Draft

PORT HADLOCK UGA SEWER SYSTEM

Biological Assessment and Essential Fish Habitat Assessment

Prepared for:

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Washington State Department of Ecology
in Coordination with
U.S. Environmental Protection Agency, Region 10

ESA Adolfson

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1.0 INTRODUCTION

Jefferson County (County) is proposing to construct a sewer collection system, wastewater treatment plant, and reuse system to serve the Irondale and Port Hadlock sewer service area. As part of its planning activities under the Washington State Growth Management Act (GMA), Jefferson County has designated the communities of Irondale and Port Hadlock as an unincorporated Urban Growth Area (UGA), with a sewer service area encompassing the entire UGA boundary. This will be referenced as the Port Hadlock Sewer Planning Area or PHSPA. The Irondale/Port Hadlock UGA is sized to accommodate approximately 17% of the total projected countywide growth for the planning period 2004-2024. The UGA is an unincorporated area approximately 6 miles south of the City of Port Townsend, Washington, as shown in Figure 1. The community is primarily residential, with commercial and retail businesses on the main arterials-Rhody Drive (SR 19), Ness' Corner Road (SR 116), and Chimacum Road. Chimacum Road is seen in Photo 1. Currently, the PHSPA is served by public water, but no sewer facilities exist. On-site septic tanks and drain fields serve the existing dwellings and commercial establishments.

The only incorporated urban area in Jefferson County is Port Townsend. As a designated UGA, the Irondale/Port Hadlock area can accommodate higher planned densities, provided there are urban sewer services which relieve properties of the space requirements 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 PHSPA. The project has documentable benefits for affordable housing and economic development. Further information on the need for the project has been documented in the *Jefferson County Port Hadlock UGA Sewer Facility Plan, Volume I of II* (Tetra Tech 2008a) and the *Jefferson County Port Hadlock UGA Sewer Facility Plan Environmental Report and SEPA Checklist*, *Volume II of II* (Tetra Tech 2008b).

1.1 Project Information

Project Name:	Port Hadlock Wastewater System
State:	Washington
County:	Jefferson
Location:	Township 29 North, Range 01 West, Sections 1, 2, 3, 11 and 12 W.M.; Township 30 North, Range 01 West, Sections 34 and 35 W.M.
Proponent:	Jefferson County Department of Community Development 621 Sheridan Street Port Townsend, WA 98368 Attn: Joel M. Peterson
Preparer:	ESA Adolfson 5309 Shilshole Avenue NW, Suite 200 Seattle, Washington 98107
Preparer Contact:	Steve Krueger Phone: (206) 789-9658

1.2 Background

The *Jefferson County Port Hadlock UGA Sewer Facility Plan, Volume I of II* (Tetra Tech 2008) 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 PHSPA 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: Conventional Gravity Collection with pump stations;
2. Effluent Reuse: Land application and groundwater recharge via surface percolation of treated effluent into a rapid rate infiltration basin;
3. Wastewater Treatment: Membrane bioreactor (MBR) system (produces reliable Class A reclaimed water);
4. Disinfection: Ultraviolet (UV)
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 design phase. Additional details will be developed as the design progresses, including final site selection and treatment methodology details (Figure 4).

1.2.1 Conventional Gravity Sewer

Conventional gravity sewers use a series of sloped pipes between manholes to collect and convey raw wastewater from the sewer connection to the wastewater treatment plant. The pipelines are a minimum of 8-inch diameter, are sloped at a minimum slope of 0.004 feet/foot, and are typically laid between 8 feet and 20 feet deep. Wastewater is collected within sewer mains that are sloped toward the wastewater treatment plant or to a local pump station.

Each service connection to the wastewater treatment plant is achieved through a sloped pipe (service lateral) from the building’s drain to the gravity sewer main in the street. The construction of the service lateral is typically the responsibility of the property owner from the property line to the building drain. Within the street right-of-way, construction of the service connection from the sewer main to the property line is typically the responsibility of the sewer agency. This type of collection system does not require any access and maintenance easements since maintenance of the service lateral on private property is the responsibility of the property owner.

In some instances, parts of the service area are located in basins requiring the construction of a pump station to locally collect the wastewater and pump it out of the basin toward the wastewater treatment plant. It is through a series of gravity collection lines and pump stations that wastewater within the service area is collected and conveyed to the wastewater treatment plant.

