land use in the service area includes public land (5.1 acres) in park facilities. The County has established interim regulations for the Freeland NMUGA. Completion of the final development regulations and required comprehensive plan elements is on the Island County Planning Commission's annual docket for 2010 and 2011 for completion.

### 2.1.1 Holmes Harbor

Holmes Harbor is a narrow, north-south trending embayment on the east side of Whidbey Island that opens to Saratoga Passage. The harbor is approximately 6 miles long and ranges in width from 2.2 miles at the mouth to about 0.7 mile at Freeland (WSCC, 2000). Depths range from 250 feet near the mouth to 85 feet near the head of the harbor. Surface salinity is low. Rainfall averages 30 to 39 inches per year. Fourteen small sub-basins drain into Holmes Harbor (WSCC, 2000). Together these drainages include 17 miles of shoreline. Land use is primarily rural residential and residential. Single family residences are scattered along the shoreline along with a few high-density residential areas (WSCC, 2000). The Holmes Harbor golf course is located on the west side of the harbor and a boat building company at the head of the harbor, along with the small town of Freeland. The majority of sewage is disposed of into on-site septic systems. Photos 1 through 9 show Holmes Harbor and the nearshore environment.

The nearshore habitat associated with Holmes Harbor supports eelgrass beds and spawning habitat for Pacific herring and surf smelt. There is a small salt marsh at the south end of Holmes Harbor which is blocked by a tidegate. The potential for this tidegate to act as a barrier to salmonids is unknown at this time (WSCC, 2000).

### 2.1.2 Vegetation

Both the wastewater treatment plant site and the reclaimed water reuse site are forested with primarily coniferous trees. The forest at the reclaimed water reuse site is relatively young with a dense layer of trees less-than 20 years old. The wastewater treatment plant site has a relatively mature second growth forest with trees greater than 50 years old and a dense understory of shrubs. This forest area was thinned in 2004. Wetland areas on the reuse site are dominated by willow and red alder. The proposed action will require clearing and grading on approximately 3 acres of land at the treatment plant site and up to 2 additional acres of land on the reuse site (roughly 4.5 acres are already cleared). All vegetation removal will occur outside of wetlands, riparian areas, and their buffers. Photo 11 shows the existing conditions at the treatment plant site, and photos 12, 13, and 14 show the existing conditions at the reuse site.

### 2.1.3 Wetlands

The National Wetland Inventory (NWI) maps and Island County critical area maps identify several wetlands within the Freeland NMUGA limits. One large wetland area is located on the south end of the NMUGA and several estuarine wetlands are associated with the nearshore of Holmes Harbor (Figure 5). Many wetlands, delineated and mapped in 2004, are located on the south and east sides of the 80-acre site northwest of the NMUGA proposed for the reclaimed water reuse site. The use of slow infiltration could possibly influence the hydrology within some of these wetlands; however, no fill, surface water inputs, or other alterations will occur to these wetlands. Additional studies are being conducted to determine the reclaimed water application rates that are suitable for the site to ensure that no flooding occurs as a result of application.

## 2.2 Construction Activities

The Freeland Water and Sewer District (District) is proposing to design and construct a new sewage collection, conveyance, treatment, and reclamation system to serve the community of Freeland. Due to its population growth and urban characteristics, Island County designated Freeland as a Non-Municipal Urban Growth Area (NMUGA) in 2007. The residences and businesses in the Freeland NMUGA are currently largely served by on-site septic systems (the Holmes Harbor Sewer District and the Main Street Sewer District serve a portion of the NMUGA). With the NMUGA designation, County population growth can be managed to meet the requirements of the Growth Management Act. This project proposes to implement wastewater collection and treatment services in conformance with the approved *Freeland Comprehensive Sewer Plan and Engineering Report/Facility Plan* (Tetra Tech, 2005) and the *Freeland Sub Area Plan* (Island County 2007). The project complies with the Growth Management Act by providing the infrastructure necessary to sustain the Freeland NMUGA.

The Freeland Sewage Collection and Treatment System Project will replace the on-site septic systems with a pressurized sewer collection system; either a Septic Tank Effluent Pumping (STEP) or a grinder pump system. Existing septic tanks and drain fields at each service location will be eliminated and replaced with STEP tank or grinder pump equipment. The collected sewage will be conveyed to a new treatment plant and be treated to “Class A” reclaimed water standards using membrane bioreactor technology. The treatment plant will be partially housed inside a building to manage odors, noise, and light impacts, and will be located on a 10-acre forested parcel with sufficient buffers from the surrounding rural residential neighborhood.

The reclaimed water will be pumped approximately 7,500 feet to a reuse site consisting of 80 acres of forest land. On that site the water will be recycled by infiltrating for groundwater recharge through surface percolation and application to vegetation with sprinklers or an equivalent technology. The system will be designed in accordance with the guidelines published by the Washington State Department of Ecology Criteria for Sewage Works Design (the Orange Book), applicable codes and permit requirements.

This project will be constructed in order to provide urban services to the area planned for population growth and to meet expected regulatory requirements. The locations for the proposed facilities are shown in Figure 2.

The proposed action includes excavation, utilities installation, concrete pouring, building construction, paving, and landscaping. Excavation will be required for new utilities, effluent reuse area, and building footprints. Grading will be required over approximately 3 acres of the treatment plant site and 5 acres of the reclaimed water reuse site. A proposed site development plan for construction of the wastewater treatment plant and associated infrastructure is shown in Figure 6. A proposed site development plan for the reclaimed water reuse site is shown in Figure 7.

Table 2-1 provides a summary breakdown of the land needs estimated for the reclamation plant and reuse area.

**Table 2-1. Estimated Land Area for Wastewater Facilities**

| Description | Estimated Land Area (acres) |
|---|---|
| **Wastewater Treatment Plant:** | |
| 2055 Treatment Plant Footprint | 3 acres |
| Area for Future Expansion | 1 acre |
| Buffer/Setback | 6 acres |
| Total | 10 acres |
| **Effluent Reuse Area:** | |
| Storage and infiltration sites | 60 acres in initial site sized for 2023 flow or longer |
| Reserve/Redundancy | Potentially 120 additional acres for 2055 flow |
| Buffers | 20 in initial site |
| Total | 80 acres in initial site, plus potential 120 additional acres |

### 2.2.1 Project Phasing

The District is proposing to construct the wastewater treatment plant to meet expected regulatory requirements and projected growth. Treatment plant construction has been phased to provide a more viable project funding package, and allow for simple expansion of treatment capacity under future construction phases. Similarly, phasing is proposed for the service area connections as well as expansion of the reuse site. The phasing will be timed to accommodate the flow needs of the service area and the expansion of the reuse site to accept the additional flows.

#### 2.2.1.1 Wastewater Treatment Plant Phasing

- Phase 1 will be completed at startup (2014) and will include 0.34 MGD of capacity. Approximately 30% of the treatment plant site (3 of the 10 acres) would be developed. Construction duration is estimated to be about 1.5 years.
- Phase 2 (2023) would include the expansion of the facility by adding a third treatment train or up to500,000 gallons of storage for standby capacity. This would result in the development of up to one more acre for the treatment plant. Construction duration for this addition is expected to last about 9 months.
- Phase 3 (2037) would similarly include the expansion of the facility by adding a standby fourth treatment train or up to an additional 500,000 gallons of storage for standby capacity. This would result in the development of up to one more acre for the treatment plant. Construction duration for this addition is expected to last about 9 months.

#### 2.2.1.2 Reuse Area Phasing

- Phase 1 (2014) would be the construction of the initial 80 acre reuse area. This would result in a construction duration of approximately 7 months.
- Phase 2 (2023) could result in development of another 80 acres, depending on the performance of the initial 80 acres.
- Phase 3 (2044) could result in development of another 40 acres, depending on the performance of the initial 80 acres and added acreage.

#### 2.2.1.3 Pressure Collection System Phasing

- Phase 1 Area (2014): This would be the initial phase of the collection system and it would serve the core area, adjacent high density residential zones, and waterfront properties along the south and west shores of Holmes Harbor. The Phase 1 service area encompasses approximately 331 acres.
- Phase 2 Area (2025): This would be the second and final phase of the collection system, and it would primarily serve outlying residential areas within the NMUGA south of the State Highway and waterfront properties along the east shore of Holmes Harbor (approximately 352 acres). This report assumes the Phase 2 collection system would be installed by the District in 2025, but alternately it could be installed as needed by local improvement districts or developer extensions.

Pipeline estimates associated with the pressure collection system phasing are as follows:

| **Pipe Lengths** | *STEP Phase 1* | *STEP Phase 2* | *STEP Total* | *Grinder* Phase 1* | *Grinder Phase 2* | *Grinder Total* |
|---|---|---|---|---|---|---|
| **Description** | **LF** | **LF** | **LF** | **LF** | **LF** | **LF** |
| 2" Pressure Mains | 30,000 | 14,900 | | 23,000 | 7,300 | |
| 3" Pressure Mains | 7,200 | 2,100 | | 8,600 | 2,900 | |
| 4" Pressure Mains | 10,300 | 2,900 | | 15,200 | 7,800 | |
| 6" Pressure Mains | 7,300 | 0 | | 7,900 | 1,900 | |
| 8" Pressure Mains | 5,600 | 0 | | 1,100 | 0 | |
| 10" Pressure Mains | 0 | 0 | | 900 | 0 | |
| 12" Pressure Mains | 700 | 0 | | 4,400 | 0 | |
| **Total** | **61,100** | **19,900** | **81,000** | **61,100** | **19,900** | **81,000** |

*For a grinder pump collection system, a booster pump station would be needed for the grinder pump collection system and would be located near Bush Point Road and the State Highway.

### 2.2.2 Wastewater Treatment Plant Operations

The facilities will include raw wastewater screening (primary treatment), Biochemical Oxygen Demand (BOD) and nitrogen removal (advanced secondary treatment), advanced filtration (tertiary treatment), disinfection, and support facilities such as odor control.

The liquid stream treatment process will consist of passing raw wastewater through four stages:

- Fine screening;
- BOD and Nitrogen Removal (anoxic & aerobic tanks);
- Solids separation through MBR tanks; and
- UV disinfection.

The treatment process would generally take place as follows and as shown in Figure 8. The proposed pressure collection system and pump station would deliver wastewater to the treatment plant. Upon entering the plant the wastewater would be routed through the headworks where fine screening of influent would occur to remove large and small solids from the liquid stream that may damage the membranes or otherwise collect at the bottom of the downstream processes. After fine screening, the wastewater would be piped to another series of tanks where the biological (advanced secondary) treatment process would take place. In this process, aerobic bacteria would oxidize ammonia into nitrite and nitrite into nitrate, and anoxic bacteria would subsequently reduce the nitrates to nitrogen gas. This process effectively removes nitrogen from the waste stream. Following this step the wastewater would go to the MBR, a set of tanks containing the membranes for solids separation.

A membrane is a set of plates or hollow filaments that are immersed in the wastewater. The plates or filaments are perforated by many tiny pores. Membrane pore sizes range from 0.04 to 0.4 microns (about 0.000002 to 0.00002 inch). The pore size for membranes at the proposed plant will nominally be 0.4 microns. Water is drawn through the pores and out of the tank by either gravity or vacuum pumping. The pore sizes are so small that water can pass through them but nearly all remaining solids as well as algae, most bacteria, and some viruses cannot. In addition, some substances that would otherwise pass through the pores (e.g., some forms of metals) adsorb to solids and are thus captured with the solids. Substances dissolved in the water such as some forms of metals and organic compounds can pass through the pores.

After passing through the membranes the water would be subjected to a final treatment step, disinfection. The purpose of disinfection is to kill remaining pathogens in the treated effluent to a level that complies with discharge permit conditions. From the MBR tanks, process water will be disinfected with ultraviolet light and a small dose of hypochlorite would be added to prevent regrowth of microorganisms downstream. Highly treated effluent (Class A reclaimed water) would then be pumped to the reuse site(s), which include storage basins and distribution systems that apply the reclaimed water to the surface and allow it to percolate into the groundwater.

The treatment plant would include odor and noise control facilities. Odor-producing processes would be enclosed, and air from these enclosures would be passed through odor treatment equipment before being released to the atmosphere. Excessive noise-producing equipment would be enclosed by noise attenuating covers or rooms. Site lighting will be designed so that light is not visible past the property boundaries and does not shine into the night sky.

The treatment plant will incorporate measures to minimize the potential for any overflow including a standby treatment train or up to three days of storage capacity on-site. The plant will include a standby generator large enough to operate all core treatment functions (pumping, aeration, instrumentation and control) when electricity is unavailable from the power grid. Enough diesel fuel to run the generator for at least 24 hours will be stored in an on-site tank.

In addition to the generator, state regulations require that the plant include redundancy for major equipment (e.g. screens, pumps, blowers, disinfection, etc.). The District will have dedicated staff that regularly maintains equipment and monitors unit processes. These measures will help insure that the wastewater receives proper treatment under all but the most catastrophic of conditions. Members of this staff will be on call 24-hours per day to correct any problems that may occur.

Overall, the MBR technology will produce highly treated, high quality water which will meet or be better than all of the applicable reuse standards. Biosolids will be trucked from the wastewater treatment plant to the Island County Septage Treatment Plant, the Langley Treatment Plant or other permitted facility for further processing and land application with their program. The County has a permitted program for land application of biosolids and Langley has a composting program for biosolids.

#### 2.2.2.1 Treatment Plant Site Layout

The location for the wastewater treatment plant is shown on Figure 2. A draft site layout is included on Figure 6.

#### 2.2.2.2 Treatment Plant Infrastructure

Construction and operation of the wastewater treatment plant will require new utilities including electricity, communications, and water. Local utilities will be contacted to ensure their individual transmission lines and other facilities are able to accommodate the treatment plant when services are needed. The proposed facilities would increase the electrical demand in the Freeland NMUGA. The design team will work with the local utility to identify utility needs and local infrastructure upgrades, if necessary.

#### 2.2.2.3 Impervious Surface

When fully developed, approximately 3 acres of the developed area for the treatment plant site and associated facilities will be impervious. This equals approximately 3 acres for the treatment plant, including roads, roofs, and structures. Stormwater will be treated for quantity and quality in accordance with the Department of Ecology's *2005 Stormwater Management Manual for Western Washington* (Ecology 2005) and Island County regulations.

#### 2.2.2.4 Excavation Clearing and Grading

Treatment plant construction will require excavation and grading of areas at the site for installation of the facilities. The majority of the grading and soil disturbance is expected to occur in the plant location (3 acres), pump station location (0.25 acre), and in the reuse area (6 acres) for a total of approximately 10 acres of clearing and grading. The remaining acres will be left as buffers and effluent reuse areas. All materials excavated and not reused on-site will be hauled to an approved facility for disposal.

Estimated quantities of excavation and fill within these areas are shown below.

Treatment Plant:

2014: Excavation = 13,000 cubic yards (cy)
Fill = 4,000 cy

2023: Excavation = 500 cy
Fill = 200 cy

Reuse Area:

2014: Excavation = 8,000 cy

2023: Excavation = 8,000 cy

Conveyance Pipelines:

2014: Excavation =15,000 cy
Fill =14,500 cy

2025: Excavation = 3,000 cy
Fill = 2,900 cy

#### 2.2.2.5 Temporary Erosion and Sediment Control

During construction, there is a potential for minor erosion and sedimentation to occur. These impacts are anticipated to be minor as the proposed sites are relatively flat, and there is dense vegetation between the wastewater treatment plant and reuse site and nearby wetlands.

Construction of the collection system will occur within existing developed roadways in proximity to Holmes Harbor. During construction, Best Management Practices (BMPs) will be employed to minimize the amount of erosion and sediment leaving the construction areas. The BMPs will be consistent with Ecology's *Stormwater Management Manual for Western Washington* (Ecology 2005) and Island County regulations, and may include the use of inlet protection, silt fence, straw waddles, and sediment traps as necessary. Clearing will only occur in areas of active construction. Following construction, disturbed areas will be revegetated or repaved promptly. Temporary erosion and sedimentation control (TESC) measures will be included as part of the project design and construction. A Construction Stormwater General Permit and Stormwater Pollution Prevention Plan (SWPPP) will be required for all construction activities. The SWPPP will meet the requirements of Washington State Department of Ecology and include measures deemed appropriate for the project. The SWPPP will be monitored by a Certified Erosion and Sedimentation Control Lead.

#### 2.2.2.6 <u>Stormwater Treatment and Conveyance</u>

The onsite stormwater system at the treatment plant will be designed in accordance with the Washington State Department of Ecology *Stormwater Management Manual for Western Washington* (Ecology 2005). All stormwater runoff from the process area, including any areas where any type of process work or material and equipment will be stored, will be diverted to the facility's storm drainage system, using curbs and sloped surfaces. Stormwater will then flow by gravity to a water quality pond or other approved process for treatment, storage and controlled release to an infiltration trench and forest buffer at the lower end of the site. All stormwater generated from non-process areas will be directed to the stormwater management system which will be designed in accordance with State and local regulations.

A Stormwater Pollution Prevention Plan (SWPPP) will also be developed for the proposed action that includes BMPs designed to prevent erosion and sedimentation, and to identify, reduce, eliminate, or prevent stormwater contamination and water pollution from construction activities. In general, a SWPPP is also intended to prevent violations of surface water quality, groundwater quality, and sediment management standards and during construction, prevent adverse water quality impacts including impacts on beneficial uses of the receiving water by controlling peak flow rates and volumes of stormwater runoff. The proposed action will not require a stormwater outfall to surface waters. Stormwater will be infiltrated; thereby minimizing the potential for water quality and quantity impacts to surface waters.

Photo 10 shows the existing stormwater control structure located in Freeland Park. A rain garden is also located within the park.

#### 2.2.2.7 <u>Construction and Equipment Staging Areas</u>

Part of the treatment plant site will be used for equipment laydown and materials staging. This laydown/staging area will be surfaced with crushed rock or spalls to provide drainage and minimize soil migration from the site during truck arrivals and departures. The total area required for staging will vary as the project progresses. All staging areas for construction of the plant will be within the site's construction footprint. No off-site staging areas or material storage facilities are likely to be required since there is adequate space on the site. Construction worker parking may occur in designated off-site areas. Staging may also be required for collection system construction. This would occur in approved areas along the construction route.

#### 2.2.2.8 Discharge of Groundwater from the Construction Area

Construction dewatering will be included as part of the overall project. The headworks, flow splitters, collection piping, anaerobic and aerobic treatment basins, MBR tanks, disinfection tanks, and associated piping will be partially buried and may potentially extend below the existing groundwater table. The contractor will be responsible for construction dewatering and the proper discharge to waters of the State per the SWPPP. Discharge is anticipated to be routed or pumped to settling and infiltration basins located near the active construction area.

#### 2.2.2.9 Construction Timing and Duration

Construction for Phase 1 is expected to begin in 2013 and will occur over an approximate two-year period. Additional construction phases are anticipated in to occur throughout the 20 year planning horizon and extend into the year 2025 (see Section 2.2.1).

#### 2.2.2.10 Vegetation Clearing

Vegetation clearing will include both forested and shrub areas, depending upon final site layout for the treatment plant and reuse sites (Photos 10, 12, and 14). No vegetation clearing will occur within wetlands, riparian areas, or their buffers. In total, approximately 10 acres of land will be developed as part of the proposed action.

## 2.3 Interrelated and Interdependent Actions

Interrelated actions are those that are part of a larger action and depend on the larger action for their justification (50 CFR 402.02). Interdependent actions are those that have no independent utility apart from the action under consideration (50 CFR 402.02). The construction of wastewater collection pipelines and pump stations are considered interrelated actions. The anticipated federal funding for the Freeland NMUGA Sewer Collection and Treatment System project will create a federal nexus for Section 7 consultation. Each of these elements of the proposed action is fully analyzed in this BA.

## 2.4 Impact Avoidance and Minimization Measures

This section discusses impact avoidance and minimization measures that will be employed to minimize, reduce, or eliminate the potential for adverse effects of the proposed action upon listed species and baseline conditions within the marine nearshore environment of Holmes Harbor.

### 2.4.1 General Construction BMPs

- Develop and implement comprehensive erosion and sediment control plans for each phase of construction in accordance with the Washington State Department of Ecology's *Stormwater Management Manual for Western Washington* (Ecology 2005) and with Island County regulations. The plans could include elements for site stabilization, slope protection, drainage way protection, and sediment retention.

- Spill and erosion prevention and sediment control plans, as well as observance of all applicable safety and environmental regulations for handling chemicals, would be in place to minimize risks.
- To minimize turbidity, route all water from dewatering operations through sediment removal facilities as needed prior to eventual discharge either to infiltration trenches or designated receiving water bodies. If dissolved oxygen were found to be low, aerate the water prior to discharge into any surface water body. Discharge of dewatering water would comply with construction NPDES standards and permit requirements.
- Control the release of construction dewatering water into nearby surface water bodies to minimize erosive velocities and the potential for erosion, turbidity increases, and sedimentation.
- Maintain vegetation and provide adequate surface water runoff systems.
- Limit the amount of area that is cleared and graded at any one time, and schedule construction activities soon after an area has been cleared and stripped of vegetation.
- Construct temporary siltation/sedimentation ponds to detain runoff waters and trap sediment from erodible areas.
- Revegetate or repave disturbed areas as soon as possible after completion of construction.
- Place straw, mulch, or commercially available erosion control blankets on slopes that require additional protection.
- Place straw bales or silt fences to reduce runoff velocity in conjunction with collection, transport, and disposal of surface runoff generated in the construction zone.
- During construction, monitoring programs could be required to ensure compliance with the site erosion control plan and with local regulatory requirements. A Stormwater Pollution Prevention Plan (SWPPP) and Temporary Erosion and sediment Control (TESC) plan are being included within project design documents. A Certified Erosion and Sedimentation Control Lead (District's staff or consultant) would measure parameters such as turbidity, temperature, and pH of surface water discharge and visually monitor the site for signs of erosion and for correct implementation of control measures.
- Clearly identifying construction areas to minimize habitat disruption.