A key strategy in the design of a gravity collection system is to use the contours of the existing terrain to maximize efficiency in the construction of pipelines toward the wastewater treatment plant. An efficient design strategy involves sewers excavated as shallow as possible while minimizing the number of pump stations. Additionally, it is preferable to construct sewers within existing street right-of-way for ease of maintenance access and to minimize permit and easement acquisition.

1.2.2 Groundwater Recharge by Surface Percolation – Rapid Rate Infiltration

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, usually 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.

Groundwater recharge by surface percolation using rapid rate infiltration involves applying reclaimed water to the land at a rate which is not necessarily controlled. The reclaimed water infiltrates into the earth as fast as the soils can accept it. Reclaimed water infiltrates through the soil to the groundwater below. Typically and simply stated, treatment plant effluent is introduced into a "leaky bottom" pond where it infiltrates into the earth. The level of wastewater treatment required for rapid rate infiltration is Class A reclaimed water.

1.2.3 Membrane Bioreactor

Water reuse systems must meet treatment standards, as defined by the Departments of Health and Ecology in the *Water Reclamation and Reuse Standards*. 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 project proponent 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. Chemical coagulation is likely not required for MBRs to meet Class A reclaimed water standards since sludge settleability is not a consideration.

In addition to aeration air for the activated sludge process, coarse bubble diffused air is used to scour the membranes and prevent excessive fouling. Significant quantities of air are required for membrane scouring, usually equaling or exceeding the requirement for the activated sludge process. This can result in significant operating costs, since aeration air production is often the most energy intensive component of wastewater treatment plant operation. Depending on the type of membranes use, backpulsing with chemical cleansing agents may be required to remove accumulated solids within the membrane pores. Because the membranes provide a positive barrier to solids, the activated sludge system can operate at very high mixed-liquor suspended solids (MLSS) concentrations, on the order of 10,000 to 15,000 mg/L. Typical extended aeration activated sludge plants operate at MLSS concentrations between 2,000 and 4,000 mg/L. The high MLSS concentrations mean that the plant can run at a low hydraulic retention time and a high solids retention time, significantly reducing the size of the aeration basin compared to typical extended aeration activated sludge plants.

Three types of membranes are available: hollow fiber units composed of a membrane wrapped around a reinforced hollow fiber tube; tubular systems where the membranes are cast on the inside of a support tube and then placed in a pressure vessel; and flat membrane sheets on top of plastic panels for reinforcement. In any case, wastewater is filtered through the membrane, and filtered effluent passes through the membrane onto the next step of the treatment process.

Settleability is not a consideration with this process due to the membrane's functional barrier to solids. This is a significant advantage over typical activated sludge plants, where the activated sludge biology must be monitored to encourage development of microorganisms that settle quickly in a clarifier basin.

1.2.4 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 use for commercial applications where a reuse ("purple pipe") distribution system is employed. 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. The proposed Port Hadlock system does not include commercial use. Rather, it proposes groundwater augmentation through rapid rate infiltration. Therefore, chlorination is not proposed.

1.2.5 Solids Handling and Reuse

Solids are removed from the wastewater treatment system by removing a calculated volume of mixed liquor or waste activated sludge from the biological treatment process. This waste activated sludge (WAS) is then stored on site in a storage tank or basin. The WAS may be decanted within the tank depending upon the volume to be wasted and the solids concentration of the WAS. During the decanting process, aeration will not be provided in order to provide a quiescent environment where the heavier solids are allowed to settle to the bottom. The lack of aeration will create odor issues that need to be addressed. The heavier solids, or subnatant are then separated from the lighter supernatant by decanting.

Providing a decanting system is optional for an MBR process since the system operates at high mixed liquor- suspended-solids concentrations. Solids can be pulled off the process and be at 1 to

1.5 percent solids without decanting. However, solids storage is essential during periods of inclement weather when truck access for hauling solids off site may be limited.

The solids storage and decanting process requires only minimal equipment, labor and energy costs and can result in a remarkably improved subnatant with perhaps as high as a 50 percent volume reduction. The reduction in hauling and handling costs can be significant. Decanting and storage typically involves a holding tank for decanted solids, minor piping and pumps, and some provisions for odor control. Decanting and storage are accomplished in the same tank.

1.2.6 Contracted Haul and Reuse of Biosolids

A contractor will provide transportation, treatment and reuse of the wastewater solids. The contractor would load solids from the storage tank into a tanker truck and haul the material off site for treatment and reuse.

1.3 Federal Nexus

The County 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 County is in the process of securing funding for the proposed Port Hadlock Wastewater System, which is the federal nexus for this project. The final source of funding will determine who the federal action agency will be, but it is anticipated that it will either be the United States Department of Agriculture (USDA) or the United States Environmental Protection Agency (EPA).

This BA evaluates the potential effects of the proposed Port Hadlock UGA Sewer 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, pump stations, and effluent reuse field, and operational impacts with respect to the discharge of highly treated effluent to groundwater, which interacts with the surface waters of Chimacum Creek. The proposed action will be constructed, operated, and maintained by Jefferson County.

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.

1.4 Consultation History

No communications with the Services have occurred prior to preparation of this document, which would have included attendance at a pre-BA meeting. All species listings were obtained from both agencies websites and are included in Appendix B.

2.0 PROJECT DESCRIPTION

2.1 Project Location

The PHSPA is approximately bordered by Port Townsend Bay on the east, Elkins and Lopeman Roads on the south, Chimacum Creek on the north, and State Route (SR) 19 on the west. According to the Jefferson County Comprehensive Plan, the UGA sewer service area boundary encompasses approximately 1,320 acres (Figure 2). In addition to the UGA sewer service area boundary, the planning area also includes potential sites for the proposed treatment plant and reuse field some of which are located outside the UGA boundary (Figure 4). The location for the treatment plant and reuse area have not been chosen at this time, but a minimum of 16 acres will be required. Based on the year 2000 Census, the estimated base year resident population is 2,553. An additional 2,353 people are expected to be accommodated in the UGA by the end of the 20-year planning period in 2024. This projected 2024 population of 4,906 people is based on a population capture rate of 17% of the total projected countywide population growth. Urban capital facilities are needed to appropriately plan for the development of the Irondale/Port Hadlock UGA (Jefferson County, 2004). The proposed wastewater treatment plant will be located east of Chimacum Creek in the general vicinity of Chimacum Road.

Ground elevations in the Port Hadlock area range from 0 to about 130 feet above sea level. The terrain gently slopes across most of the PHSPA, with some areas near the coastline having slopes greater than15 percent. Most of the study area is underlain by Quaternary Vashon Recessional Outwash, which generally consists of loose, clean, stratified sands and gravels (Simonds et al. 2004; Grimstad 1981). There is some Quaternary Vashon Till in the southern portion of the study area, west of the southern cove in Port Townsend Bay. Vashon till deposits generally consist of a compact unsorted mixture of clay to boulder size particles. Occasional sand and gravel lenses may be present. A geologic map provided by Jefferson County (1995) also indicates Vashon Recessional Outwash over much of the study area, with a large area of Vashon Lacustrine Deposits in the area bounded by the northern reach and mouth of Chimacum Creek and the coastline (Jefferson County 1995). Lacustrine deposits are typically fine-grained (silt and clay) lake-bottom deposits

The existing land use pattern is characterized by commercial development concentrated along the major highway corridors of SR 19 (Rhody Drive), SR 116 (Ness' Corner Road), and Chimacum Road; creating a core commercial zone at Chimacum Road and SR 116 and a secondary commercial zone along SR 19. 286 acres are zoned for commercial development in the UGA. Over two-thirds of the gross acres in the UGA are zoned for 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 Port Hadlock and northward into Irondale. Multi-family dwellings are located throughout the Port Hadlock area, with the highest unit-density multifamily dwellings primarily at the fringe of the Port Hadlock commercial core area. Of the 917 total gross acres zoned for residential development in the UGA, approximately 39% is considered to be fully developed, 34% is considered underdeveloped, and 27% is vacant land. The bulk of the vacant lands are found in the residential zones north of Irondale Road. In this area, a significant number of small lots platted in the late 19th century (at urban densities) remain undeveloped, though the re-development potential of these 'lots and blocks' will be tempered by various land-use constraints. The remaining land use in the PHSPA includes public land (80 acres) in pocket parks and shoreline parks and facilities, and light industrial zoning (25 acres) at the south end of the UGA. The County is currently in the process of changing the zoning designations in the Port Hadlock area to urban standards and will receive a final determination from the Western Washington Growth Management Hearings Board by July of 2009.