### 2.4.2 Operational Conservation Measures for the Wastewater Treatment Plant

- The treatment plant design would include extensive BMPs and source controls to minimize the risk of contamination from spills and leaks, in the rare event that a spill may occur. Spill containment provisions include double-walled fuel storage and chemical storage facilities and emergency cleanup procedures, as required by code. The site would be sloped to direct any drainage from spill-prone areas (i.e., sludge loading) back to the treatment plant for processing.
- Stormwater generated in areas of the treatment plant site exposed to contaminants would be collected and processed through the treatment plant.

- Reclaimed water quality will be monitored in accordance with the NPDES permit limits for constituents of concern. It is anticipated that the discharge of Class A reclaimed water will meet all standards for discharge to groundwater via slow infiltration and land application.

# 3.0 ACTION AREA

The ESA requires that potential effects to listed and proposed endangered and threatened species be evaluated in relation to the complete range of area influenced by the proposed action (the Action Area) (50 CFR Part 402.02). The Action Area encompasses the complete extent where measurable direct and indirect effects resulting from the proposed action are foreseeable and are reasonably certain to occur (USFWS, 1998; NMFS, 1996).

For the purpose of this assessment, the Action Area generally includes the entire area within the Freeland service area boundary, the proposed site for the wastewater treatment plant, the proposed reuse site located northwest of the NMUGA boundary, and a 100-foot wide corridor along the reclaimed water conveyance pipeline alignment. This area includes the majority of the existing Freeland NMUGA and defines the extent of potential sewer collection system expansions into the NMUGA. The Action Area also includes the marine nearshore habitats of Holmes Harbor along the NMUGA boundary, which represent the aquatic zone affected by existing septic drainfields and the indirect effects related to increased impervious surface area as a result of projected development and population growth and direct effects associated with sedimentation and turbidity resulting from construction activities (Figure 3).

# 4.0 SPECIES AND CRITICAL HABITAT

## 4.1 Species List

NMFS (2008) and the USFWS (2007) indicate that the project will occur within the range of the federally-listed species and designated critical habitats shown in Table 4-1 below. Appendix B contains the complete NMFS and USFWS species lists. In addition, the Washington State Department of Natural Resources (WDNR) Natural Heritage Database (WDNR, 2008) was reviewed for the potential presence of federally-listed plant species in the project area.

**Table 4-1. Occurrence of Listed Species and Critical Habitat in the vicinity of the Project Action Area.**

| Common Name | Scientific Name | ESA Status * | Jurisdiction | Critical Habitat |
|---|---|---|---|---|
| Coastal-Puget Sound Distinct Population Segment (DPS) Bull Trout | *Salvelinus confluentus* | Threatened | USFWS | Yes |
| Puget Sound Chinook Salmon Evolutionarily Significant Unit (ESU) | *Oncorhynchus tshawytscha* | Threatened | NMFS | Yes |
| Puget Sound DPS steelhead | *O. mykiss* | Threatened | NMFS | No |
| Marbled Murrelet | *Brachyramphus marmoratus* | Threatened | USFWS | No |
| Yelloweye Rockfish | *Sebastes ruberrimus* | Threatened | NMFS | No |
| Canary Rockfish | *Sebastes pinniger* | Threatened | NMFS | No |
| Bocaccio Rockfish | *Sebastes paucispinis* | Endangered | NMFS | No |
| Southern Resident Population Killer Whale | *Orcinus orca* | Endangered | NMFS | Yes |

*__Threatened:__ Species are likely to become endangered within the foreseeable future. **Endangered:** A species that is in danger of extinction throughout all or a significant portion of its range.

The USFWS is no longer providing site-specific species lists due to current workload and budget constraints. Therefore, the species list provided for this project is a county-wide species list that includes species that would not normally be included on a site-specific list due to their limited range or specific habitat requirements. For this project, the only species included is the golden paintbrush (*Castilleja levisecta*). Golden paintbrush occurs in native grassland habitats (NatureServe, 2003), which are not present within the project Action Area.

In summary, golden paintbrush is not likely to occur within the Action Area due to a lack of suitable habitat. Therefore, this species will not be affected by the project and is not addressed further in this BA.

## 4.2 Species Evaluations

This section outlines the distribution, listing and stock status, and critical habitat designations for listed and proposed marine and fish species within and in the vicinity of the project Action Area.

### 4.2.1 Bull Trout

The Coastal-Puget Sound bull trout (*Salvelinus confluentus*) distinct population segment (DPS) is composed of 34 subpopulations (USFWS, 1998b; USFWS, 1999). In 1998, USFWS completed a status review of bull trout, identifying five DPSs in the continental U.S. (USFWS, 1998a). USFWS listed bull trout in the Coastal-Puget Sound DPS as threatened under the ESA on November 1, 1999 (USFWS, 1999).

#### 4.2.1.1 Life History

The life history of the Coastal-Puget Sound DPS Bull Trout is described in the *Endangered and Threatened Wildlife and Plants: Determination of Threatened Status for Bull Trout in the Coterminous U.S.; Final Rule* (USFWS, 1999) and the *Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout, Volume II (of II) Olympic Peninsula Management Unit* (USFWS, 2004a) and is included herein by reference. This information has been summarized to assist in the discussion of effects related to the proposed action, and is included in Appendix C.

#### 4.2.1.2 Occurrence of Species in the Action Area

Bull trout have not been documented within any of the streams draining WRIA 6, including the freshwater drainages draining to Holmes Harbor or marine nearshore areas of Holmes Harbor (WDFW, 2010a and 2010b). However, it is possible that migratory life history forms of bull trout may use the marine nearshore environment adjacent to Freeland for migration and foraging. The estuarine and marine nearshore areas of Holmes Harbor adjacent to Freeland provide spawning habitat for forage fish including Pacific sand lance, Pacific herring, and surf smelt, which are a primary prey species for bull trout in the marine environment. Bull trout are not precluded from the Action Area by any physical barrier, but may be substantially out of their range and their occurrence in the Action Area is likely to be rare.

#### 4.2.1.3 Critical Habitat

Critical habitat for the Coastal-Puget Sound bull trout DPS was initially designated on September 26, 2005 (70 Federal Register 185). Designated critical habitat was identified within the marine nearshore adjacent to Holmes Harbor. In January, 2010, US Fish and Wildlife Service proposed to revise its 2005 designation of critical habitat for the Bull Trout; however, the proposed revisions would not affect the existing critical habitat designation Holmes Harbor (Cite Federal Register here).

PCEs for bull trout in freshwater and marine nearshore areas, as defined by USFWS (70 Federal Register 185) are (Only 1, 6, 7, and 8 apply to marine nearshore critical habitat in Holmes Harbor):

1. Water temperatures that support bull trout use.
2. Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and in-stream structures.
3. Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine substrate less than 0.63 cm (0.25 in) in diameter and minimal substrate embeddedness are characteristic of these conditions.
4. A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, a hydrograph that demonstrates the ability to support bull trout populations.

5. Springs, seeps, groundwater sources, and subsurface water connectivity to contribute to water quality and quantity.
6. Migratory corridors with minimal physical, biological, or chemical barriers between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows.
7. An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish.
8. Permanent water of sufficient quantity and quality such that normal reproduction, growth, and survival are not inhibited.

### 4.2.2 Puget Sound ESU Chinook Salmon

NMFS issued a ruling in May 1999 listing the Puget Sound ESU Chinook Salmon (*Oncorhynchus tshawytscha*) as threatened (NMFS, 1999). Primary factors contributing to declines in Chinook salmon in the Puget Sound ESU include habitat blockages, hatchery introgression, urbanization, logging, hydropower development, harvests, and flood control (NMFS, 1998).

#### 4.2.2.1 Life History

The life history of Puget Sound Chinook salmon is described in detail in *NOAA Technical Memorandum NMFS-NWFSC-35 Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California* (Myers et al., 1998) and is included herein by reference. This information has been summarized to assist in the discussion of effects related to the proposed action, and is included in Appendix C.

#### 4.2.2.2 Occurrence of Species in the Action Area

There are no Chinook populations within the freshwater streams of WRIA 6 (WDFW, 2010a; WDFW 2010b, WSCC, 2000); however, the Freeland drainages have been documented as providing some salmonid restoration potential (WSCC, 2000).

Estuarine and nearshore habitats are critical for juvenile Chinook rearing, foraging, and migration. It is likely that juvenile Chinook could occur along the marine nearshore areas adjacent to Freeland; however, their occurrence appears to be sporadic and never occurring in great numbers.

#### 4.2.2.3 Critical Habitat

On April 30, 2002, the U.S. District Court for the District of Columbia approved a NMFS consent decree withdrawing a February 2000 Critical Habitat designation for this and 18 other ESUs. On December 14, 2004, NMFS proposed Critical Habitat for 13 Pacific Salmon ESUs, which includes the Puget Sound Chinook ESU (69 Federal Register 239).

On September 2, 2005, NMFS designated critical habitat for 12 salmon and steelhead ESUs in California and the Pacific Northwest (70 Federal Register 170). Designated critical habitat for

Puget Sound Chinook salmon in the vicinity of the Freeland NMUGA includes all marine waters extending from the line of extreme high tide out to a depth of 30 meters (98 feet).

Specific PCEs for Chinook salmon in marine/estuarine areas, as defined by NMFS (70 Federal Register 170) include:

- Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.
- Nearshore marine areas free of obstruction with water quality and quantity conditions and forage , including aquatic invertebrates and fishes supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels.
- Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

Chinook are not known to spawn in any of the freshwater streams in the Action Area; therefore, the freshwater PCEs do not apply in this instance. PCEs that do occur within the Action Area include those associated with the estuarine and nearshore marine areas. Due to the complex nature of marine ecosystems and lack of quantifiable information, it is difficult to determine whether or not the Action Area contains offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation of salmonids. Furthermore, it is also difficult to determine whether or not human activities have affected the offshore marine PCE. Therefore, an analysis of this PCE is not included. It is likely that this PCE has been degraded, but the extent of degradation is not measurable at this time.

### 4.2.3 Puget Sound DPS Steelhead

On May 7, 2007, NMFS announced the listing of the Puget Sound DPS of steelhead (*Oncorhynchus mykiss*) as a threatened species under the Endangered Species Act (72 Federal Register 91). Possible factors influencing the depletion of Puget Sound steelhead populations include habitat destruction and fragmentation, inadequate regulatory mechanisms of hatchery practices and land use activities, and potential genetic introgression between hatchery - and natural-origin steelhead.

#### 4.2.3.1 Life History

The life history of Puget Sound Steelhead (*O. mykiss*) is described in the *Proposed Endangered Status for Five ESUs of Steelhead and Proposed Threatened Status for Five ESUs of Steelhead in Washington, Oregon, Idaho, and California* (61 Federal Register 155) and is included herein by reference. This information has been summarized to assist in the discussion of effects related to the proposed action, and is included in Appendix C.

#### 4.2.3.2 Occurrence of Species in the Action Area

There are no steelhead populations within the freshwater streams of WRIA 6 (WDFW, 2010a; WDFW 2010b, WSCC, 2000); however, the Freeland drainages have been documented as providing some salmonid restoration potential (WSCC, 2000). Steelhead rear in freshwater streams and acclimate in the lower reaches of natal streams prior to entry into the marine environment. Since there are no streams supporting steelhead in WRIA 6 and rearing takes place primarily in freshwater, steelhead presence whether adult or juvenile is not anticipated within the project Action Area.

#### 4.2.3.3 Critical Habitat

Critical habitat for Puget Sound DPS steelhead has not been designated or proposed at this time.

### 4.2.4 Yelloweye Rockfish

On April 28, 2010, NMFS announced the listing of the Puget Sound DPS of yelloweye rockfish (*Sebastes ruberrimus)* as a threatened species under the Endangered Species Act (75 Federal Register 81). The primary factors influencing the decline of the Puget Sound/Georgia Basin DPS yelloweye rockfish are overutilization by commercial and recreational fisheries, habitat degradation, degraded water quality including low dissolved oxygen and elevated levels of contaminants, and inadequate regulatory mechanism (75 Federal Register 81). Presently, the species distribution extends from northern Baja California to the Aleutian Islands in Alaska, but is most common from central California north to the Gulf of Alaska (Clemens and Wildby, 1961; Eschmeyer et al., 1983; Hart, 1973; Love, 1996). The Puget Sound/Georgia Basin DPS distribution includes Puget Sound and the Georgia Basin within the state of Washington and the province of British Columbia, Canada (75 Federal Register 81).

#### 4.2.4.1 Life History

The life history of the yelloweye rockfish is described in *The rockfishes of the northeast Pacific* (Love et. al, 2002) and is included herein by reference. This information has been summarized to assist in the discussion of effects related to the proposed action, and is included in Appendix C.

#### 4.2.4.2 Occurrence of Species in the Action Area

Holmes Harbor depths range from the shallow nearshore and intertidal habitat to depths ranging from approximately 80 feet at the head of the harbor to 250 feet near the mouth of the harbor and confluence with the deeper waters of Saratoga Passage. These depths are within the range occupied by yelloweye rockfish; however, they are most frequently observed at depths between 300 to 590 feet (Love et. al, 2002). Yelloweye adult and juvenile rockfish are likely to be present within Holmes Harbor.

#### 4.2.4.3 Critical Habitat

Critical habitat for Puget Sound DPS yelloweye rockfish has not been designated or proposed at this time.

### 4.2.5 Canary Rockfish

On April 28, 2010, NMFS announced the listing of the Puget Sound DPS of canary rockfish (*Sebastes pinniger)* as a threatened species under the Endangered Species Act (75 Federal Register 81). The primary factors influencing the decline of the Puget Sound/Georgia Basin DPS canary rockfish are overutilization by commercial and recreational fisheries, habitat degradation, degraded water quality including low dissolved oxygen and elevated levels of contaminants, and inadequate regulatory mechanism (75 Federal Register 81). Presently, the species distribution extends between Punta Colnett, Baja California and the western Gulf of Alaska (Boehlert, 1980; Mecklenberg et. al, 2002). The Puget Sound/Georgia Basin DPS distribution includes Puget Sound and the Georgia Basin within the state of Washington and the province of British Columbia, Canada (75 Federal Register 81).

#### 4.2.5.1 Life History

The life history of the canary rockfish is described in *The rockfishes of the northeast Pacific* (Love et. al, 2002) and is included herein by reference. This information has been summarized to assist in the discussion of effects related to the proposed action, and is included in Appendix C.

#### 4.2.5.2 Occurrence of Species in the Action Area

Holmes Harbor depths range from the shallow nearshore and intertidal habitat to depths ranging from approximately 80 feet at the head of the harbor to 250 feet near the mouth of the harbor and confluence with the deeper waters of Saratoga Passage. These depths are within the range occupied by canary rockfish; however, they are most frequently observed at depths between 160 and 820 feet (Boehlert, 1980). Canary rockfish adult and juveniles are likely to be present within Holmes Harbor.

#### 4.2.5.3 Critical Habitat

Critical habitat for Puget Sound DPS canary rockfish has not been designated or proposed at this time.

### 4.2.6 Boccacio Rockfish

On April 28, 2010, NMFS announced the listing of the Puget Sound DPS of boccacio rockfish (*Sebastes pinniger)* as an endangered species under the Endangered Species Act (75 Federal Register 81). The primary factors influencing the decline of the Puget Sound/Georgia Basin DPS bocaccio are overutilization by commercial and recreational fisheries, habitat degradation, degraded water quality including low dissolved oxygen and elevated levels of contaminants, and inadequate regulatory mechanism (75 Federal Register 81). Presently, the species distribution extends from Punta Blanca, Baja California, to the Gulf of Alaska off Krozoff and Kodiak Islands, Alaska (Chen, 1971; Miller and Lea, 1972). Within this range, they are most common from Oregon to northern Baja, California (Love et. al, 2002). The Puget Sound/Georgia Basin DPS distribution includes Puget Sound and the Georgia Basin within the State of Washington and the Province of British Columbia, Canada (75 Federal Register 81).

#### 4.2.6.1 Life History

The life history of the boccacio rockfish is described in *The rockfishes of the northeast Pacific* (Love et. al, 2002) and is included herein by reference. This information has been summarized to assist in the discussion of effects related to the proposed action, and is included in Appendix C.

#### 4.2.6.2 Occurrence of Species in the Action Area

Holmes Harbor depths range from the shallow nearshore and intertidal habitat to depths ranging from 80 feet at the head of the harbor to 250 feet near the mouth of the harbor and confluence with the deeper waters of Saratoga Passage. These depths are within the range occupied by boccacio; however, they are most frequently observed at depths between 160 and 820 feet but may be found in waters as deep as 1,500 feet (Orr et. al, 2000). Bocaccio adult and juveniles are likely to be present within Holmes Harbor.

#### 4.2.6.3 Critical Habitat

Critical habitat for Puget Sound DPS bocaccio rockfish has not been designated or proposed at this time.

### 4.2.7 Southern Resident killer whale

NOAA Fisheries listed the Southern Resident Population killer whale, a portion of the killer whale population that may be found in Washington waters, as endangered in 2005. NOAA Fisheries listed the Southern Resident Population of killer whale as depleted under the Marine Mammal Protection Act in May 2003 (Marine Mammal Commission, 2004). Possible factors influencing the depletion of Southern Resident killer whale populations include high levels of contamination, reduced availability of prey, and potentially increased whale-watching activities (Krahn et al., 2002). Two other subpopulations of killer whales that may occur in the project Action Area include the Northern Resident Population and transients (Haro Strait). The Northern residents and transient killer whales are not currently protected under the ESA.

#### 4.2.7.1 Life History

The life history of the southern resident killer whale is described in *Washington State Status Report for Killer Whale* (Wiles, 2004) and is included herein by reference. This information has been summarized to assist in the discussion of effects related to the proposed action, and is included in Appendix C.

#### 4.2.7.2 Occurrence of Species in the Action Area

Killer whales are periodically observed in the waters of Holmes Harbor. While in inland waters during the warmer summer months, all pods concentrate their activities in Haro Strait, Boundary Passage, the southern Gulf Islands, the eastern end of the Strait of Juan de Fuca, and several localities in the southern Georgia Strait (Heimlich-Boran, 1988; Fellemen et al., 1991; Olson, 1998; Ford et al., 2000). Less time is spent elsewhere including the areas surrounding the San Juan Islands, Admiralty Inlet west of Whidbey Island, and Puget Sound, although J pod is the only group known to regularly venture inside the San Juan Islands (Balcomb, unpublished data). J pod is comprised of 28 individuals (Center for Whale Research, 2010). Resident killer whales rarely enter water less than about 15 feet (5 m) deep (Balcomb, unpublished data).

#### 4.2.7.3 Critical Habitat

On November 29, 2006, NMFS designated Critical Habitat for the Southern Resident killer whale (71 Federal Register 69054). Critical habitat in the action area includes Holmes Harbor, limited to waters more than 20 feet deep (relative to high high water).

### 4.2.8 Marbled Murrelet

#### 4.2.8.1 Life History

The life history of the marbled murrelet (*Brachyramphus marmoratus*) is described in the *Endangered and Threatened Wildlife and Plants; Final Designation of Critical Habitat for the Marbled Murrelet; Final Rule* (61 Federal Register 102) and is included herein by reference. This information has been summarized to assist in the discussion of effects related to the proposed action, and is included in Appendix C.

#### 4.2.8.2 Occurrence of Species in the Action Area

The project Action Area is located within the developed and developing areas of Freeland. Most of the forested areas surrounding the project area are either second or third growth coniferous forests. The inadequate size and age of the stands, in addition to the close proximity to development activities, likely limits the use of the Action Area by marbled murrelet for nesting habitat. The project Action Area includes the nearshore areas of Holmes Harbor, which contain habitat for forage fish species that comprise a portion of the marbled murrelet diet. However, no marbled murrelet use of the project Action Area or areas within one mile have been documented (WDFW, 2009a).

#### 4.2.8.3 Critical Habitat

The critical habitat designation includes 11 units in Washington State, including 1.2 million acres of federal land, 421,500 acres of state forest land, and 2,500 acres of private land. Not all suitable habitats are included in this designation, as only areas designated as most essential to murrelet survival in terms of quality, distribution, and ownership are included. The USFWS is currently proposing to revise the 1996 critical habitat designation for marbled murrelet (73 Federal Register 148). This revision to critical habitat would not affect current critical habitat designations in Washington State.

The closest designated critical habitat is located approximately 20 miles southwest of the project Action Area in Clallam County.

# 5.0 ENVIRONMENTAL BASELINE

## 5.1 Freshwater Aquatic Species

Freshwater aquatic habitat within the Action Area is limited to a small unnamed seasonal stream, which enters Holmes Harbor near the north end of the NMUGA. The unnamed stream is primarily a ditched system upstream of Stewart Road draining areas of Freeland to the south. No salmonid habitat is documented or expected within the freshwater portions of the seasonal stream. Downstream of Stewart Road, flows enter the harbor through a tidally influenced estuarine channel.