2.1.1 Chimacum Creek

Chimacum Creek (6th Field HUC No. 171100190802) originates from multiple spring-fed lakes and streams in the forested foothills on the northeast side of the Olympic Peninsula (Correa 2002). Chimacum Creek is located in Water Resource Inventory Area 17 (WRIA 17), the Quilcene-Snow Basin. The Chimacum Creek watershed is approximately 30 square miles in area, which includes 30 miles of mainstem and tributary streams (Ames et al. 2000). The mainstem divides upstream into two forks at approximately River Mile (RM) 2.9 (Photo 2). At the confluence, the east fork continues southeast for 6.5 miles through Beaver Valley and the west fork continues southwest and then west at Eaglemount Road for 11.3 miles through Center Valley (Ames and Bucknell 1981). Chimacum Creek flows enter the marine waters of Port Townsend Bay and Admiralty Inlet near the unincorporated town of Irondale (Figure 1 and Photo 3).

From its originating headwaters, Chimacum Creek flows through glacially carved lowland valleys dominated by agricultural land uses (pasture). The hills surrounding the lowland valleys are primarily used for rural residential development and forestry practices (Correa 2002)]. The town of Chimacum is located near the confluence of the east and west forks of Chimacum Creek at RM 2.9 (Photo 2). The towns of Port Hadlock and Irondale are located downstream of the confluence of the east and west forks of Chimacum Creek and are included within the project area. The project area has been designated as an urban growth area to accommodate a portion of the countywide residential and commercial growth within the Chimacum sub-basin. Below RM 1.3 and as Chimacum Creek flows through the town of Irondale, it enters a narrow forested ravine (Photo 4) after which at RM 0.2 Chimacum Creek flows through a fairly undisturbed portion of estuarine lagoon and salt marsh (Photos 3 and 5) before discharging to the marine waters of Port Townsend Bay (Correa 2002).

The mean annual rainfall in the Chimacum sub-basin is 27.2 inches (Parametrix et al. 2000). "Annual rainfall in the upper watershed is typically higher than that seen closer to the mouth with approximately 35 inches and 22 inches respectively (Ames et al. 2000). The highest stream flows occur between December and April, while the lowest streamflows typically occur in late summer (July through September). Since 1998, Jefferson County Conservation District has recorded flows at a gage located just downstream of the confluence of the east and west forks. High flows ranging from 210 to 250 cubic feet per second (cfs) were documented in January and February of 1998 and 1999. Since the period of record beginning in 1998, the lowest recorded flows were documented in July of 1999and August 2000, 4.22 cfs and 0.32 cfs respectively (Correa 2002). Overall, the hydrograph for the project area is typical for Puget Sound lowland streams with higher flows occurring in the winter and low flows occurring during the late summer.

Land use in the less developed portion of the upper Chimacum watershed is primarily forestry, while the middle and lower watershed, including the project Action Area, is characterized by agriculture, single- and multi-family residential development, commercial and industrial development, and parks associated with the towns of Chimacum, Port Hadlock, and Irondale (Correa 2002). Zoning within the watershed includes 41.7 percent commercial, 39.9 percent rural residential, 14 percent agriculture, 3.6 percent parks and open space, and 0.7 percent industrial (Jeff Miller, unpublished data, 2002 *in* Correa 2002).

The quantity and quality of salmonid and wildlife habitat within the upper watershed of Chimacum Creek has decreased substantially since the arrival of Eouropean settlers (Correa 2002). Agricultural practices within the lower valley has resulted in the elimination of over 90 percent of juvenile coho rearing habitat through the elimination of beaver ponds, channel sinuosity, and the elimination of wetlands associated with the Chimacum Creek drainage (Correa 2002). Other practices including forest clearing and rural and residential development have contributed to the further degradation of habitat conditions including excessive sedimentation, increased stream temperatures, and low dissolved oxygen (Bahls and Rubin 1996). Although the habitat has been degraded since European settlement began over 145 years ago, much of the lower watershed, below RM 1.0, has been preserved and or restored and is in public ownership or protected by conservation easements through The Jefferson County Land Trust, which includes approximately 1.5 to 1.75 miles of stream habitat rehabiltation since 1998 (Correa 2002).

2.1.2 Vegetation

Vegetation varies within each site proposed for the wastewater treatment plant and associated facilities vary for each site. Upland areas are dominated by Douglas fir or contain bare ground and grasses. Riparian areas are dominated by wetland shrub species and red alder. Depending on the final site selection, the amount and type of disturbance to vegetation will vary. The proposed action will require approximately 16 acres of land, of which approximately 12 acres will be cleared and graded. All vegetation removal will occur outside of wetlands and riparian areas. Photos 6, 7, and 8 are potential areas for construction of the wastewater treatment plant and reuse field.