It is anticipated that none of the properly functioning conditions established by both NMFS (1996) and USFWS (1998) would be met under baseline conditions for the unnamed stream, and the proposed action is anticipated to maintain the majority of these conditions with the exception of water quality. Currently, the unnamed ditch (stream) is listed on the Washington State Department of Ecology 303(d) list of impaired water bodies for the fecal coliform bacteria parameter (Ecology, 2008). The proposed action will likely improve the water quality indicator by removing existing commercial and residential development from septic systems, which contribute to elevated fecal coliform bacteria levels in receiving waters.

## 5.2 Nearshore Marine Species

Three distinct areas containing habitat for marine species occur within the Action Area. The nearshore shallows of Holmes Harbor adjacent to Freeland, a narrow estuarine channel connecting the Type IV freshwater stream with the Harbor through a culvert beneath East Stewart Road, and a small pocket estuary connected to the Harbor through a culvert beneath Shoreview Drive are all accessible to marine species at high tide. The locations of the narrow estuarine channel and the small pocket estuary are shown on Figure 5. Photographs of these estuarine habitats and the culverts that connect them with Holmes Harbor are shown in Photos 1 through 8).

All eight of the species listed in Section 4.1 have access to the nearshore of Holmes Harbor and to a lesser extent the estuary channel and the pocket estuary. Use of these nearshore marine environments could be possible from juvenile fish seeking food sources and using eelgrass beds for cover. No listed adult salmonids are expected to use these areas for feeding or breeding. Adult rockfish are typically associated with deeper waters and are not anticipated to occur within the marine nearshore, estuarine channel, or pocket estuary. Killer whales would only be expected to occur in marine waters deeper than 15 feet and would not occur in the estuary channel or pocket estuary habitats. Murrelets may be present foraging within the marine nearshore; however, they would not be expected to occur within the pocket estuary or estuary channel.

Holmes Harbor is currently on the Washington State Department of Ecology 303(d) list of impaired water bodies for the dissolved oxygen (DO) parameter (Ecology, 2008). The listing covers an area of Holmes Harbor between the head of the harbor and the outlet into Saratoga Passage, well outside the project Action Area. The proposed action will likely improve the water quality indicator by removing existing commercial and residential development from septic systems, which contributes to elevated DO levels in the harbor. In addition, the proposed treatment plant will use advanced secondary treatment for removal of BOD and nitrogen prior to tertiary treatment and land application of reclaimed water.

# 6.0 EFFECTS OF THE ACTION

The Endangered Species Act (ESA) requires that where a discretionary federal action may adversely affect listed species or critical habitat, federal agencies must analyze the direct and indirect effects that actions will add to the environmental baseline, together with the effects of future state or private actions reasonably certain to occur in the Action Area (50 CFR 402.02, 402.03, 402.14).

Under the ESA "direct effects" result from an agency action and include the action's immediate effects on a species or its habitat (50 CFR 402.02; USFWS and NMFS, 1998, p. 4-25). The ESA's regulations define "indirect effects" as those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (40 CFR 1508.8; 50 CFR 402.02). A federal action's indirect effects may include the stimulation or inducement of growth or development activities carried out by other persons or entities (*National Wildlife Federation v. Coleman*, 529 F.2d 359; 5th Cir. Miss. 1976).

The ESA's implementing regulations also require a federal agency to analyze certain environmental impacts caused by the actions of others, <u>not</u> by the agency's proposed action. ESA regulations define these "cumulative effects" as including only the effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the Action Area of the federal action subject to consultation (40 CFR 402.02). The ESA's regulations establish a separate category—the "environmental baseline"—for the past or present impacts of all federal, state or private actions and other human activities in the Action Area, the anticipated impacts of all proposed federal projects in the Action Area that have already undergone Section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

The impacts of future private, local, or state development are properly analyzed as cumulative effects if there is no causal relationship between the development and the federal action under consideration (see 40 CFR 1508.7; 50 CFR 402.02). If a causal relationship exists between a federal action and future private, local, or state development, the development's environmental impacts should be discussed as an indirect effect of the underlying federal action (see 40 CFR 1508.8; 50 CFR 402.02; *National Wildlife Federation v. Coleman*, above; and USFWS and NMFS, 1998, p. 4-28). Where future private, local, or state development is subject to federal discretion, it is not analyzed as part of an ongoing Section 7 consultation, because it will be addressed in a separate future Section 7 consultation (see 50 CFR 402.02 and USFWS and NMFS [1998], pp. 4-25, 4-28, 4-30).

## 6.1 Direct Effects

### 6.1.1 Construction

Activities necessary to construct the proposed action will result in direct effects to the Action Area. These include effects related to construction activities for the proposed wastewater treatment plant, collection system, and reuse area. In general, direct effects as a result of the construction of the treatment plant and associated facilities will be minimal. No surface water features occur in proximity to the treatment plant site and construction at the treatment plant site will not alter aquatic habitats that may be utilized by listed species.

The most probable mechanisms to affect listed species during construction are anticipated to be the potential for turbidity and sedimentation, and a small increase in local noise and disturbance as a result of the need to use heavy equipment to construct the treatment plant and conveyance pipelines.

#### 6.1.1.1 Turbidity and Sedimentation

The proposed action will include the temporary disturbance of soils during grading and excavating activities and potential construction dewatering activity. Grading and excavating could result in erosion from disturbed upland soils and increase the sediment load in runoff potentially entering Holmes Harbor. Sedimentation is a concern since it can degrade fish spawning habitat, increase scour potential, degrade rearing habitat, and alter riparian vegetative structure. The risk of sedimentation would be limited to construction of the wastewater treatment plant, effluent reuse area, and collection system; however the majority of these facilities would not be constructed in the vicinity of any streams and would be constructed primarily greater than 200 feet from marine waters. An approximately 2,000-foot length of the collection system beneath Shoreview Drive will be less than 200 feet from marine waters. Site specific erosion control measures will not be specified until final design is complete; however, construction of the proposed action will be required to develop a TESC Plan and implement erosion and sediment control BMPs that meet Island County and Ecology standards for construction. Because of the implementation of BMPs, sedimentation and turbidity within Holmes Harbor resulting from construction activities is expected to be minimal. Specific conservation measures are detailed in Section 2.4.

#### 6.1.1.2 Construction Noise and Disturbance

The project will require the use of heavy equipment. The project is expected to result in a level of disturbance typical for construction projects of this type. No blasting or pile driving will be necessary during project construction. The proposed action will occur within developed and developing areas that produce noise levels associated with residential and commercial development and transportation related noise. The potential for the noise and disturbance to affect listed species, including the marbled murrelet, is expected to be discountable.

## 6.2 Indirect Effects

The primary operational effects of the proposed action would occur in relation to the discharge of highly treated reclaimed water to a slow infiltration site. The highly treated water (Class A reclaimed water) would be land applied to the infiltration basin and percolate into the subsurface groundwater system. The US Environmental Protection Agency (EPA) designated Whidbey Island as a sole source aquifer in 1982 (Island County, 2007). EPA reviewed the project information and found that the project will not have a significant adverse impact on the Whidbey Island Sole Source Aquifer (Ennes, 2010).

The shallow groundwater aquifer in this area is likely connected with the wetlands located primarily to the south and east of the infiltration area. It is likely that the proposed action will result in some benefits to the wetlands through additional groundwater recharge, especially during the late summer. It is also likely that removal of residences from septic systems may also concentrate groundwater recharge to the infiltration area and remove groundwater inputs from other areas within the basin.

The potential effects to water quality associated with reclaimed water reuse are generally related to temperature, nutrients, bacteria and viruses, turbidity, and chemical contamination. Under Phase I, the wastewater treatment plant will treat and reuse approximately 0.34 million gallons per day (MGD) of reclaimed water. At full build-out, the treatment plant will have been expanded to treat approximately 0.68 MGD maximum monthly flow (Tetra Tech, 2005).

### 6.2.1 Temperature

The proposed action will not result in the direct discharge of highly treated effluent to Holmes Harbor or any other fresh or marine waters, rather highly treated water will be land applied to a slow rate percolation system and allowed to infiltrate into the groundwater. It is anticipated that there will be some groundwater and surface water interaction and that the infiltration of reclaimed water and subsequent mixing with groundwater will minimize any elevated temperatures at the time of application.

### 6.2.2 Nutrients

Excess nutrients (nitrogen and phosphorus) can artificially stimulate plant growth, resulting in algal blooms which speed up the aging process of aquatic systems in addition to contributing to low dissolved oxygen levels, which can affect salmonids, particularly juveniles. In addition, ammonia is toxic to salmonids.

To meet Class A reclaimed water standards, the proposed wastewater treatment plant will include nitrogen removing technology within the design, which includes an anoxic basin in the secondary liquid processing train. In addition, the proposed action will not result in the direct discharge of highly treated water to surface waters, rather highly treated water will be land applied to a slow infiltration basin and allowed to percolate into the groundwater. In addition to nitrogen removal in the treatment process, it is anticipated that there will be significant groundwater interaction and that the infiltration of reclaimed water and subsequent mixing with groundwater will minimize and dilute concentrations of nutrients within the groundwater that provides recharge to local wetlands. No mapped streams occur in the vicinity of the proposed infiltration site and the infiltration basin will be located greater than 4,500 feet from the nearest marine waters (Mutiny Bay) and greater than 1.5 miles from Holmes Harbor.

### 6.2.3 Organic Contaminants

The new facility will utilize MBR treatment technology. This represents the highest practical level of treatment, achieving greater removal of contaminants than the existing on-site septic systems. MBR technology, however, does not remove all constituents of concern to aquatic life in the receiving water.

Organic chemicals may be either naturally occurring or human-made. Organic chemicals will biodegrade over time into their component elements. However, some persistent organic chemicals may not break down for decades. Organic chemicals include hydrocarbons and solvents. These compounds are frequently found at low levels in residential effluent. Because they are not part of the typical residential waste stream, these compounds enter the system in small quantities associated with disposal of paint, cleaning materials, or automotive wastes. There are currently no surface water quality standards for these compounds.

### 6.2.4 Metals

Metals, including copper, lead, arsenic, and zinc, may be present in highly treated water. They do not break down and are considered persistent chemicals. In general, metals bind to sediment or particulates suspended in water, but they may also dissolve in water and accumulate in surface sediments or bioaccumulate in the tissues of aquatic life. Metals discharged into groundwater that provides recharge to local wetlands may cause a variety of effects on biological resources. The types of effects would vary depending upon the particular metal and the level of exposure. At high enough exposures, metals may cause immediate health risks, including death, to plants and animals. At lower levels, long-term effects such as those associated with reproduction or growth may potentially occur. In general, the acute toxicity levels of most metals for aquatic organisms are considerably higher than the levels that would be allowed by state and federal water quality standards (Mason, 1991; WHO, 1998). Exposure to concentrated effluent on fish species is highly dependent upon the species exposed and their movement patterns. Adverse effects to salmonids from certain metals can include habitat avoidance and reduced olfactory function, which can increase the vulnerability of affected individuals to predators, reduce feeding efficiency, and reduce the likelihood of successful migration (Hansen et al. 1999). However, adverse effects attributable to the proposed action are not expected due to the lack of a direct discharge to surface waters, the overall dilution that would occur within the groundwater and additional binding that may occur with soils between the infiltration basin/application areas and within the hyporheic zone of local wetlands.

The toxicity of dissolved copper and dissolved zinc is species-specific and effects may be visible at various levels of biological organization (i.e., on a molecular, cellular, tissue, or whole-organism level). Very little research has been conducted on ESA-listed species and results must be extrapolated based on physiological and environmental similarities. Laboratory results are extremely useful because there is an ability to control multiple variables; thus providing the ability to determine cause-and-effect relationships. However, laboratory studies have not been verified with field studies. Currently, there is limited peer reviewed science on the effects of pollutants of concern on listed species in the natural environment and agreement has not been reached that identifies the best available science to use in analysis. Thus this report focuses on the changes the project is having on the baseline and to determine the potential for exposure for listed species.

Dissolved copper and zinc are considered “constituents of concern” due to their toxicities at low and environmentally relevant concentrations, assuming the species at risk is present and the constituents are biologically available. For these constituents, NMFS has defined biological thresholds above which, biological effects to species may occur. These thresholds are as follows:

- A 0.0056 mg/L (5.6 microgram/liter) increase in dissolved zinc over the receiving water's background concentration.
- A 0.002 mg/L (2.0 microgram/liter) increase in dissolved copper over the receiving water's background concentration.

Since this is an entirely new facility, there is no information on the concentrations of copper and zinc that will occur within the liquid waste stream delivered to the plant. However, the potential for adverse impacts to threatened and endangered species from dissolved metals are anticipated to be insignificant because there will be no direct discharge of effluent to surface waters, the effluent will be treated to Class A reclaimed water standards, and the effluent will infiltrate into groundwater and receive additional polishing prior to any interaction with surface waters.

### 6.2.5 Unregulated Contaminants/Microconstituents

Municipal wastewater contains numerous chemicals generated from the daily use of products disposed of via the sewer system and industrial process discharges. Wastewater effluent has been implicated as a source of endocrine disrupting chemicals (EDCs), pharmaceuticals and personal care products (PPCPs), persistent, bioaccumulative and toxic chemicals (PBTs), polybrominated diphenyl ethers (PBDE's), and other compounds of anthropogenic origin in surface waters of the United States, Europe and Washington State (Kolpin et al., 2002, King County, 2007). Wastewater treatment plants have been a focus of research because they represent a point-source target for investigation, and not because they have been implicated as the most important, or significant, source of these substances in the environment.

There are currently no requirements for measuring these compounds. Consequently, listed species may be exposed to these contaminants. Importantly, while the chemical concentrations are in many cases quite low, discharges occur on a continuous basis and include mixtures of compounds that may interact with each other under certain conditions. The potential toxicity effects of these mixtures can thus be both complex and additive.

Wastewater treatment plants are designed to remove conventional pollutants. These processes also remove many types of EDCs. Plants designed for secondary treatment and disinfection can remove over 90 percent of the most common EDCs entering a treatment plant, according to published research (WEF, 2005; Lubliner et. al., 2010). Higher removal rates have been achieved with other treatment technologies, which include ozonation, granulated or powdered activated carbon, and membrane technology (for some high molecular weight undissolved chemicals) (Ternes et al., 2003). These more advanced treatment processes are more costly and are primarily used in the treatment of drinking water.

Unregulated chemicals detected in wastewater include pharmaceuticals, personal care products, plasticizers, disinfectants, detergent metabolites, flame retardants, antioxidants, trace metals, and others. Many of these chemicals are ubiquitous and typically generated from non-point sources; sewage and domestic waste are the primary sources of pharmaceuticals and personal care products in the aquatic environment. However, at the present time municipal dischargers are not required to measure these emerging chemicals in their discharges, even though they are environmentally active and may adversely affect wildlife. These chemicals are addressed here as "unregulated" chemicals.

Although data are not available to definitively demonstrate the chemical composition of the treatment plant effluent, it is reasonable to assume that many of these chemicals will be present in the effluent. These chemical groups are common to most wastewater effluents and are frequently measured in surface waters that receive wastewater effluent. Currently, no monitoring data are available for these chemicals within the treatment plant effluent because the facility has not been constructed and no data has been collected at this time. In addition, there is no monitoring data available for the unnamed stream or Holmes Harbor at the confluence with the unnamed stream.

The question with respect to the proposed facility is really one of exposure potential. The proposed treatment plant will discharge highly treated reclaimed water to an infiltration basin where it will percolate into the soil and mix with the local shallow groundwater aquifer. Currently, septic tank effluent is infiltrating to the local groundwater system and is not provided the high level of treatment and contaminant removal provided by Class A reclaimed water. Although the shallow groundwater system near the reuse site is assumed to have a hydrologic connection with local wetlands; no fish habitat occurs in the wetlands and therefore, no exposure to listed species will occur.

### 6.2.6 Land Application of Biosolids

A recent study prepared by the United States Geological Survey (USGS) and a colleague from Colorado State University at Pueblo found that earthworms collected from an agricultural field where biosolids were applied, contained a number of anthropogenic waste indicators (AWIs). AWIs are organic chemicals that are found in waste sources such as biosolids or wastewater effluent from wastewater treatment plants. AWIs are made up of a wide variety of organic chemicals, some of which are found in household products such as prescription drugs, over-the-counter drugs, detergents, antibacterial soaps, fragrances, and pesticides. Some AWIs are naturally occurring chemicals (such as plant and animal sterols) that are concentrated by the treatment processes at wastewater treatment plants (Kinney et al., 2008). This study found that of the 77 AWIs tested for, 28 showed up in the biosolids applied to the agricultural field and 25 of the 28 AWIs were also detected in earthworms collected from the agricultural field where the biosolids were applied (Kinney et al., 2008). The results of this study reinforce two other recent studies that found the presence of household chemicals in biosolids and pharmaceuticals in soil irrigated with reclaimed water (Kinney et al., 2006a; Kinney et al., 2006b).

This information suggests that these commonly found household chemicals are present in biosolids and that these chemicals are finding their way into the food chain. While there is insufficient information at this time to directly link the land application of biosolids with adverse effects to listed species, it can be assumed that there is an interaction between organisms in the lower links of the food web with those at higher levels and the potential for bioaccumulation of the more persistent types of AWIs is possible.

Biosolids removed from the treatment plant will be hauled off-site for treatment at other facilities. The finished product will meet federal (40CFR Part 503) and Washington State standards (Chapter 173-308 WAC) for use by the general public.

### 6.2.7 Flows

Under Phase I, the wastewater treatment plant will treat and discharge approximately 0.34 million gallons per day (MGD) maximum monthly flow. At full build-out, the treatment plant will have been expanded to treat approximately 0.68 MGD maximum monthly flow (Tetra Tech 2008a).

### 6.2.8 Impervious Surface and Land Cover Alteration Associated with Wastewater Treatment Plant Construction

Stream degradation has been associated with the quantity of impervious surface in a basin (Booth, 2000; May et al., 1997; Horner and May, 2000). Studies in Puget Sound lowland streams show that alteration can occur in basins with as little as 10 percent total impervious surface area. However, dramatic effects can be seen relative to discharge in basins where impervious surface area exceeds 40 percent (May et al., 1997).

One of the most common concerns regarding impervious surface and land cover conversions is decreased baseflows and increased storm flows. Even medium-sized flood events in moderately urbanized watersheds are found to have peak-flow increases of two to three times the amount of runoff from non-urbanized watersheds (Booth et al., 2000). Increases in peak flow are more apparent as smaller, more frequent floods relative to larger floods (Booth et al., 2001). Stream flow or discharge has a significant influence on salmonids during their various life stages. Low flows may limit access to some streams or reaches and excessively high flows can also affect both stream habitat and reproductive success. Stream baseflow is particularly important to stream-flow sensitive salmonids in the Pacific Northwest, because riparian areas provide baseflow from groundwater during the region's typically dry season (City of Portland, 2001; Booth, 2000; May et al., 1997). In urban basins, increases in stormflow quantities and velocities can cause scouring that can displace stream substrates, which in turn reduces the quality and quantity of spawning areas (May et al., 1997). Scouring can result from increased runoff from impervious surfaces and from increases in velocities as a result of channelization (straightening) or other alterations in the floodplain, and/or the removal of streamside vegetation. Increased runoff rates from impervious surfaces can also flush spawning gravel from streams (Bledsoe and Watson, 2001).

In addition to changes in stream hydrology, the constituents of runoff from some impervious surfaces can contain nutrients, metals, and other pollutants if not properly treated using appropriate stormwater BMPs. Common pollutants in urban areas include nutrients such as phosphorus and nitrogen, pesticides, bacteria, and miscellaneous contaminants such as PCBs and heavy metals. Impervious surfaces collect and concentrate pollutants from different sources and deliver these materials to streams during rain storms. In general, concentrations of pollutants increase in direct proportion to total impervious area (May et al., 1997). Undisturbed riparian areas can retain sediments, nutrients, pesticides, pathogens, and other pollutants that may be present in runoff, protecting water quality in streams (Ecology, 2001; City of Portland, 2001).

The proposed action will add approximately 3 acres of impervious surface area associated with the wastewater treatment plant and associated facilities. Because the area is designated as a NMUGA, the impervious surface area within the service area is expected to increase as development occurs within the NMUGA.

Most of the roads in the service area are constructed to rural stormwater management standards. Roadside ditches are used to collect, convey, treat, and discharge stormwater runoff. There are currently two locations where stormwater discharges directly to Holmes Harbor. Water quality sampling at these locations indicates water quality typical of urban stormwater runoff including pollutants such as metals, oil, grease, fecal coliform bacteria, nitrogen, phosphorous, and suspended solids.

The treatment plant will treat all new impervious surface area (3 acres) in accordance with the Department of Ecology *2005 Stormwater Management Manual for Western Washington* (Ecology, 2005). It is anticipated that a stormwater pond will be constructed to treat stormwater generated at the wastewater treatment plant and associated parking areas and driveways, excluding areas within the process area. Stormwater generated within the process area will be directed to the treatment plant, processed, and discharged to the reuse area.

It is unlikely that the small amount of additional impervious surface that will occur in conjunction with the construction of the wastewater treatment plant will result in any measurable indirect effects. The proposed treatment plant footprint is insignificant in comparison to the overall size of the watershed, and the District proposes to provide stormwater detention and water quality treatment for all new impervious surfaces in compliance with the *2005 Stormwater Management Manual for Western Washington* (Ecology 2005). No new impervious surface will occur as a result of construction of the collection pipelines.

### 6.2.9 Impervious Surface and Land Cover Alteration Associated with Future Population Growth

While the changes in impervious surface and hydrological response that accompany population growth and development can and sometimes are considered to be indirect effects of proposed actions, in this case population growth and development in Freeland's NMUGA are not indirect effects of the proposed action. This is because Washington's Growth Management Act (GMA) eliminates any causal relationship between public infrastructure and future development. Under the GMA (RCW Ch. 36.70A), Non-Municipal areas like Freeland are required to use the state's census-based 20-year population projections to develop comprehensive land use plans ("comprehensive plans") to preemptively prescribe where and what type of development is allowed, as well as where and what type of development is *not* allowed. Each jurisdiction's individual zoning and building codes further define the actual parameters of permissible development in that jurisdiction, subject to the comprehensive plan as well as state and federal law, including FEMA flood insurance requirements. (See RCW 36.70B.030, .040; WAC 365-195-800(1); WAC 365-195-855; see also *Moss v. City of Bellingham*, 109 Wn. App. 9, 19, — P.2d — Div. I, 2001, citing RCW 36.70B.040; see also 42 USC 4001;44 CFR Ch. 60.) These comprehensive plans concentrate future development in a designated urban areas, and avoid conversion of undeveloped land into sprawling, low-density development (see RCW 36.70A.020(1), (2)).

Under the GMA, Island County was required to (and did) develop a comprehensive land use plan to designate where future population growth and development would occur (Island County, 1998, 2004, and 2007). As reflected in the comprehensive plan, land within the Freeland NMUGA will undergo a certain increment of additional and more intensive development even if the treatment plant is not constructed. This increment of additional, more intensive development would occur because it could be supported, in part, by on-site sewage disposal (septic) systems. However, the GMA required Island County to allow even more intensive land use within its NMUGA, in order to concentrate development there, to preserve rural areas and open space, and to avoid sprawl. Figure 4 shows future land use and zoning within the Freeland NMUGA and the service area.

The GMA also required Island County to produce a comprehensive sewer plan to support that additional increment of development (see RCW 36.70A.070(4)). In ESA terms, then, "but for" Island County's comprehensive plan, the proposed wastewater treatment plant and associated facilities would not exist. As such, the second layer of additional development linked to the treatment system is directly caused by Island County's comprehensive plan, and as such, it is correctly analyzed as a cumulative effect, not as an indirect effect of the action. Federal appellate courts have ruled consistent with this analysis (see, for example, *City of Carmel-by-the-Sea v. U.S. Dep't of Transportation*, 123 F.3d 1142, 1162-63 ($9^{th}$ Cir. Cal. 1997); *Laguna Greenbelt, Inc. v. U.S. Dep't of Transportation*, 42 F.3d 517, 525 ($9^{th}$ Cir. Cal. 1994)).

There are additional reasons why the impacts of future development in Freeland's NMUGA are more properly analyzed as cumulative effects. The first is that the primary purpose of ESA Section 7 consultation is to avoid jeopardy, and in so doing, to avoid and minimize impacts to listed species and designated critical habitat (16 USC 1536(a)(2); 50 CFR 402.02; USFWS and NMFS 1998, p. 4-19). The Services can require the project proponent to minimize such impacts as may be within the proponent's control. They may legitimately require a project proponent to undertake reasonable and prudent alternatives to avoid jeopardy, as well as reasonable and prudent measures to minimize the direct and indirect effects of the action (16 USC 1536(b)(4)(ii); 50 CFR 402.02; USFWS and NMFS 1998, p. 4-50).

### 6.2.10 Summary of Operational/Indirect Effects

The wastewater treatment plant will produce high quality reclaimed water. The expected low concentrations of pollutants in highly treated water (Class A reclaimed water) from the treatment plant and dilution within subsurface groundwater will produce high quality water and allow for the discontinuation of septic systems, which currently serve the project Action Area. However, the volume of flow will increase as a result of planned development within the service area and NMUGA. The District will monitor both treatment plant effluent and groundwater quality to ensure that impacts due to the above concerns are not occurring.

The presence of nutrients, metals, or elevated temperatures resulting from operation of the proposed wastewater treatment plant is not expected to result in significant adverse effects to threatened or endangered species. The discharge water from the proposed facility would be required to meet Class A reclaimed water standards. Water quality in Holmes Harbor is anticipated to improve with the removal of septic systems that ultimately drain toward the harbor.

## 6.3 Analyses of Effects to Critical Habitat Primary Constituent Elements

### 6.3.1 Puget Sound ESU Chinook Salmon Critical Habitat

#### 6.3.1.1 Estuarine Areas

Estuarine areas provide very important habitat to Chinook salmon. This area is very important to juvenile Chinook as they move out of their natal streams and into the estuarine habitats and undergo the physiological changes necessary for life in the marine environment.

Chinook salmon are not known to spawn or rear within the unnamed stream near Freeland Park and use of the estuarine habitat is likely limited to a few individual juveniles that may potentially stray into the estuarine habitat from other drainages. The proposed wastewater treatment plant and associated facilities are approximately one mile from the pocket estuaries at the south end of Holmes Harbor. During construction, appropriate TESC and spill prevention measures and BMPs will be in place to prevent the potential for erosion, sedimentation, and or turbidity from affecting the unnamed stream and subsequently the pocket estuaries. In addition, water quality is anticipated to improve within both the unnamed stream and the pocket estuaries as a result of treatment plant operations. Therefore, there are no anticipated adverse affects to the estuarine site primary constituent element.

#### 6.3.1.2 Nearshore Marine Areas

Chinook salmon fry rely upon the estuary and nearshore environments for growth and maturation prior to moving out into the open ocean. Juvenile Chinook salmon have been found, although in extremely low numbers, within the marine nearshore environment adjacent to the Freeland/ NMUGA. The proposed wastewater treatment plant and associated facilities would be located approximately one mile west of Holmes Harbor and the marine nearshore. During construction, appropriate TESC and spill prevention measures and BMPs will be in place to prevent the potential for erosion, sedimentation, and or turbidity from affecting streams and subsequently the marine nearshore during the construction of collection pipelines. In addition, water quality is anticipated to improve within the unnamed stream, the pocket estuaries, and the marine nearshore. Therefore, there are no anticipated adverse affects to the nearshore site primary constituent element in Holmes Harbor.

#### 6.3.1.3 Offshore Marine Areas

It is difficult to determine whether or not the Action Area contains offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation or whether or not human activities have affected this primary constituent element. It is likely that this PCE has been degraded, but the extent of degradation is not measurable at this time.

### 6.3.2 Puget Sound DPS Bull Trout Critical Habitat

#### 6.3.2.1 Water Temperature

The proposed action includes no alterations that would contribute directly or indirectly to increased water temperatures along the marine nearshore.

#### 6.3.2.2 Water Quantity/Quality

The proposed action will result in the discontinuation of sewer discharge to septic systems, which tend to leak over time and contribute to a degradation of water quality conditions in receiving waters, including the marine waters of Holmes Harbor. The proposed action will result in the treatment of wastewater to Class A Reclaimed Water Standards and land applied or slow infiltrated in upland areas a considerable distance from the marine nearshore environment. Construction has some limited potential to contribute to degraded water quality via sedimentation and turbidity of the marine nearshore; however, this is considered discountable due to the use of appropriate TESC measures and the distance from soil disturbing activities and the marine nearshore. The potential for growth within the service area may result in an increase in population and pollution generating impervious surface area associated primarily with new roadways in areas that were previously undeveloped. All new development will be subject to Island County's stormwater regulations as well as critical areas regulations, which ensure that all new impervious surface areas will be treated for quantity and quality prior to discharge.

#### 6.3.2.3 Prey Base

Pacific sand lance, Pacific herring, and surf smelt use the marine nearshore of Holmes Harbor adjacent to Freeland for spawning and are a prey species for anadromous life history forms of bull trout. The proposed action is anticipated to improve water quality conditions within the marine nearshore resulting in higher productivity and an increase in prey abundance. Construction has some limited potential to contribute to degraded water quality via sedimentation and turbidity of the marine nearshore; however, this is considered discountable due to the use of appropriate TESC measures and the distance from soil disturbing activities and the marine nearshore.

#### 6.3.2.4 Migratory Corridors

The proposed action includes no alterations that would contribute directly to creating conditions that may interfere with migration of bull trout along the shoreline. However, the proposed action will indirectly influence the future development of the area by providing sewer services to currently unserviced areas. Additional residential/commercial development may result in additional recreational/commercial dock construction along the marine shoreline, which may potentially result in migratory corridor obstructions. There are currently several regulatory mechanisms in-place to ensure that dock construction, if it were to occur, would be protective of the environment and minimize impacts to bull trout movements along the shoreline. These include the Island County Shoreline Master Program, Critical Area Ordinance, and the need for state and federal permits for in-water work. Project requiring federal permits would undergo individual ESA consultation.

## 6.4 Beneficial Effects

NMFS and USFWS (1998) identify beneficial effects as those that "are contemporaneous positive effects without any adverse effects." The proposed project will provide collection of wastewater, a new wastewater treatment plant, and reuse of highly treated effluent. The action will be beneficial to both human health and the environment; however, these factors are not considered "beneficial effects" as defined in relation to the ESA.

# 7.0 EFFECT DETERMINATIONS

Provided that the construction techniques and conservation measures summarized herein are properly implemented, this project is anticipated to have the following effects on ESA regulated species and critical habitat:

## 7.1 Threatened Species

### 7.1.1 Coastal-Puget Sound DPS Bull Trout

The overall effect determination for Coastal-Puget Sound DPS bull trout as a result of the proposed action is "may affect, not likely to adversely affect."

A "may affect" determination for Coastal-Puget Sound DPS bull trout is warranted based on the following rationale:

- Bull trout have not been identified as occurring within any streams within WRIA 6. However, anadromous life history forms of bull trout may be present foraging and migrating along the marine nearshore of Holmes Harbor adjacent to Freeland.
- The proposed action will facilitate future development within the Action Area indirectly resulting in an increase in impervious surface area and increased human activity adjacent to the marine nearshore environment.
- The proposed action will result in the discontinuation of existing septic system use by residential and commercial development and treatment of these and future development waste streams in the proposed treatment plant facility. Wastewater will be treated to Class A Reclaimed Water standards using primary treatment, advanced secondary treatment (BOD and Nitrogen removal), tertiary treatment (MBR), and UV disinfection and applied to upland areas either through surface infiltration/percolation or sprayed onto vegetation. Biosolids will be hauled off-site, treated to federal and state standards, and re-used for beneficial purposes. The removal of residential and commercial properties from septic systems is anticipated to improve overall water quality within Holmes Harbor.

A "not likely to adversely affect" determination is warranted based on the following rationale:

- Bull trout have not been identified as occurring within any streams within WRIA 6. The unnamed stream within the Freeland NMUGA is a low gradient stream and provides no spawning habitat for bull trout.
- The proposed MBR technology will produce high quality reclaimed water and result in the conversion of residential and commercial septic drain fields to the proposed sewer system.

- The use of MBR treatment technology and UV disinfection would not result in exceedences of water quality criteria for the unnamed creek or Holmes Harbor. No outfall to surface waters will occur as part of the proposed action. Once treated, the wastewater will meet Class A Reclaimed Water Standards. Reclaimed water will be directed to a slow infiltration basin and or application system where it will percolate into the groundwater table and interact with groundwater supplying nearby wetlands.
- The wastewater treatment plant will be designed to meet Class A Reclaimed Water Standards. In addition and since effluent reuse will include percolation into the groundwater, a nitrogen removal process has been included within the secondary liquid stream treatment process.
- The proposed action will not require in-water work. The proposed action may require soil disturbing activities in the vicinity of the unnamed stream and wetlands during installation of collection lines; however, the project proponent will employ TESC measures and appropriate BMPs to minimize and/or avoid potential for erosion, sedimentation, and turbidity during soil disturbing activities.
- All disturbed areas will either be reseeded following construction or paved thereby eliminating any future potential for erosion of upland soils and subsequent sedimentation and turbidity issues to wetlands.
- All equipment and materials will be stored and staged within the construction footprint located greater than 200 feet from any wetland or stream.
- Refueling will occur farther than 300 feet from any surface water feature, including the unnamed stream near Freeland Park and the pocket estuaries. All equipment operators will be trained in spill response and a Spill Prevention Plan will be prepared specifically for this project.
- Stormwater during construction will be treated on-site using methods consistent with the Ecology *2005 Stormwater Management Manual for Western Washington*, and island County regulations. Stormwater treatment will include infiltration of all stormwater runoff within a constructed stormwater pond. In addition a Stormwater Pollution Prevention Plan (SWPPP) will be prepared to address stormwater issues during construction.
- Future development will be required to meet regulatory requirements such as local critical area ordinance and shoreline regulations as well as other state and federal permit requirements associated with work in regulated critical areas. Future development requiring a federal permit or federal funding will undergo separate ESA consultation.

### 7.1.2 Puget Sound DPS Steelhead

The overall effect determination for Puget Sound DPS steelhead as a result of the proposed action is “no effect.”

A “no effect” determination for Puget Sound DPS steelhead is warranted based on the following rationale:

- Steelhead are not known to occur in any of the streams within WRIA 6.
- Steelhead juveniles rear in natal streams before migrating to salt water; therefore juveniles are not anticipated and have not been documented within the marine nearshore environment of Holmes Harbor.

- The proposed MBR technology will produce high quality reclaimed water and result in the conversion of residential and commercial septic drain fields to the proposed sewer system.
- The use of MBR treatment technology and UV disinfection would not result in exceedences of water quality criteria for the unnamed creek or Holmes Harbor. No outfall to surface waters will occur as part of the proposed action. Once treated, the wastewater will meet Class A Reclaimed Water Standards. Reclaimed water will be directed to a slow infiltration basin and or application system where it will percolate into the groundwater table and interact with groundwater supplying nearby wetlands.
- The wastewater treatment plant will be designed to meet Class A Reclaimed Water Standards. In addition and since effluent reuse will include percolation into the groundwater, a nitrogen removal process has been included within the secondary liquid stream treatment process.
- The proposed action will not require in-water work. The proposed action may require soil disturbing activities in the vicinity of the unnamed stream and wetlands during installation of collection lines; however, the project proponent will employ TESC measures and appropriate BMPs to minimize and/or avoid potential for erosion, sedimentation, and turbidity during soil disturbing activities.
- All disturbed areas will either be reseeded following construction or paved thereby eliminating any future potential for erosion of upland soils and subsequent sedimentation and turbidity issues to wetlands.
- All equipment and materials will be stored and staged within the construction footprint located greater than 200 feet from any wetland or stream.
- Refueling will occur farther than 300 feet from any surface water feature, including the unnamed stream near Freeland Park and the pocket estuaries. All equipment operators will be trained in spill response and a Spill Prevention Plan will be prepared specifically for this project.
- Stormwater during construction will be treated on-site using methods consistent with the Ecology *2005 Stormwater Management Manual for Western Washington*, and island County regulations. Stormwater treatment will include infiltration of all stormwater runoff within a constructed stormwater pond. In addition a Stormwater Pollution Prevention Plan (SWPPP) will be prepared to address stormwater issues during construction.
- Future development will be required to meet existing regulatory requirements such as local critical area ordinance and shoreline regulations as well as other state and federal permit requirements associated with work in regulated critical areas. Future development requiring a federal permit or federal funding will undergo separate ESA consultation.

### 7.1.3 Puget Sound ESU Chinook Salmon

The overall effect determination for Puget Sound ESU Chinook salmon as a result of the proposed action is “may affect, not likely to adversely affect.”

A “may affect” determination is warranted based on the following rationale:

- Chinook use of the unnamed stream near Freeland Park within the Action Area has not been documented; however, a small number of juveniles are known to occur along the marine nearshore and may extend into the two small pocket estuaries.

- The project will include excavation work during wastewater treatment plant, reuse site, and collection system construction that could result in small amounts of localized sedimentation and turbidity. Sedimentation from construction could occur if not properly controlled on-site.
- The proposed action will result in the construction and operation of a wastewater treatment plant that will discharge highly treated reclaimed water to a slow infiltration basin where highly treated reclaimed water will percolate into groundwater. This groundwater is hydrologically connected to nearby wetlands and could feed into the pocket estuaries.
- The wastewater treatment plant will utilize MBR treatment technology and UV disinfection. This represents the highest practical level of treatment technology; however, MBR technology does not remove all constituents from the effluent. Some of the constituents present in the treated wastewater are regulated and are known to have the potential to affect aquatic life.
- The proposed action will require approximately 3 acres of clearing and grading and vegetation removal at the treatment plant site.
- Construction of the proposed action will result in an increase in impervious surface within the basin.
- The proposed action will likely include soil disturbing activities within 200 feet of the nearshore of Holmes Harbor, the unnamed stream and the pocket estuary during installation of collection lines.
- The proposed action will facilitate future development within the Action Area indirectly resulting in an increase in impervious surface area and increased human activity adjacent to the marine nearshore environment.

A “not likely to adversely affect” determination is warranted for this proposed action for Chinook because:

- While some limited use of the marine nearshore areas of Holmes Harbor by juvenile Chinook has been identified during baseline studies and follow up surveys, adults Chinook are not known to spawn or have been documented within the Action Area. Chinook use of the project Action Area is potential, but their occurrence appears to be in very small numbers.
- The proposed MBR technology will produce high quality reclaimed water and result in the conversion of residential and commercial septic drain fields to the proposed sewer system. This will provide an overall benefit to water quality within the marine nearshore and estuarine environments within the Freeland NMUGA service area.
- The use of MBR treatment technology and UV light disinfection would not result in exceedences of water quality criteria within marine nearshore environments. No outfall to surface waters will occur as part of the proposed action. Once treated, the wastewater will meet Class A Reclaimed Water Standards. Reclaimed water will be directed to a slow infiltration basin where it will percolate into the groundwater.
- The wastewater treatment plant will be designed to meet Class A Reclaimed Water Standards. In addition and since effluent reuse will include percolation into the groundwater, a nitrogen removal process has been included within the secondary liquid stream treatment process.

- The project proponent will employ TESC measures and appropriate BMPs to minimize and/or avoid potential for erosion, sedimentation, and turbidity during soil disturbing activities. No in-water work is required.
- All disturbed areas will either be reseeded following construction or paved thereby eliminating any future potential for erosion of upland soils and subsequent sedimentation and turbidity issues.
- The majority of site work for the wastewater treatment plant will occur approximately 1 mile from the two pocket estuaries.
- All equipment and materials will be stored and staged within the construction footprint located greater than 200 feet from the pocket estuaries.
- Refueling will occur farther than 300 feet from any surface water feature, including the pocket estuaries and the unnamed stream. All equipment operators will be trained in spill response and a Spill Prevention Plan will be prepared specifically for this project.
- Stormwater during construction will be treated on-site using methods consistent with the Ecology *2005 Stormwater Management Manual for Western Washington*, and Island County regulations. Stormwater treatment will include infiltration of all stormwater runoff within a constructed stormwater pond. In addition a Stormwater Pollution Prevention Plan (SWPPP) will be prepared to address stormwater issues during construction.
- Future development will be required to meet regulatory requirements such as local critical area ordinance and shoreline regulations as well as other state and federal permit requirements associated with work in regulated critical areas. Future development requiring a federal permit or federal funding will undergo separate ESA consultation.

### 7.1.4 Yelloweye Rockfish, Canary Rockfish, and Bocaccio Rockfish

The overall effect determination for yelloweye rockfish as a result of the proposed action is “may affect, not likely to adversely affect.”

A “may affect” determination is warranted based on the following rationale:

- Adult and juvenile rockfish are likely to occur within Holmes Harbor at varying depths. Juvenile yelloweye rockfish prefer shallow, high relief zones while adults are generally found at depths ranging from 300 to 590 feet. Juveniles canary rockfish prefer shallow, high relief zones while adults are generally found at depths ranging from 160 to 820 feet. Juveniles bocaccio rockfish prefer floating kelp bed associations and then eventually settle to depths ranging from 60 to 100 feet in rock reefs. Adults migrate to deeper waters and can be found 100 feet above unhardened sea floor in the water column.
- The project will include excavation work during wastewater treatment plant, pump station, reuse field, and collection system construction that could result in small amounts of localized sedimentation and turbidity change within Holmes Harbor. Sedimentation from construction could occur if not properly controlled on-site.
- The proposed action will result in the construction and operation of a wastewater treatment plant that will discharge highly treated reclaimed water to a slow infiltration basin where highly treated reclaimed water will percolate into groundwater. This groundwater is hydrologically connected to local wetlands and pocket estuaries, but none of the estuaries contain habitat for rockfish.

- The wastewater treatment plant will utilize MBR treatment technology and UV disinfection. This represents the highest practical level of treatment technology; however, MBR technology does not remove all constituents from the effluent. Some of the constituents present in the treated wastewater are regulated and are known to have the potential to affect aquatic life.
- The proposed action will require approximately 3 acres of clearing and grading and vegetation removal at the treatment plant site.
- Construction of the proposed action will result in an increase in impervious surface within the basin.
- The proposed action will likely include soil disturbing activities within 200 feet of the nearshore of Holmes Harbor and the two pocket estuaries during installation of collection lines.