2.1.3 Wetlands

The National Wetland Inventory (NWI) maps and Jefferson County critical area maps identify several wetlands within the Port Hadlock/Irondale UGA limits. Most of the wetlands are associated with the Chimacum Creek or the nearshore estuarine areas (Figure 3). There are several large wetlands located upstream of the East and West Forks Chimacum Creek in addition to a large wetland complex located to the west of the proposed wastewater treatment plant and associated facilities. The use of a rapid rate infiltration basin would likely influence hydrology within this large wetland complex; however, no fill or other alterations will occur to these wetlands.

2.2 Construction Activities

As discussed in Section 1.0 of this report, Jefferson County is proposing to construct a wastewater collection, treatment, and reuse system within the Port Hadlock/Irondale UGA. The new sewer system will include a conventional gravity collection system; a membrane bioreactor (MBR) treatment facility with fine screening; anoxic and aerobic treatment basins; UV disinfection; solids handling using on-site storage and decanting technology; contracted solids hauling and treatment; and effluent reuse via groundwater augmentation through rapid rate infiltration. This project will be constructed in order to provide urban services to the area planned for population growth and to meet expected regulatory requirements through 2030. Potential locations for the proposed facility are shown in Figure 4.

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 the majority of the site. A typical site development plan for construction of the wastewater treatment plant and associated infrastructure is shown in Figure 5.

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

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

Description	**Estimated Land Area (acres)**
Wastewater Treatment Plant:	
2030 Treatment Plant Footprint	3 acres
Area for Future Expansion	2 acres
Buffer/Setback	1 acre
Total	6 acres
Effluent Reuse Area:	
Infiltration Basin (Sized for 2030 Flow)	3 acres
Reserve/Redundancy	3 acres
Buffers	3 acres
Total	9 acres
Influent Pump Station:	
Pump Station Site	1 acre
Total Estimated Land Need	**16 acres**

2.2.1 Project Phasing

Jefferson County is proposing to construct the wastewater treatment plant to meet expected regulatory requirements and projected growth through 2030. Treatment plant construction has been phased to provide a more viable project funding package, and allow for simple modular expansion of treatment capacity under future construction phases (Figure 6).

2.2.1.1 Wastewater Treatment Plant Phasing

- Phase 1 will be completed at startup (2010) and will include 0.25 MGD of capacity. Approximately 66% of the site (2 of the 3 acres) would be developed. Construction duration is estimated to be about 1 year.
- Phase 2 (2013) would include the expansion of the facility by including 800,000 gallons of storage for standby capacity. (This would result in the development of the third acre for the treatment plant). Construction duration about 9 months.
- Phase 3 (2018) would be the expansion of the treatment train by adding an additional treatment train. No anticipated expansion of the plant footprint. Construction duration about 1 year.
- Phase 4 (2024) would be the addition of membranes within the installed treatment trains. Construction duration about 4 months. Sewer service would be available throughout the entire UGA sewer service area at this time.

2.2.1.2 Effluent Reuse Area Phasing

- Phase 1 (2010) would be the construction of the first half of the reuse area. This would result in half of the six acre reuse area (three acres) being developed. Construction duration about 7 months.
- Phase 2 (2018) would result in development of the remaining three acres. Construction duration about 7 months.

2.2.1.3 Influent Pump Station Phasing

- Phase 1 (2010) would be the construction of the influent pump station and pipeline. The entire 1 acre site would be developed. Approximately 8,200 feet of both 6-inch and 10-inch diameter force main would be installed within existing street right-of-way between the pump station and the treatment plant. The dual force mains are required to maintain reasonable velocities and detention times for the sewage in the force main during the earlier years after the system is in operation as well as meet the increased flows projected within the planning horizon.
- There may be subsequent phases where pumps are switched out and/or added to the constructed wet well to increase pumping capacity as the service area develops.

2.2.1.4 Conventional Gravity Collection System Phasing

- Core Area and Alcohol Plant Area (2010): This would be the initial phase of the collection system. The service area encompasses approximately 350 acres. The estimated amount of 8-inch diameter gravity pipeline to be installed is 12,000 feet. The estimated amount of 12-inch diameter gravity pipeline to be installed is 4,400 feet. The estimated amount of 14-inch diameter gravity pipeline to be installed is 1,600 feet. The influent pump station and two local pump stations are within this area.