A “not likely to adversely affect” determination is warranted for this proposed action for rockfish because:

- The proposed MBR technology will produce a high quality effluent and result in the conversion of residential and commercial septic drain fields to the proposed sewer system.
- The use of MBR treatment technology and UV disinfection would not result in exceedences of water quality criteria within the pocket estuaries or the nearshore of Holmes Harbor. No outfall to surface waters will occur as part of the proposed action. Once treated, the wastewater will meet Class A Reclaimed Water Standards with the primary goal of recharging local groundwater. Reclaimed water will be directed to a slow infiltration basin where it will percolate into the groundwater.
- The wastewater treatment plant will be designed to meet Class A Reclaimed Water Standards. In addition and since effluent reuse will include percolation into the groundwater, a nitrogen removal process has been included within the secondary liquid stream treatment process.
- The project proponent will employ TESC measures and appropriate BMPs to minimize and/or avoid potential for erosion, sedimentation, and turbidity during soil disturbing activities. No in-water work is required.
- All disturbed areas will either be reseeded following construction or paved thereby eliminating any future potential for erosion of upland soils and subsequent sedimentation and turbidity issues to the pocket estuaries.
- The majority of site work for the wastewater treatment plant will occur approximately 1 mile from the two pocket estuaries.
- All equipment and materials will be stored and staged within the construction footprint located greater than 200 feet from the pocket estuaries.
- Refueling will occur farther than 300 feet from any surface water feature, including the pocket estuaries and the unnamed stream. All equipment operators will be trained in spill response and a Spill Prevention Plan will be prepared specifically for this project.
- Stormwater during construction will be treated on-site using methods consistent with the Ecology *2005 Stormwater Management Manual for Western Washington*, and Island County regulations. Stormwater treatment will include infiltration of all stormwater runoff within a constructed stormwater pond. In addition a Stormwater Pollution

Prevention Plan (SWPPP) will be prepared to address stormwater issues during construction.

- Future development will be required to meet existing regulatory requirements such as local critical area ordinance and shoreline regulations as well as other state and federal permit requirements associated with work in regulated critical areas. Future development requiring a federal permit or federal funding will undergo separate ESA consultation.

### 7.1.5 Southern resident population killer whale

The overall effect determination for southern resident population killer whale as a result of the proposed action is “may affect, not likely to adversely affect.”

A “may affect” determination is warranted based on the following rationale:

- Killer whales are periodically observed foraging in Holmes Harbor.
- Forage species such as Pacific salmon use both Holmes Harbor for rearing, foraging and migration.
- The proposed action will result in the discontinuation of existing septic system use by residential and commercial development and treatment of these and future development waste streams in the proposed treatment plant facility. Wastewater will be treated to Class A Reclaimed Water standards using primary treatment, advanced secondary treatment (BOD and Nitrogen removal), tertiary treatment (MBR), and UV disinfection and applied to upland areas either through surface infiltration/percolation or sprayed onto vegetation. Biosolids will be hauled off-site, treated to federal and state standards, and re-used for beneficial purposes. The removal of residential and commercial properties from septic systems is anticipated to improve overall water quality within Holmes Harbor.
- The proposed action will facilitate future development within the Action Area indirectly resulting in an increase in impervious surface area and increased human activity adjacent to the marine nearshore environment.

A “not likely to adversely affect” determination is warranted for this proposed action for southern resident population killer whales because:

- The project is not likely to have a significant effect on salmon populations or other forage species within the area.
- The project will have no in-water work and will not block any migration routes or permanently alter marine habitat.
- Future development will be required to meet existing regulatory requirements such as local critical area ordinance and shoreline regulations as well as other state and federal permit requirements associated with work in regulated critical areas. Future development requiring a federal permit or federal funding will undergo separate ESA consultation.

### 7.1.6 Marbled Murrelet

The overall effect determination for marbled murrelet as a result of the proposed action is “no effect.”

A “no effect” determination is warranted based on the following rationale:

- No marbled murrelet sightings have occurred within one-mile of the proposed action.
- No suitable nesting habitat for marbled murrelet exists within the Action Area. Freeland is within developed and developing residential and commercial areas with numerous traffic corridors and are surrounded primarily by second and third growth coniferous forests.
- The proposed action will not result in alterations to foraging habitat and will have no effect on prey species within the Action Area.
- The proposed action will result in a temporary increase of noise levels above ambient conditions and will also result in an increase in human activity during construction activities; however, these increases are expected to attenuate to ambient conditions within one-half mile of construction activities.
- The proposed action will not include sound intensive construction methods such as blasting or pile driving.

## 7.2 Critical Habitat

### 7.2.1 Critical Habitat for Puget Sound ESU Chinook salmon

The overall effect determination for critical habitat for Puget Sound ESU Chinook salmon as a result of the proposed action is “may affect, not likely to adversely affect.”

A “may affect” determination for Puget Sound ESU Chinook salmon critical habitat is warranted based on the following rationale:

- The project lies within designated critical habitat along the marine nearshore environment adjacent to Freeland. No critical habitat has been designated within the pocket estuaries.
- Nearshore and estuarine PCEs are present within the Action Area.
- The proposed action will result in the discontinuation of existing septic system use by residential and commercial development and treatment of these and future development waste streams in the proposed treatment plant facility. Wastewater will be treated to Class A Reclaimed Water standards using primary treatment, advanced secondary treatment (BOD and Nitrogen removal), tertiary treatment (MBR), and UV disinfection and applied to upland areas either through surface infiltration/percolation or sprayed onto vegetation. Biosolids will be hauled off-site, treated to federal and state standards, and re-used for beneficial purposes. The removal of residential and commercial properties from septic systems is anticipated to improve overall water quality within Holmes Harbor.
- The proposed action will facilitate future development within the Action Area indirectly resulting in an increase in impervious surface area and increased human activity adjacent to the marine nearshore environment.
- The proposed action will entail limited amounts of work near the pocket estuary to install the sewage collection lines.
- The proposed action will likely include soil disturbing activities within 200 feet of the nearshore environment of Holmes Harbor during installation of collection lines. This action may temporarily increase erosion and sedimentation of Holmes Harbor. No in-water work will be required.
- Construction of the proposed action will result in an increase in impervious surface within the basin.

A “not likely to adversely affect” determination is warranted for this proposed action for Puget Sound ESU Chinook salmon critical habitat because:

- The proposed action will not require any in-water work and therefore there are no anticipated direct effects to critical habitat PCEs in the action area as a result of construction.
- The use of MBR treatment technology and UV disinfection would not result in exceedences of water quality criteria within the marine or estuarine habitats. No outfall to surface waters will occur as part of the proposed action. Once treated, the wastewater will meet Class A Reclaimed Water Standards and will be directed to a slow infiltration basin in upland areas where it will percolate into groundwater.
- The proposed MBR technology will produce high quality reclaimed water and result in the conversion of residential and commercial septic drain fields to the proposed sewer system. This is anticipated to have an overall benefit to the marine and estuarine environments by reducing nutrient inputs from leaking septic systems and improving overall water quality.
- While some new impervious surface will be added to the basin, all stormwater generated from construction and operation of the facility will be treated in accordance with the Ecology *2005 Stormwater Management Manual for Western Washington*, and Island County regulations.
- TESC measures and a Stormwater Pollution Prevention Plan will be in place to minimize the potential for turbidity and sedimentation of Holmes Harbor and subsequently the estuary and marine nearshore environment during construction of the proposed action. Spill prevention plans and other construction related BMP’s will be in place to prevent spills of oils, hydraulic fluids, or other contaminants into surface waters.
- Future development will be required to meet existing regulatory requirements such as local critical area ordinance and shoreline regulations as well as other state and federal permit requirements associated with work in regulated critical areas. Future development requiring a federal permit or federal funding will undergo separate ESA consultation.

### 7.2.2 Critical Habitat for Coastal-Puget Sound DPS Bull Trout

The overall effect determination for critical habitat for Coastal Puget Sound DPS bull trout as a result of the proposed action is “may affect, not likely to adversely affect.”

A “may affect” determination for Coastal-Puget Sound DPS bull trout critical habitat is warranted based on the following rationale:

- The project lies within designated critical habitat along the marine nearshore environment adjacent to Freeland. No critical habitat has been designated within the pocket estuaries.
- Water temperature, water quality/quantity, prey base, and migratory PCEs are present within the Action Area.
- The proposed action will result in the discontinuation of existing septic system use by residential and commercial development and treatment of these and future development waste streams in the proposed treatment plant facility. Wastewater will be treated to Class A Reclaimed Water standards using primary treatment, advanced secondary treatment (BOD and Nitrogen removal), tertiary treatment (MBR), and UV disinfection and applied to upland areas either through surface infiltration/percolation or sprayed onto vegetation.

Biosolids will be hauled off-site, treated to federal and state standards, and re-used for beneficial purposes. The removal of residential and commercial properties from septic systems is anticipated to improve overall water quality within Holmes Harbor.

- The proposed action will facilitate future development within the Action Area indirectly resulting in an increase in impervious surface area and increased human activity adjacent to the marine nearshore environment.
- The proposed action will entail limited amounts of work near the pocket estuary to install the sewage collection lines.
- The proposed action will likely include soil disturbing activities within 200 feet of the nearshore environment of Holmes Harbor during installation of collection lines. This action may temporarily increase erosion and sedimentation of Holmes Harbor. No in-water work will be required.
- Construction of the proposed action will result in an increase in impervious surface within the basin.

A "not likely to adversely affect" determination is warranted for this proposed action for Coastal-Puget DPS bull trout critical habitat because:

- The proposed action will not require any in-water work and therefore there are no anticipated direct effects to critical habitat PCEs in the action area as a result of construction.
- The use of MBR treatment technology and UV disinfection would not result in exceedences of water quality criteria within the marine or estuarine habitats. No outfall to surface waters will occur as part of the proposed action. Once treated, the wastewater will meet Class A Reclaimed Water Standards and will be directed to a slow infiltration basin in upland areas where it will percolate into groundwater.
- The proposed MBR technology will produce a high quality reclaimed water and result in the conversion of residential and commercial septic drain fields to the proposed sewer system. This is anticipated to have an overall benefit to the marine and estuarine environments by reducing nutrient inputs from leaking septic systems and improving overall water quality.
- While some new impervious surface will be added to the basin, all stormwater generated from construction and operation of the facility will be treated in accordance with the Ecology *2005 Stormwater Management Manual for Western Washington*, and Island County regulations.
- TESC measures and a Stormwater Pollution Prevention Plan will be in place to minimize the potential for turbidity and sedimentation of Holmes Harbor and subsequently the estuary and marine nearshore environment during construction of the proposed action. Spill prevention plans and other construction related BMP's will be in place to prevent spills of oils, hydraulic fluids, or other contaminants into surface waters.
- Future development will be required to meet existing regulatory requirements such as local critical area ordinance and shoreline regulations as well as other state and federal permit requirements associated with work in regulated critical areas. Future development requiring a federal permit or federal funding will undergo separate ESA consultation.

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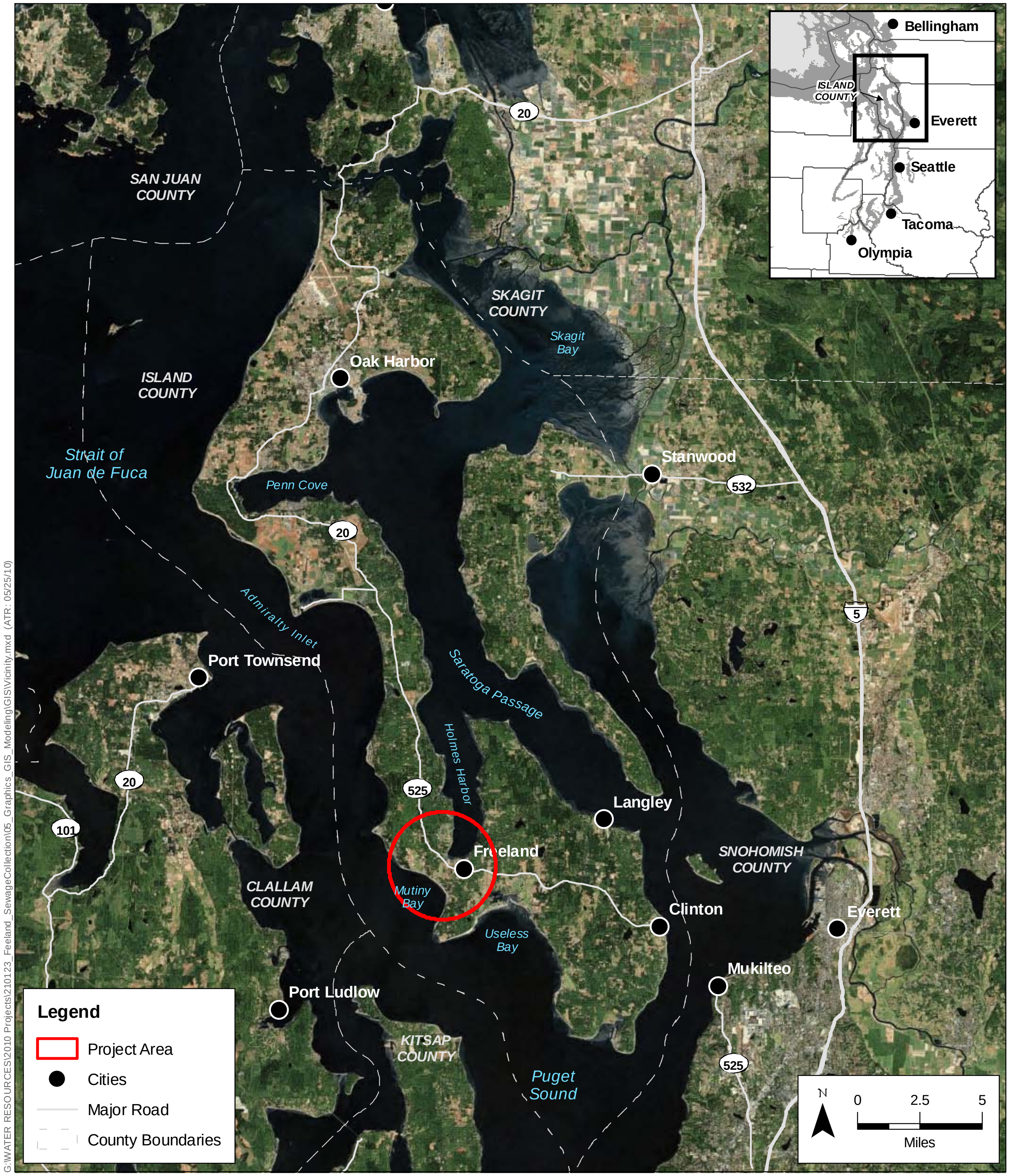
# FIGURES AND PHOTOGRAPHS



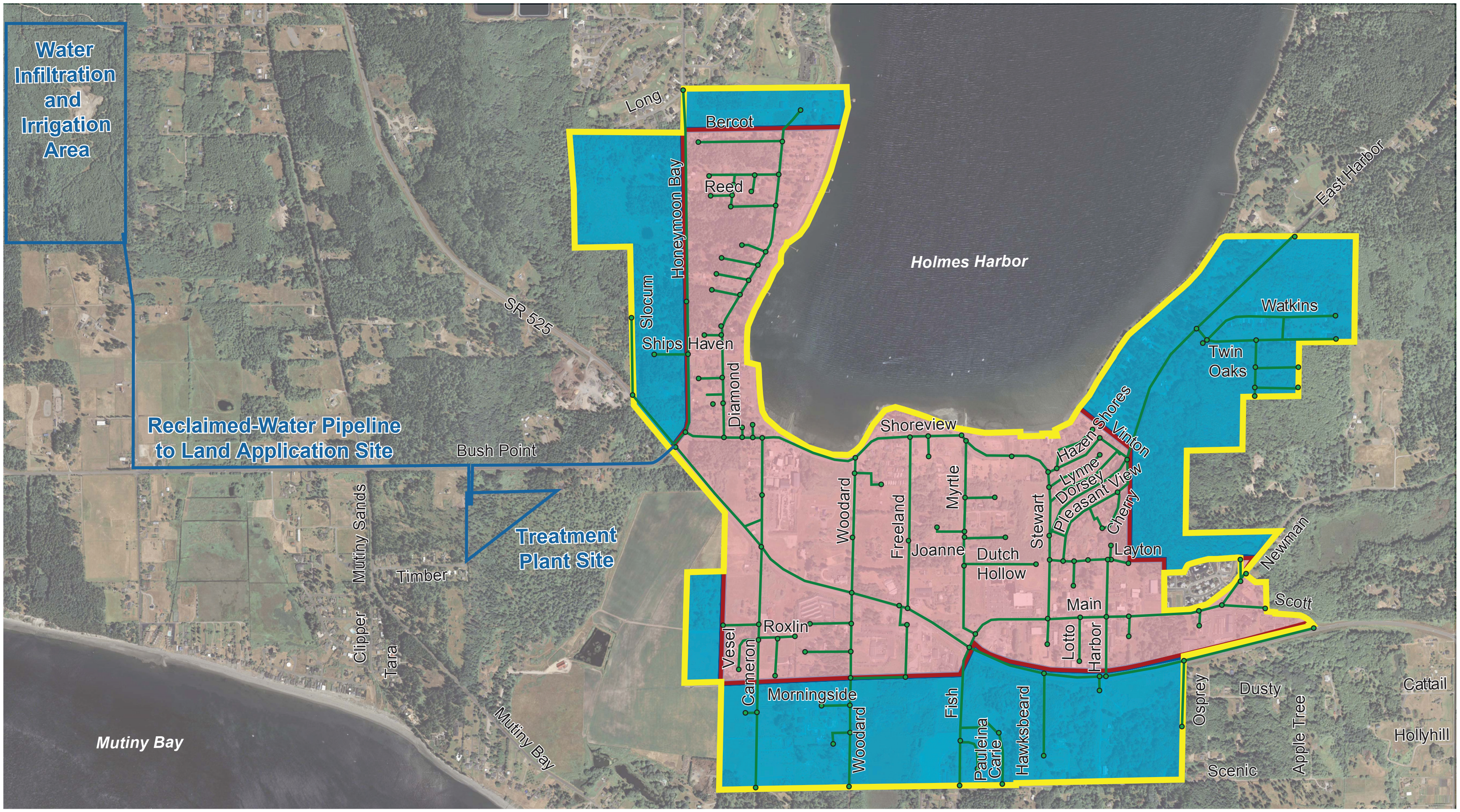

SOURCE: WSDOT, 2001; Microsoft Live (2007 Approx) (Aerial)

Freeland Sewage Collection . 210123

**Figure 1**

Vicinity Map

Island County, Washington




500' 0 1,000' 2,000'

Approximate Scale

**LEGEND**

- District boundary
- Collection system piping
- Conveyance pipeline
- Phase 1 project area
- Phase 2 project area

N

TETRA TECH

FILE NAME: Fig02_ServiceArea_Collection.ai
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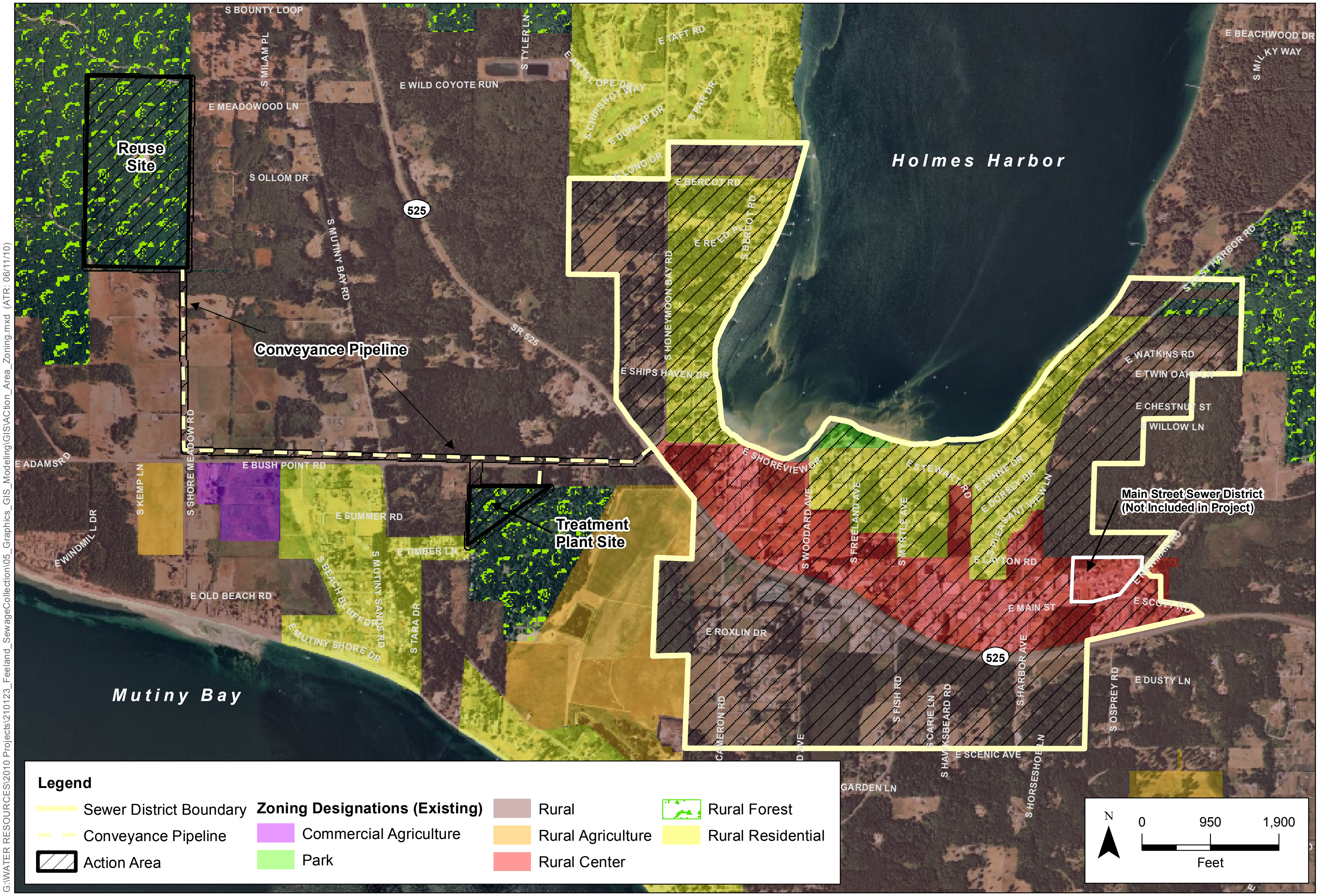
SOURCE: Tetra Tech.

Freeland Sewage Collection . 210123

**Figure 2**

Service Area and Collection System Phasing
Island County, Washington



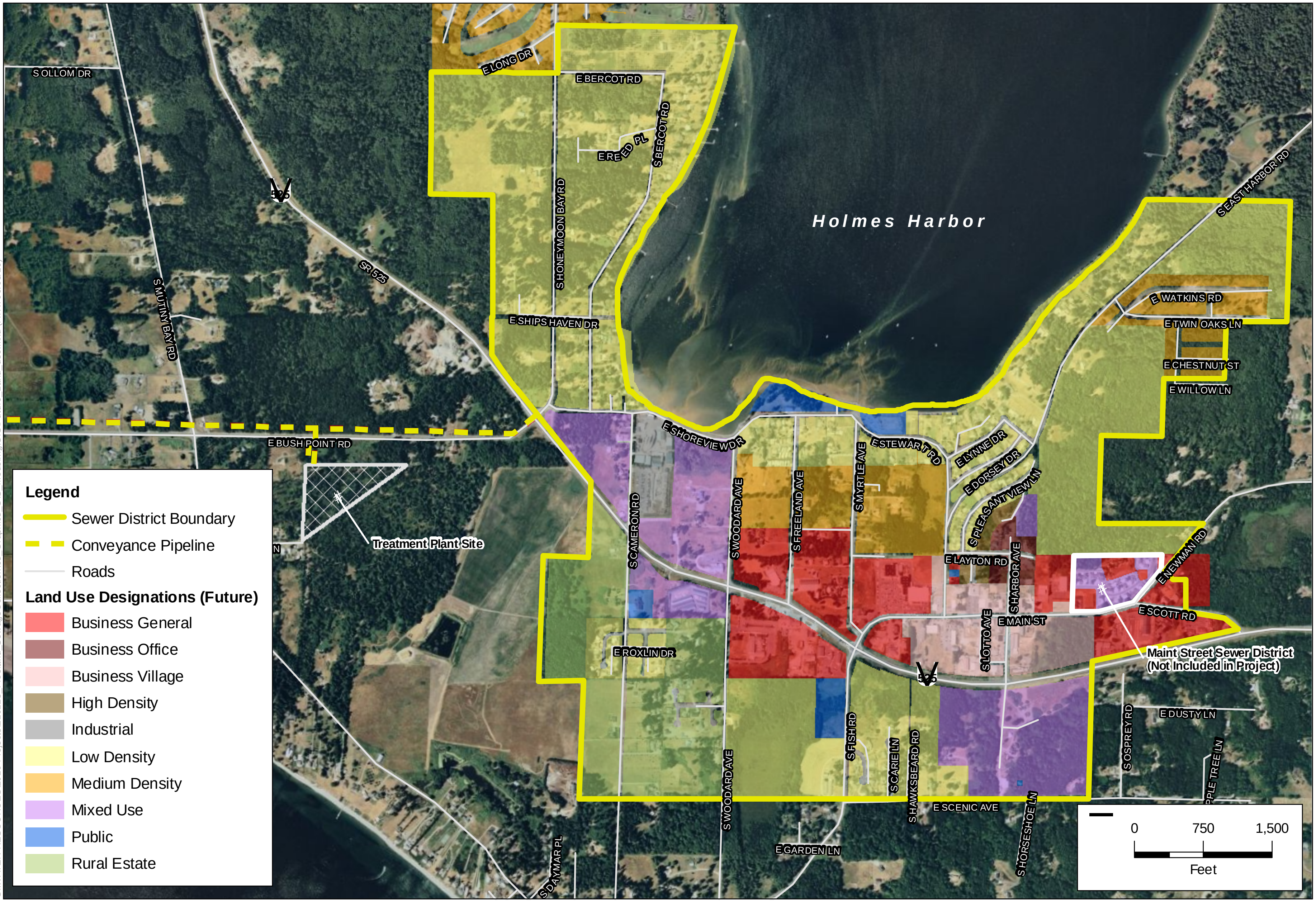

SOURCE: Island County, 2005; Tetra Tech, 2010; Microsoft Live (2007 Approx) (Aerial)

Freeland Sewage Collection . 210123

**Figure 3**

Current Zoning & Action Area

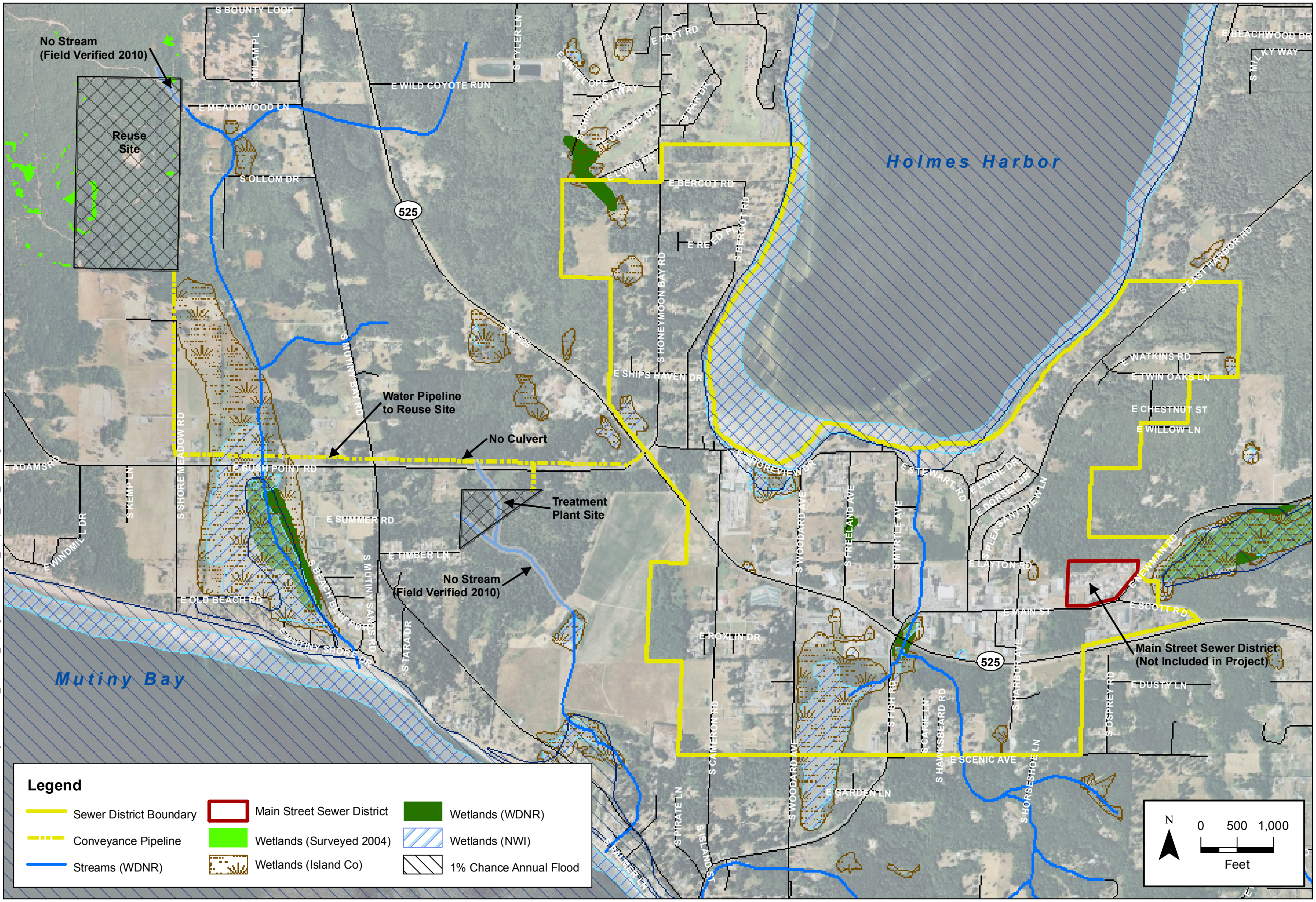
Freeland, Washington




SOURCE: Island County, 2005, 2007; Tetra Tech, 2010; Microsoft Live (2007 Approx) (Aerial)

Freeland Sewage Collection . 210123

**Figure 4**
Future Land Use Designations
Freeland, Washington

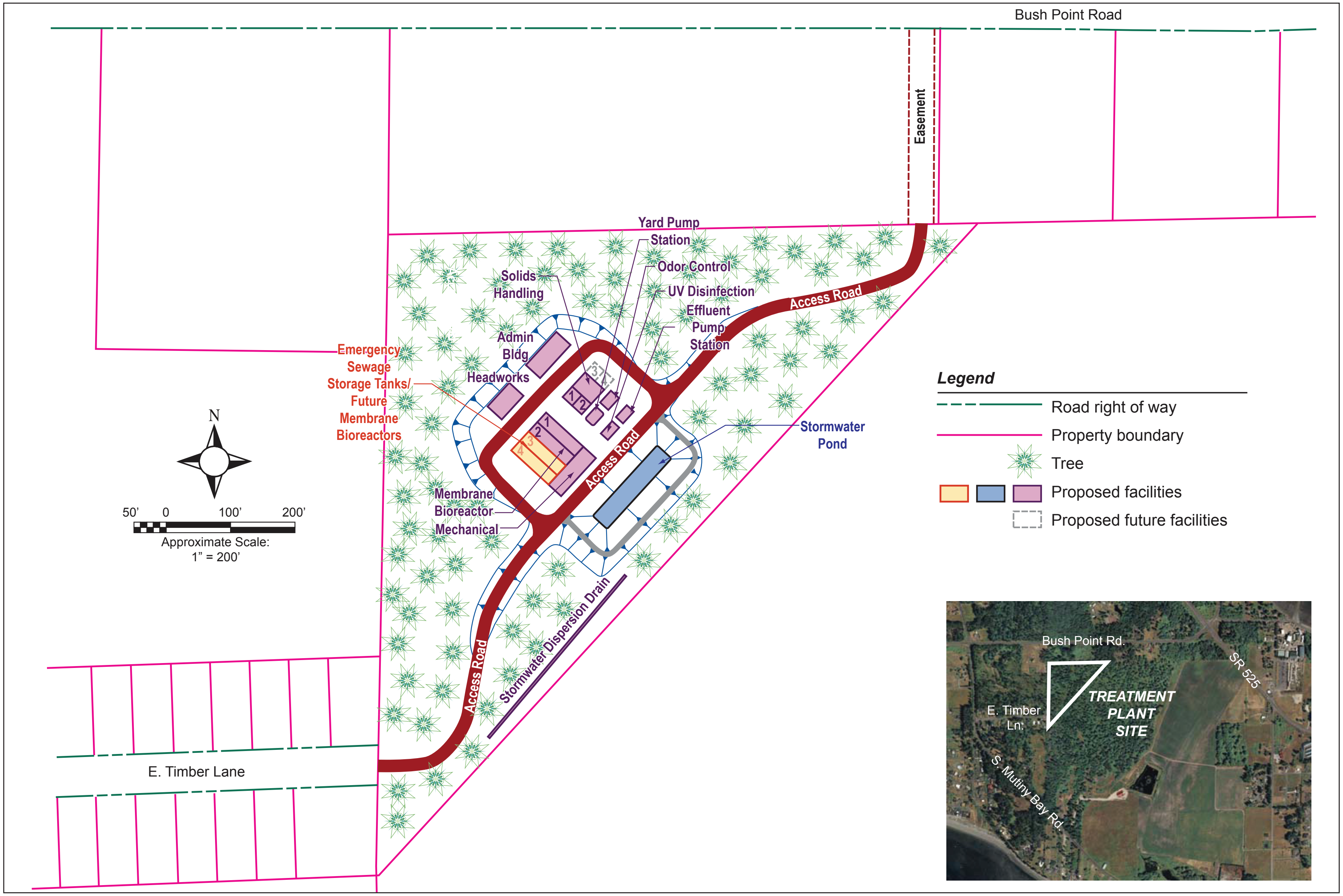



G:\WATER RESOURCES\2010 Projects\210123_Feeland_SewageCollection\05_Graphics_GIS_Modeling\GIS\Wetlands.mxd (ATR: 06/04/10)

SOURCE: FEMA, 1996; Tetra Tech, 2010; WDFW 2010; WDNR, 2008; WSDOT, 2001; Microsoft Virtual Earth, 2009

Freeland Sewage Collection . 210123

**Figure 5**
Wetlands & Streams
Freeland, Washington




FILE NAME: Fig06_SitePlan.ai
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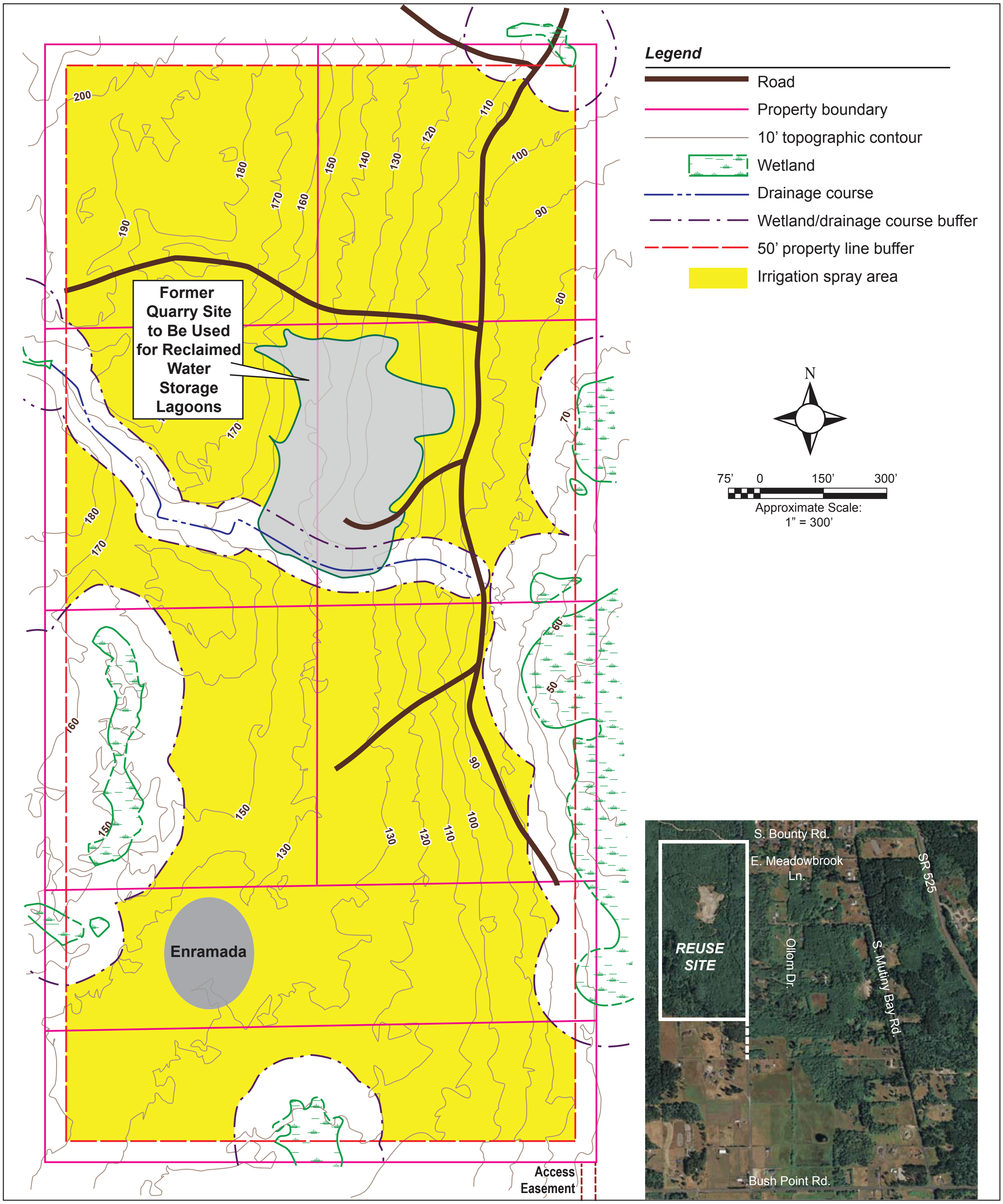
SOURCE: Tetra Tech.

Freeland Sewage Collection . 210123

**Figure 6**
Proposed Treatment Plant Site Plan
Island County, Washington

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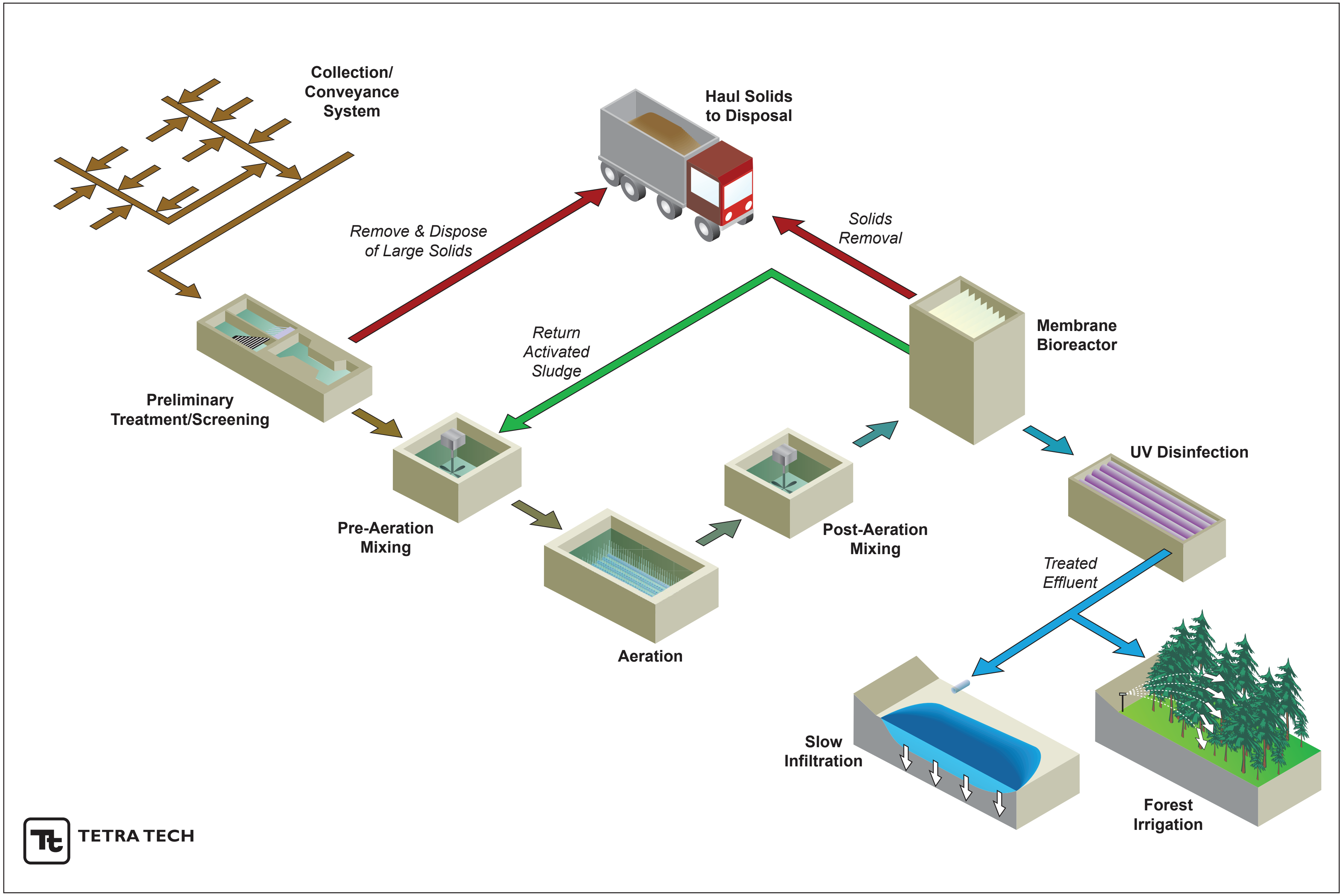
SOURCE: Tetra Tech.

Freeland Sewage Collection . 210123

**Figure 7**
Proposed Reuse Site Plan
Island County, Washington




FILE NAME: Fig08_Process.ai
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SOURCE: Tetra Tech.

Freeland Sewage Collection . 210123

**Figure 8**

Wastewater Treatment Process Schematic
Island County, Washington

**Photos Freeland Sewer Collection and Treatment System**


Photo 1. Estuary at mouth of unnamed stream located north of East Stewart Road in Freeland Park. Looking upstream from outlet culvert.


Photo 2. Outlet of estuary at mouth of unnamed stream.

Photo 3.  Outfall of unnamed stream on the beach below high tide line.

Photo 4. Pocket estuary located south of Shoreview Drive and west of South Woodard Avenue. Looking south from roadway above outlet culvert.

Photo 5. Pocket estuary and Shoreview Drive. Looking west from intersection with South Woodard Avenue.

Photo 6. Outlet of pocket estuary south of Shoreview Drive and west of South Woodard Ave.

Photo 7. Outfall of culvert draining pocket estuary near intersection of Shoreview Drive and South Woodard Avenue.


Photo 8.  Holmes Harbor shoreline adjacent to Shoreview Drive. Looking west.


Photo 9.  Looking west at Shoreview Drive and adjacent shoreline.


Photo 10.  Stormwater control structure for parking lot of Freeland Park.


Photo 11.  Treatment plant site. Looking southwest from northeast corner of property.


Photo 12.  Water reuse site. Typical mixed deciduous/coniferous forest on site.


Photo 13.  Water reuse site. Small wetland near east property boundary.


Photo 14. Abandoned gravel pit located near center of water reuse site.

# APPENDIX A: EFH ASSESSMENT

## EFH Background

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires Federal agencies to consult with NOAA Fisheries on activities that may adversely affect Essential Fish Habitat (EFH). The Pacific Fisheries Management Council (PFMC) has designated EFH for the Pacific salmon fishery, federally managed ground fishes, and coastal pelagic fisheries (NMFS, 1999; PFMC,, 1999).

The EFH designation for the Pacific salmon fishery includes all those streams, lakes, ponds, wetlands, and other water bodies, currently or historically accessible to salmon in Washington, Oregon, Idaho, and California, except above the impassable barriers indentified by PFMC (1999). In estuarine and marine environments, proposed designated EFH extends from near-shore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone offshore of Washington, Oregon, and California north of Point Conception (PFMC, 1999).

The Pacific salmon management unit includes Chinook, coho, and pink salmon. All three species likely use the marine nearshore environment for rearing and migration as juveniles. Only coho salmon adults are known to use the marine waters of Holmes Harbor and the Action Area as none of the streams in WRIA 6 support Chinook or pink salmon.

In addition to Pacific salmon, EFH has been designated for groundfish and coastal pelagic species. EFH for Pacific coast groundfish is generally defined as the aquatic habitat from the mean higher high water line, and the upriver extent of saltwater intrusion in river mouths seaward. The *Coastal Pelagic Species Fishery Management Plan* describes the habitat requirements of five pelagic species: Northern anchovy, Pacific sardine, Pacific (chub) mackerel, jack mackerel and market squid (PFMC, 1998). These four finfish and market squid are treated as a single species complex because of similarities in their life histories and habitat requirements. EFH for coastal pelagic species is generally defined as all marine and estuarine waters from the shoreline offshore above the thermocline.

The west coast groundfish management unit includes 83 species that typically live on or near the bottom of the ocean. Species groups include sharks and skates, rockfishes (55 species), flatfishes (12 species) and ground fishes. Ground fishes such as ling cod, Cabezon, and brown rockfish potentially occur within Holmes Harbor. Coastal pelagics are schooling fish not associated with the ocean bottom that migrate in coastal waters. These fishes are primarily associated with the open ocean and coastal waters (PFMC 1998), and are not likely to occur within the project area.

The Pacific sand lance is an important forage fish for juvenile Chinook salmon. Loss of prey is considered an adverse affect on EFH. Surf smelt, pacific sand lance, and Pacific herring are known to breed along the beaches adjacent to Freeland.

The objective of this EFH assessment is to determine whether or not the proposed action "may adversely affect" designated EFH for relevant commercially, federally-managed fisheries species within the proposed Action Area. It also describes conservation measures proposed to avoid, minimize, or otherwise offset potential adverse effects to designated EFH resulting from the proposed action.

## Description of the Proposed Action

For the purpose of this assessment, the proposed action for the EFH assessment and BA incorporate the same project elements. The Freeland Water and Sewer District proposes to construct a new sewer collection system, a wastewater treatment plant, and reuse area to serve a large portion of the Freeland NMUGA. A detailed description of the proposed action is included in Section 2.0 of the BA. Table A below indicates the federally managed Pacific salmon and life history forms that are potentially present within the project Action Area.

**Table A. Fish species and life-stages with essential fish habitat in the Action Area**

| Salmon Species | Eggs | Larvae | Young Juvenile | Juvenile | Adult | Spawning |
|---|---|---|---|---|---|---|
| Chinook | | | X | X | X | |

## Potential Adverse Effects of the Proposed Action

Potential impacts of the proposed action to ESA listed fish species and habitats are discussed in Section 6.0 of this BA and are expected to be similar for all federally managed Pacific salmon that occur within the Action Area.

*Adverse Effects on Essential Fish Habitat for Salmonids*

The proposed action will include 6 acres of clearing and grading and excavation, which have the potential to contribute to increased sedimentation and turbidity in marine waters. However, the majority of these actions will not occur within 200 feet of the nearshore environment.

Operation of the wastewater treatment plant should have some positive impacts to water quality due to removal of households and businesses within the service area from septic systems. In addition, the reuse of reclaimed water to provide groundwater recharge will also benefit nearby wetlands.

*Adverse Effects on Essential Fish Habitat for Ground Fishes*

No work is proposed within EFH for ground fish. All work will occur in upland areas. However, the proposed action will result in the discharge of highly treated reclaimed water to the local groundwater table through land application into a slow infiltration basin. It is anticipated that the reclaimed water recharged to groundwater will interact with wetlands. Operation of the wastewater treatment plant should have some positive impacts to water quality due to removal of households and businesses within the service area from septic systems. No direct outfall of treated effluent will occur within marine waters. It is not anticipated that the proposed action and its potential for creating degraded water quality conditions will occur due to the highly treated nature of the effluent, additional polishing provided by percolation through subsurface soils, mixing and dilution with groundwater, and the adherence to Class A Reclaimed Water Standards.

*Adverse Effects on Essential Fish Habitat for Coastal Pelagic Species*

No areas of EFH for coastal pelagic species occur within the Action Area.

**Essential Fish Habitat Conservation Measures**

The following measures will be implemented to minimize the potential adverse effects on designated EFH described above:

- No in-water work will occur.
- The proposed action will incorporate TESC measures including silt fencing, straw bales/wattles, mulch, to minimize the potential for sedimentation and turbidity of downstream areas.
- All construction will comply with the Island County and Ecology erosion control standards.
- A spill prevention and pollution control plan will be in place prior to construction.
- All equipment will be staged and stored a minimum of 200 feet from nearshore waters when not in use.
- All cleared areas will be re-vegetated or paved following construction.
- Overall, the proposed action is expected to improve the water quality of Holmes Harbor and marine and estuarine environments adjacent to Freeland by removing use of existing residential and commercial septic systems.
- Stormwater will be treated in accordance with the Department of Ecology's *2005 Stormwater Management Manual for Western Washington* and Island County regulations.

**Conclusion and Effect Determination**

EFH for Pacific salmon and groundfish is present in the project Action Area. The proposed action will require limited work within 200 feet of EFH for federally managed Pacific coast ground fish and Pacific salmon, including Chinook, coho, and pink salmon. The primary concern is with water quality and the discharge of highly treated reclaimed water into the groundwater and its potential effects to EFH. Effluent water quality, resulting from the proposed treatment process at the wastewater treatment plant is expected to improve baseline conditions for chemical contaminants. All other potential effects of the action upon EFH, including vegetation removal, soil disturbing activities, are expected to be short-term effects and will be further minimized by the conservation measures listed above. Therefore, the proposed action *will not adversely effect* EFH for Pacific salmon or Pacific coast ground fish.

# APPENDIX B: SPECIES LISTS

# Endangered Species Act Status of West Coast Salmon & Steelhead

*(Updated July 1, 2009)*

| Species[1] | | | *Current Endangered Species Act Listing Status*[2] | *ESA Listing Actions Under Review* |
|---|---|---|---|---|
| Sockeye Salmon (*Oncorhynchus nerka*) | 1 | Snake River | *Endangered* | |
| | 2 | Ozette Lake | *Threatened* | |
| | 3 | Baker River | *Not Warranted* | |
| | 4 | Okanogan River | *Not Warranted* | |
| | 5 | Lake Wenatchee | *Not Warranted* | |
| | 6 | Quinalt Lake | *Not Warranted* | |
| | 7 | Lake Pleasant | *Not Warranted* | |
| Chinook Salmon (*O. tshawytscha*) | 8 | Sacramento River Winter-run | *Endangered* | |
| | 9 | Upper Columbia River Spring-run | *Endangered* | |
| | 10 | Snake River Spring/Summer-run | *Threatened* | |
| | 11 | Snake River Fall-run | *Threatened* | |
| | 12 | Puget Sound | *Threatened* | |
| | 13 | Lower Columbia River | *Threatened* | |
| | 14 | Upper Willamette River | *Threatened* | |
| | 15 | Central Valley Spring-run | *Threatened* | |
| | 16 | California Coastal | *Threatened* | |
| | 17 | Central Valley Fall and Late Fall-run | *Species of Concern* | |
| | 18 | Upper Klamath-Trinity Rivers | *Not Warranted* | |
| | 19 | Oregon Coast | *Not Warranted* | |
| | 20 | Washington Coast | *Not Warranted* | |
| | 21 | Middle Columbia River spring-run | *Not Warranted* | |
| | 22 | Upper Columbia River summer/fall-run | *Not Warranted* | |
| | 23 | Southern Oregon and Northern California Coast | *Not Warranted* | |
| | 24 | Deschutes River summer/fall-run | *Not Warranted* | |
| Coho Salmon (*O. kisutch*) | 25 | Central California Coast | *Endangered* | |
| | 26 | Southern Oregon/Northern California | *Threatened* | |
| | 27 | Lower Columbia River | *Threatened* | • Critical habitat |
| | 28 | Oregon Coast | *Threatened* | |
| | 29 | Southwest Washington | *Undetermined* | |
| | 30 | Puget Sound/Strait of Georgia | *Species of Concern* | |
| | 31 | Olympic Peninsula | *Not Warranted* | |
| Chum Salmon (*O. keta*) | 32 | Hood Canal Summer-run | *Threatened* | |
| | 33 | Columbia River | *Threatened* | |
| | 34 | Puget Sound/Strait of Georgia | *Not Warranted* | |
| | 35 | Pacific Coast | *Not Warranted* | |
| Steelhead (*O. mykiss*) | 36 | Southern California | *Endangered* | |
| | 37 | Upper Columbia River | *Threatened* | |
| | 38 | Central California Coast | *Threatened* | |
| | 39 | South Central California Coast | *Threatened* | |
| | 40 | Snake River Basin | *Threatened* | |
| | 41 | Lower Columbia River | *Threatened* | |
| | 42 | California Central Valley | *Threatened* | |
| | 43 | Upper Willamette River | *Threatened* | |
| | 44 | Middle Columbia River | *Threatened* | |
| | 45 | Northern California | *Threatened* | |
| | 46 | Oregon Coast | *Species of Concern* | |
| | 47 | Southwest Washington | *Not Warranted* | |
| | 48 | Olympic Peninsula | *Not Warranted* | |
| | 49 | Puget Sound | *Threatened* | • Critical habitat |
| | 50 | Klamath Mountains Province | *Not Warranted* | |
| Pink Salmon (*O. gorbuscha*) | 51 | Even-year | *Not Warranted* | |
| | 52 | Odd-year | *Not Warranted* | |

**1** The ESA defines a "species" to include any distinct population segment of any species of vertebrate fish or wildlife. For Pacific salmon, NOAA Fisheries Service considers an evolutionarily significant unit, or "ESU," a "species" under the ESA. For Pacific steelhead, NOAA Fisheries Service has delineated distinct population segments (DPSs) for consideration as "species" under the ESA.

# ESA-Listed Marine Mammals

Under the jurisdiction of NOAA Fisheries Service that may occur:

**off Washington & Oregon**

- Southern Resident Killer Whale (E), *Orcinus orca*; critical habitat
- Humpback Whale (E), *Megaptera novaeangliae*
- Blue Whale (E), *Balaenoptera musculus*
- Fin Whale (E), *Balaenoptera physalus*
- Sei Whale (E), *Balaenoptera borealis*
- Sperm Whale (E), *Physeter macrocephalus*
- Steller Sea Lion (T), *Eumetopias jubatus*; critical habitat

**in Puget Sound**

- Southern Resident Killer Whale (E), *Orcinus orca*; critical habitat
- Humpback Whale (E), *Megaptera novaeangliae*
- Steller Sea Lion (T), *Eumetopias jubatus*; critical habitat

(E) = Endangered
(T) = Threatened

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*Page last updated: May 27, 2009*

**LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES AND CRITICAL HABITAT; CANDIDATE SPECIES; AND SPECIES OF CONCERN IN ISLAND COUNTY AS PREPARED BY THE U.S. FISH AND WILDLIFE SERVICE WESTERN WASHINGTON FISH AND WILDLIFE OFFICE**

**(Revised November 1, 2007)**

## LISTED

Bull trout (*Salvelinus confluentus*) [marine waters]

Marbled murrelet (*Brachyramphus marmoratus*) [marine waters]

Major concerns that should be addressed in your Biological Assessment of project impacts to listed species include:

1. Level of use of the project area by listed species.
2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project.
3. Impacts from project activities and implementation (e.g., increased noise levels, increased human activity and/or access, loss or degradation of habitat) that may result in disturbance to listed species and/or their avoidance of the project area.

*Castilleja levisecta* (golden paintbrush)

Major concerns that should be addressed in your Biological Assessment of project impacts to listed plant species include:

1. Distribution of taxon in project vicinity.
2. Disturbance (trampling, uprooting, collecting, etc.) of individual plants and loss of habitat.
3. Changes in hydrology where taxon is found.

## DESIGNATED

Critical habitat for bull trout

## PROPOSED

None

**CANDIDATE**

None

**SPECIES OF CONCERN**

Bald eagle (*Haliaeetus leucocephalus*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Northern sea otter (*Enhydra lutris kenyoni*)
Olive-sided flycatcher (*Contopus cooperi*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend=s big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey(*Lampetra ayresi*)
Western toad (*Bufo boreas*)
*Aster curtus* (white-top aster)

# APPENDIX C: LISTED SPECIES LIFE HISTORY INFORMATION

## Coastal – Puget Sound Bull Trout Life History

In 1998, USFWS completed a status review of bull trout, identifying five distinct population segments (DPSs) in the continental U.S. (USFWS, 1998a). The Coastal-Puget Sound bull trout DPS is composed of 34 subpopulations (USFWS, 1998b; USFWS, 1999). USFWS listed bull trout in the Coastal-Puget Sound DPS as threatened under the ESA on November 1, 1999 (USFWS, 1999).

Bull trout have a complex life history that includes a resident form and a migratory form. The individuals of the migratory form may be stream dwelling (fluvial), lake dwelling (adfluvial), or ocean/estuarine dwelling (anadromous) (USFWS, 1998). Resident bull trout spend their entire life cycle within their natal or nearby streams. Fluvial populations spawn in tributary streams where the young rear from two to three years before migrating to a river where they grow to maturity (Knowles and Gumtow, 1999). Adfluvial forms spawn and rear in headwater streams like fluvial fish, but migrate to lakes and reservoirs to mature (KCDNR, 2000). Anadromous bull trout spawn in tributary streams, with major growth and maturation occurring in the marine or estuarine environment (Sims 2000). Individuals of each form may be represented in a single population; however, migratory populations may dominate where migration corridors and subadult rearing habitats are in good condition (USFWS, 1998).

Like many other salmonids, bull trout migrate to fresh water streams to spawn. Spawning begins in late August, peaking in September and October, and ending in November (WDFW, 2000). Bull trout spawn in streams with clean gravel substrates and cold water temperatures (less than 9ºC/48ºF) (USFWS, 1998). Redds are dug by females in water 8 to 24 inches deep, in substrate gravels 0.2 to 2 inches in diameter (Wydoski and Whitney ,1979). Fecundity for bull trout can reach up to 5,000 eggs. Emergence from the streambed typically occurs in late winter and early spring (KCDNR, 2000). Among migratory forms (fluvial, adfluvial, and anadromous), outmigration to larger rivers, lakes and the ocean most commonly occurs at age two, but has been observed for ages of one to three years (FERC, 1999).

Bull trout are opportunistic feeders, consuming fish in the water column and insects on the bottom (WDW, 1991). Low stream temperatures and clean substrates are key features of bull trout habitat. This species is most commonly associated with pristine or only slightly disturbed basins (USFWS, 1998).

The Coastal-Puget Sound DPS of bull trout is unique because it is thought to contain the only anadromous forms of bull trout within the continental U.S. (USFWS, 1998a). The status of the migratory (fluvial, adfluvial, and anadromous) forms is of greatest concern throughout most of their range. The majority of the remaining populations in some areas may be largely composed of resident bull trout (Leary et al., 1991; Williams and Mullan, 1992).

## Puget Sound ESU Chinook Salmon Life History

NMFS completed an ESA status review of Chinook salmon populations from Washington, Oregon, Idaho, and California and defined 15 evolutionarily significant units (ESUs) within the region. Naturally spawned spring, summer/fall, and fall Chinook salmon runs from the Puget Sound ESU were considered likely to become endangered in the foreseeable future (Myers et al., 1998). NMFS issued a ruling in May 1999 listing the Puget Sound ESU as threatened (NMFS, 1999).

Chinook salmon in Hood Canal are included in the Puget Sound Chinook ESU, a population currently listed as threatened under the ESA in Washington State. The life history and habitat requirements of Puget Sound Chinook salmon are described by Myers et al. (1998) and are briefly summarized herein. Chinook salmon have a historic range from the Ventura River in California to Point Hope, Alaska in North America; and from Hokkaido, Japan to Anadyr River in Russia. Chinook require varied habitats during different phases of their life. Peak spawning occurs within the streams between mid-October and mid-November (Haring, 2000). Spawning habitat typically consists of lower mainstem areas with large quantities of gravel and greater flows (Haring, 2000). Upstream migration of adult fall Chinook salmon in south Puget Sound's lowland streams typically extends from mid-September to mid-November. After spending 3 to 4 months rearing in the lowland streams, fry enter the estuaries around May or early June, depending on the spring flows (Haring, 2000). Chinook generally migrate to salt water in the spring and summer. Most Chinook spend from two to four years feeding in the North Pacific before returning to spawn. Chinook salmon die after spawning.

The abundance of Chinook salmon in the Puget Sound ESU has declined substantially from historic levels, and there is concern over the effects of hatchery supplementation on genetic fitness of stocks, as well as severely degraded spawning and rearing habitats throughout the area (Myers et al., 1998). In addition, harvest exploitation rates in excess of 90 percent were estimated to occur on some Puget Sound Chinook salmon stocks. Subsequent to this status review, primary factors contributing to declines in Chinook salmon in the Puget Sound ESU were identified as habitat blockages, hatchery introgression, urbanization, logging, hydropower development, harvests, and flood control (NMFS, 1998).

## Puget Sound DPS Steelhead Life History

On May 7, 2007, NMFS announced the listing of the Puget Sound distinct population segment (DPS) of steelhead as a threatened species under the Endangered Species Act.

The DPS distribution extends from the United States/Canada border and includes all naturally spawned anadromous winter-run and summer-run populations in streams and river basins of the Strait of Juan de Fuca (east of and including the Elwha River), Puget Sound (north to include the Nooksack River), and Hood Canal. Possible factors influencing the depletion of Puget Sound steelhead populations include habitat destruction and fragmentation, inadequate regulatory mechanisms of hatchery practices and land use activities, and potential genetic introgression between hatchery - and natural-origin steelhead.

Steelhead exhibit one of the most complex suite of life history traits of any salmonid species. Steelhead may be anadromous or freshwater residents (which are usually referred to as rainbow or redband trout). Biologically, steelhead can be divided into two reproductive ecotypes: "stream maturing" and "ocean maturing." Stream maturing, or summer run steelhead enter fresh water in a sexually immature condition and require several months to mature and spawn. Ocean maturing, or winter run steelhead enter fresh water with well-developed gonads and spawn shortly after river entry. Steelhead adults typically spawn between December and June. Depending on water temperature, steelhead eggs may incubate in redds for 1.5 to 4 months before hatching. Puget Sound DPS steelhead typically smolt after 2 years, though they may spend 1 to 4 years in fresh water. They then reside in marine waters for typically 2 or 3 years prior to returning to their natal stream to spawn. Steelhead are iteroparous, but rarely spawn more than twice before dying; most that do so are females (64 CFR 222).

## Yelloweye Rockfish

Rockfish comprise a diverse group of marine fishes including 102 species worldwide and 72 species in the northeastern Pacific Ocean (Kendall, 1991). Rockfish are among the most common mid-water and bottom dwelling fish species on the Pacific coast of North America (Love et. al, 2002). Adult rockfish can be one of the most abundant fish species associated with coastal benthic habitats such as kelp forests, rocky reefs, and rocky outcroppings in submarine canyons at depths greater than 980 feet (Yoklavich, 1998). The life history of rockfish is different than most other bony fishes in that rockfish fertilization and embryo development is internal as opposed to external egg fertilization in other species. Females give birth to live larval young, which disperse to open waters extending several hundred miles offshore (Love et. al, 2002).

Yelloweye rockfish primarily inhabit waters between 25 and 474 meters (m) (80 and 1,560 feet) in depth, but are most common between 91 and 180 m (300 to 590 feet) (Love et. al, 2002). Yelloweye rockfish are one of the largest (up to 25 pounds) and longest lived (up to 118 years) species of rockfish (Love, 1996; Love et. al, 2002; OConnell and Funk, 1987).

Yelloweye rockfish sexually mature at about the age of six (Love, 1996). Fertilization generally occurs between September and April, though fertilized individuals may be seen during any month of the year (Wyllie-Echeverria, 1987). Female yelloweye rockfish can produce between 1.2 and 2.7 million eggs, considerably more than most rockfish species (Love et. al, 2002). Although thought to only spawn once per year (MacGregor, 1970), there is evidence from studies in Puget Sound that spawning may occur up to twice per year (Washington et. al, 1978). Estimates of pelagic larval dispersion duration are not available for yelloweye rockfish. Paturition is thought to occur during late spring and early summer (Washington et. al, 1978). Following the pelagic larval stage, juvenile yelloweye rockfish settle primarily in shallow, high relief zones, crevices, and sponge gardens (Love et. al, 1991; Richards et, al, 1985). As the juveniles grow and mature they move to deeper water, but maintain an association with rocky, high relief areas (Carlson and Straty, 1981; Love et. al, 1991; O'Connell and Carlisle, 1993; Richards et. al, 1985). Therefore, yelloweye rockfish are less frequently observed in South Puget Sound and are more commonly found in North Puget Sound (Miller and Borton, 1980) such as the Strait of Georgia and Canadian Gulf Islands, which exhibit more complex, high relief, rocky habitats (Yamanaka et. al, 2006).

Yelloweye rockfish are opportunistic feeders, and due to their larger size, adults can feed on larger prey including smaller yelloweye rockfish and are preyed upon less frequently (Rosenthal et. al, 1982). Typical adult forage includes sand lance, gadids, flatfish, shrimp, crabs and gastropods (Love et. al, 2002; Yamanaka et. al, 2006). Juveniles and larval life history forms of yelloweye rockfish feed on species similar to that of canary rockfish and bocaccio. Predators of yelloweye rockfish include salmon and orcas (Ford et. al, 1998; Love et. al, 2002).

### Canary Rockfish

Canary Rockfish primarily inhabit waters between 50 and 250 meters (m) (160 and 820 feet) in depth, but may be found in waters as deep as 425 m (1,400 feet) (Boehlert, 1980) and can live up to 84 years (Drake et. al, 2008). Canary rockfish were at one time considered fairly common in the greater Puget Sound area (Holmberg, 1967).

Canary rockfish spawn once per year (Guillemot, 1985). Female canary rockfish can produce between 280,000 and 1.9 million eggs per year with larger females producing even more. Fertilization can occur as early as September off central California (Lea, 1999), but peaks in December (Phillips, 1960; Wyllie-Echeverria, 1987). Birth or parturition generally occurs between January and April with the peak occurring in April (Phillips, 1960). Parturition off the Washington and Oregon coasts occurs between September and March, with peaks in December and January (Barss, 1989; Wyllie-Echeverria, 1987). In British Columbia, parturition occurs a little later than other areas with a peak in February (Hart, 1973; Westrheim, 1975). Canary rockfish larvae are readily dispersed with a pelagic larval duration of approximately 116 days (Shanks and Eckert, 2005).

Canary rockfish larvae feed primarily on plankton including crustacean larvae, invertebrate eggs, and copepods (Moser 1981; Love, 2002). Juveniles feed primarily on zooplankton such as harpacticoids (an order of copepods), barnacle cyprids (final larval stage), and euphasiid eggs and larvae. Predators of juvenile canary rockfish include other fishes (cabezon, lingcod, other rockfishes, salmon), birds, and porpoises (Ainley, 1981; Love, 1991; Miller, 1973; Morejohn, 1978; Roberts, 1979). Adult canary rockfish are planktivores/carnivore, foraging on euphasiids and other crustaceans and small fish (Cailliet, 2000; Love, 2002). Predators of adult canary rockfish include yelloweye rockfish, salmon, sharks, dolphins, seals, and possibly river otters (Antonelis Jr.. 1980; Merkel, 1957; Morejohn, 1978; Rosenthal, 1982; Stevens, 1983).

Canary rockfish are generally associated with course and rocky habitats that occur throughout the Puget Sound basin (Miller and Borton, 1980) and are broadly distributed throughout the Strait of Georgia (COSEWIC, 2007).

### Bocaccio Rockfish

Bocaccio primarily inhabits waters between 50 and 250 meters (m) (160 and 820 feet) in depth, but may be found in waters as deep as 475 m (1,560 feet) (Orr et. al, 2000) and are suspected to live as long as 54 years (Drake et. al, 2008). Bocaccio rockfish were at one time considered fairly common in the greater Puget Sound area (Holmberg, 1967). In the Georgia Basin and based upon available information, bocaccio are generally not associated with areas containing hard substrates. This may be due to their pelagic behavior or availability or prey items.

Reproduction (copulation and fertilization) generally occurs in the fall between August and November. Female canary rockfish can produce 20,000 to over 2 million eggs, which is more than many other rockfish species (Love et. al, 2002). Bocaccio larvae are readily dispersed with a pelagic larval duration of approximately 155 days (Shanks and Eckert, 2005). Larvae and pelagic juveniles tend to be associated with floating kelp mats and are therefore generally near the surface. Most boccacio remain pelagic between 3.5 And 5.5 months before settling to shallower areas. Several weeks after settlement, juveniles move to deeper water 18-30 m (60-100 feet) where they are found on rock reefs (Carr, 1983; Feder, 1974; Johnson, 2006; Love, 2008). As bocaccio mature into adults, generally between four and six years (MBC, 1987), they move into deeper water habitats (typically found at least 98 feet off the bottom) and associated hard substrata (Love et. al, 2002). In the Georgia Basin, and based upon available information, bocaccio are generally not associated with areas containing hard substrates. This may be due to their pelagic behavior or availability or prey items (74 Federal Register 77). Boccacio are also known to stray into mud flats (Love et. al, 2002).

Bocaccio larvae feed primarily on plankton larval krill, diatoms, and dinoflagellates. Pelagic juveniles are opportunistic, feeding on fish larvae, copepods, krill, and other prey. Larger juveniles and adults are generally picivorous, eating other rockfish, sablefish, hake, anchovies, lanternfish, and squid. Predators of juvenile bocaccio include Chinook salmon, terns, and harbor seals (Love et. al, 2002). The primary predators of adult bocaccio are marine mammals (COSEWIC, 2002).

### Southern Resident Killer Whale

Southern Resident killer whales prey on many species of fish but predominantly feed on salmon (Wiles, 2004). Transient killer whales, which occasionally enter Puget Sound, prey primarily on marine mammals, primarily harbor seals in Washington. There are no known predators of killer whales.

Male killer whales average about 26 feet (8 m) in length; females are about 23 feet (7 m) in length (Heyning and Dahlheim, 1988). Males live about 50 to 60 years and females 80 to 90 years (Reeves et al., 2002). Females reach sexual maturity when they are about 16 feet (5 m) in length and give birth every 3 to 8 years after that (Heyning and Dahlheim, 1988). Calves are about 6.5 feet (2 m) long when born and, although weaned at about 12 months, they remain closely tied to their mother until they are about 2 years old. There is no specific breeding season for killer whales, although most breeding behavior in Puget Sound is observed in summer and fall (Osborne et al.,1988).

The Southern Resident Population consists of three pods totaling about 88 animals (Center for Whale Research, 2010). They range widely between California and the Queen Charlotte Islands, but spend most of their time, especially from spring to fall, in northern Puget Sound, Georgia Strait, and the Strait of Juan de Fuca (Carretta et al., 2004). Transient whales often enter small inlets and shallow areas while hunting for harbor seals (Wiles, 2004). Over 300 transient killer whales make up a distinct population that lives in the waters between California and southeast Alaska. Transient sightings in the Georgia Basin are centered on southeastern Vancouver Island, the San Juan Islands, and the southern edge of the Gulf Islands, with less activity occurring in Puget Sound and elsewhere in the Strait of Juan de Fuca and Georgia Strait (Olson, 1998).

## Marbled Murrelet

The Marbled murrelet was listed by the USFWS in 1992 as a federally threatened species in Washington, Oregon, and California. Marbled murrelet critical habitat was designated in May 1996 in 50 CFR Part 17.11. Marbled murrelets are found from the Aleutian Islands of Alaska south to central California, and individual birds may winter as far south as southern California. In Washington, marbled murrelets are year-round residents on coastal waters. Murrelets feed within 500 feet (152 m) of the shore (Ehrlich et al., 1988) to 1.2 miles (1.93 km) from the shore (WDW, 1991), at depths of less than 100 feet (30.5 m). Their preferred prey includes small fish and crustaceans (WDW, 1991; Ehrlich et al., 1988). However, nestlings are usually fed larger second year fish (USFWS, 1997).

Historical data are limited, but murrelets are currently rare and uncommon in areas where they were common or abundant in the early 1900s, especially along the southern coast of Washington, northern coast of Oregon, and coast of California south of Humboldt County (Sealy and Carter, 1984; Marshall, 1988; Carter and Erickson, 1992; Nelson et al., 1992; and Ralph, 1994). An estimate for the number of individuals in Washington is 5,000 to 6,000 birds (Speich et al., 1992 and Speich and Wahl, 1995). The breeding population in Washington is estimated to be 1,900 to 3,500 pairs (Speich et al., 1992).

Marbled murrelets nest and roost in mature and old growth forest areas of western Washington (WDW, 1991). The nesting period extends from April 1 to September 15. Although they do not nest in colonies like many other seabirds, they may nest in clusters, and tend to nest in the same forest stand in successive years (USFWS, 1997). Nest trees are typically greater than 32 inches (81 cm) (dbh). Murrelets prefer large flat conifer branches, often covered with moss (WDW, 1991). These branches can range from four to 25 inches (10 to 63 cm) in diameter. Nesting branches are usually located in the upper third of the tree canopy layer (USFWS, 1997).

Marbled murrelet population decline has been attributed primarily to the loss and fragmentation of old-growth nesting habitat caused by logging and development (Ralph and Miller 1995). It is believed that forest fragmentation may be making nests near forest edges vulnerable to predation by other birds, such as jays, crows, ravens, and great-horned owls. In addition, this species is vulnerable to fishing nets and oil spills (Marshall, 1988).

The USFWS conducted a 5-year review of marbled murrelet status in 2003 (USFWS, 2004b). Based on available information in the Washington, Oregon, and California, the status review estimated there are currently 2,223,048 acres of suitable murrelet nesting habitat. The status review found that the marbled murrelet population is not stable through reproduction due to low fecundity levels across the 3-state area, as determined through nest success values (i.e., the number of fledglings per breeding pair of murrelets per year). In general, both radio telemetry and at-sea survey methods indicate that murrelet breeding success appears to decline from north to south. Predation has consistently been the most significant cause of nest failure. Murrelets appear to select platforms that provide protection from predation (USFWS, 2006). The factors affecting rates of predation on murrelet nests are not fully clear, yet key elements seem to be proximity to humans, abundance of avian predators, and proximity and type of forest edge to the nest. The status review did not find that a change in classification from threatened was warranted.

# APPENDIX D: PFC ASSESSMENT DETAILS

## Properly Functioning Conditions

Ideally, reliable scientific information would exist for all populations of listed species that would allow the effects of an action to be quantified in terms of population impacts. As stated in an August 1999 supplement to NOAA Fisheries' guidance document titled *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NMFS, 1999), in the absence of population-specific information, an assessment must define the biological requirements of a listed fish species in terms of properly functioning conditions (PFC). PFCs are described as the sustained presence of natural habitat-forming processes necessary for the long-term survival of the species through the full range of environmental variation (NMFS, 1999). PFC elements are typically identified as being either:

1. "properly functioning," meaning that an element can support healthy populations of fish;
2. "at risk," meaning that functionality is maintained but there is a likelihood that further degradation would result in a negative response by fish populations; or
3. "not properly functioning," meaning that there are known limitations to those parameters necessary to support healthy salmonid populations.

Indicators of PFC vary in different landscapes based on unique physiographic and geologic features (NMFS, 1999). Since aquatic habitats are inherently dynamic, PFC's are defined by the persistence of natural processes that maintain habitat productivity at a level sufficient to ensure long-term survival, and are not necessarily defined by absolute thresholds and parameters (NMFS, 1999).

Both NMFS and the USFWS have prepared guidance on the evaluation of PFC for salmonid fish in montane stream systems. A pathway-indicator matrix has not been published by the Services for marine or estuarine environments; however, marine and estuarine habitat requirements for salmonid stocks have been described by many authors (Fresh et al., 1981; Healy, 1982; Levy and Northcote, 1982; Shepherd, 1981; Weitkamp et al., 2000). Table 3 summarizes indicators for PFC elements that have been adapted from the available literature and provide the basis for the evaluation of PFC for this assessment.

**Table 2. PFC Indicators for Marine Habitats**

| Indicators | Summary | Pertinent Studies |
|---|---|---|
| **Water Quality** | | |
| Turbidity | Concentrations between 300 mg/l and 4,000 mg/l are at risk. Concentrations above 4,000 mg/l are not properly functioning. | Nightingale and Simenstad (2001a); Nightingale and Simenstad (2001b); Healy (1991); Beauchamp et al. (1983); Sandercock (1991) |
| Dissolved Oxygen | Concentrations below 4.0 mg/l are not properly functioning. Dissolved oxygen concentrations between 4.0 mg/l and 7.0 mg/l constitute at risk habitat. | Ecology (2004); Reiser and Bjorn (1979); Beauchamp et al. (1983) |
| Water Contamination | Section 303(d) of the Clean Water Act (CWA) listed water bodies are defined as not properly functioning for the purpose of this assessment. | Ecology (2008) |
| Sediment Contamination | Sediment contaminant concentrations established by Ecology are determined at risk. Contaminant levels at or above toxic levels are not properly functioning. | Ecology (1990); Chapter 173-204 WAC |
| **Physical Habitat** | | |
| Substrate/ Armoring | Shorelines with minor armoring by riprap and low-density shoreline development are considered at risk. Shoreline areas containing extensive armoring are not properly functioning. | Nightingale and Simenstad (2001a); Nightingale and Simenstad (2001b); Fresh et al. (1981); KCDNR (2001); Thom et al. (1994); Prinslow et al. (1979); Williams and Thom (2001) |
| Depth/Slope | Habitats that have been altered by wharves, bulkheads, and nearshore dredging to have steep side slopes, drop-offs, and nearshore deep-water habitats are considered not properly functioning. Areas that have naturally occurring steep slopes with narrow nearshore habitat areas are defined as at risk. | KCDNR (2001) |
| Tideland Condition | Habitat that has experienced loss of tidal areas through filling is considered not properly functioning. Areas where tidelands are fragmented by development are at risk. | Beechie and Wasserman (1994); Williams and Thom (2001); Shepard (1981) |
| Marsh Prevalence and Complexity | Habitat containing historical marshland that has been lost by filling and/or degradation is considered not properly functioning. Areas where marshes are fragmented by development are at risk. | Shepherd (1981); Simenstad et al. (1982); Healy (1991) |

| Indicators | Summary | Pertinent Studies |
|---|---|---|
| Refugia | At risk habitat consists of the presence of refugia insufficient in size, number and connectivity. A not properly functioning habitat condition exists when adequate habitat refugia do not exist. | NOAA Fisheries (1996) |
| Physical Barriers | An at-risk habitat is considered to contain a minimal amount and minimum sized overwater structures. A not properly functioning habitat is defined as habitat that contains a large number of structures along a shoreline that are likely a significant barrier to juvenile salmon. | Nightingale and Simenstad (2001b); Weitkamp et al. (2000) |
| Current Patterns | Areas that contain minor alterations are determined to be at risk. Areas where shoreline modifications and/or dredging are prevalent are determined to be not properly functioning. | Nightingale and Simenstad (2001b) |
| **Physical Habitat** | | |
| Salt/Fresh Water Mixing Patterns and Locations | An altered condition that changes the natural surface hydrology is an at-risk habitat. A not properly functioning habitat contains significant impervious surface or a high level of modification of estuarine habitats. | U.S. Navy (2002) |
| **Biological Habitat** | | |
| Benthic Prey Availability | Sediments that have an impaired ability to support benthic invertebrates are not properly functioning. Sediments containing a benthic community that was altered from its natural state are considered at risk. | Healy (1991); Bax et al. (1978)<br>Kjelson et al. (1982); Fresh et al. (1981) |
| Forage Fish Community | An at risk habitat has limited forage fish resources or habitat. Not properly functioning habitats have depleted forage fish resources or habitat. | Myers et al. (1998); USFWS (1998) |
| Aquatic Vegetation | If an area historically contained vegetation but the vegetation is degraded by disturbance then the habitat is considered at risk. Habitat without previously occurring vegetation as a result of shoreline development is considered not properly functioning. | Shafer (2002); Nightingale and Simenstad (2001a); Nightingale and Simenstad (2001b); Simenstad (2000); Goforth et al. (1979); Garono et al. (2002); Peeling and Goforth (1975) |
| Exotic Species | Habitat containing exotics that may compete with, or prey on, salmonids, are considered not properly functioning. If exotic species are present, but do not present any adverse effects, an at risk condition is assumed. | U.S. Navy (2001) |

**Environmental Baseline**

Existing environmental conditions in the Holmes Harbor Action Area are evaluated according to the criteria established in the matrix of pathways and indicators outlined above. A rating of properly functioning, at risk or not properly functioning is assigned to each estuarine habitat indicator for the Holmes Harbor Action Area. The ratings are presented in Table 2 and summarized below by principal indicator (Water Quality, Physical Habitat, Biological Habitat). The ratings are based upon data from the Washington Department of Ecology's Marine Waters Monitoring Program and from site visits.

**Table 3. Matrix of Pathways and Indicators for Salmonids in Holmes Harbor**

| Pathways and Indicators | Environmental Baseline | | | | Effects of the Action(s) | | |
|---|---|---|---|---|---|---|---|
| | Properly Functioning | At Risk | Not Properly Functioning | Unknown | Restore | Maintain | Degrade |
| **Water Quality** | | | | | | | |
| Turbidity | | | | X | | X | |
| Dissolved Oxygen | | X | | | X | | |
| Water Contamination | | X | | | X | | |
| Sediment Contamination | | | | X | | X | |
| **Physical Habitat** | | | | | | | |
| Substrate/Armoring | | X | | | | X | |
| Depth/Slope | X | | | | | X | |
| Tideland Condition | X | | | | | X | |
| Marsh Prevalence and Complexity | | X | | | | X | |
| Refugia | X | | | | | X | |
| Physical Barriers | | X | | | | X | |
| Current Patterns | X | | | | | X | |
| Salt/Fresh Water Mixing Patterns and Locations | | X | | | | X | |
| **Biological Habitat** | | | | | | | |
| Benthic Prey Availability | X | | | | | X | |
| Forage Fish Community | X | | | | | X | |
| Aquatic Vegetation | | X | | | | X | |
| Exotic Species | | | | X | | X | |

### Water Quality Indicators

The Department of Ecology Marine Water Quality Monitoring Program has monitored water quality periodically in Holmes Harbor. Their 1995-96 data indicate that oxygen levels in the harbor fell below 5 mg/l during seven of the monthly sampling occasions. Holmes Harbor exhibits persistent stratification throughout the year. In 2006, the Washington Department of Health, Office of Shellfish and Water Protection completed a shoreline survey of Holmes Harbor. After the survey was complete, approximately 98 acres of beach, including all of Freeland Park, in south Holmes Harbor beaches were closed to shellfish harvesting and other recreational activities due to elevated bacteria levels (Health, 2006). In 2008, the waters of south Holmes Harbor were opened for recreational activities such as swimming, but shellfish harvests remained prohibited due to the presence of fecal coliform bacteria (Island County, 2007).

### Physical Habitat Indicators

The Holmes Harbor shoreline has moderate armoring to protect infrastructure and industrial buildings including concrete and wood bulkheads, concrete and stone groins, boat launch platforms, and wooden piers (Island County, MRC). Harborview Drive runs adjacent to portions of Holmes Harbor and has two culverts connecting pocket estuaries to the tidal flats. At the south end of Holmes Harbor, flooding occurs when large volumes of storm water runoff naturally drain to the low elevation estuary and is prevented from draining into Holmes Harbor during high tides. The relatively small diameter culvert limits the transfer of aquatic waters into the marine environment (WSCC, 2000).

### Biological Habitat Indicators

Several species of forage fish are known to use Holmes Harbor for spawning habitat, including surf smelt (*Hypomesus pretiosus),* sand lance (*Ammodytes hexapterus*) and Pacific herring (*Clupea pallasii pallasii*) (WSCC, 2000). Extensive eelgrass beds can be found along Holmes Harbor; however, in 2008, Freeland residents noticed that the percent of eelgrass coverage appears to be reduced compared to historical norms.