- Rhody Drive Area (2013): This is the second phase collection system. The service area encompasses approximately 190 acres. The estimated amount of 8-inch gravity pipeline to be installed is 11,250 feet. This area will have one local pump station
- Residential Area #1 (2016 – 2018): The service area encompasses approximately 110 acres. The estimated amount of 8-inch gravity pipeline to be installed is 10,800 feet. This area will have one local pump station.
- Residential Area #2 (2019-2023): The service area encompasses approximately 140 acres. The estimated amount of 8-inch gravity pipeline to be installed is 4,100 feet. No local pump stations are planned in this area.
- Residential Area #3: (2024-2030): The service area encompasses approximately 505 acres. The estimated amount of 8-inch gravity pipeline to be installed is 11,000 feet. This area will have two local pump stations.

2.2.2 Wastewater Treatment Plant Operations

The facilities will include raw wastewater screening (primary treatment), nitrogen removal (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;
- 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 7. The proposed conventional gravity 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 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 (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 third 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. Highly treated effluent would then be pumped or gravity fed, depending on the plant hydraulics, to the effluent reuse field, which is the rapid rate infiltration basin, where effluent will be applied to the surface and allowed to infiltrate into the groundwater (Tetra Tech 2008a).

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.

The plant will incorporate measures to minimize the potential for any overflow including 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 a sub-base tank.

In addition to the generator, state regulations require that the plant include redundancy for major equipment (e.g. screens, pumps, blowers, disinfection, etc.). Jefferson County will have a 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 exceed all of the applicable reuse standards. Biosolids will be trucked from the wastewater treatment plant to an off-site area operated by a third-party contractor for treatment and re-use.

2.2.2.1 <u>Treatment Plant Site Layout</u>

As discussed previously, the location for the wastewater treatment plant has not been chosen at this time; however, candidate sites are being evaluated from which a preferred alternative will be chosen (Figure 4). It is anticipated that the site will require a minimum of 16 acres to address Phase 1 construction activities and all future expansions (Table 2-1).

2.2.2.2 <u>Treatment Plant Infrastructure</u>

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 Port Hadlock/Irondale UGA. 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

Approximately 75% of the developed area for the treatment plant site and pump station site will be impervious. This equals approximately 2.25 acres for the treatment plant (75% of 3 acres) and 0.75 acres for the pump station site (75% of 1 acre) for a total of 3.0 acres of new impervious surface area. 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).

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 (5 acres), pump station location (1 acre), and in the effluent reuse area (6 acres) for a total of approximately 12 acres of clearing and grading. The remaining four acres will be left as buffers. 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:

2010: Excavation = 2,800 cubic yards (cy)

Fill = 1,175 cy

2013: Excavation = 6,500 cy

2018: Excavation = 2,800 cy

Fill = 1,175 cy

Effluent Reuse Area:

2010: Excavation = 18,400 cy

2018: Excavation = 18,400 cy

Influent Pump Station:

2010: Excavation: = 100 cy

Disturbed areas will be paved or reseeded following construction.

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 effluent reuse sites and Chimacum Creek. During construction, Best Management Practices (BMPs) will be employed to minimize the amount of erosion and sediment leaving the site. The BMPs will be consistent with Ecology's *Stormwater Management Manual for Western Washington* (Ecology 2005), 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 promptly. Temporary erosion and sedimentation control (TESC) measures will be included as part of the project design and construction. The TESC Plan will meet the requirements of Washington State Department of Ecology and Jefferson County, as well as any additional measures deemed appropriate for the project.

2.2.2.6 Stormwater Treatment and Conveyance

The onsite stormwater system 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 be pumped into the treatment plant for processing. 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 prevent, during construction, adverse water quality impacts including impacts on beneficial uses of the receiving water by controlling peak flow rates and volumes of stormwater runoff at the Permittee's outfalls and downstream of the outfalls. The proposed action will not require a stormwater outfall to surface waters. Stormwater will be infiltrated through a stormwater pond; thereby minimizing the potential for water quality and quantity impacts to surface waters.

2.2.2.7 Construction and Equipment Staging Areas

Part of the 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.

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, pump station, 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 on-site.

2.2.2.9 Construction Timing and Duration

Construction for Phase 1 is expected to begin in 2010 and will occur over an approximate one-year period. Additional construction phases are anticipated in to occur throughout the 20 year planning horizon and extend into the year 2030 (see Section 2.2.1).

2.2.2.10 Vegetation Clearing

Vegetation clearing will be limited to grasses and some trees, depending upon final site selection (Photos 6, 7, and 8). No vegetation clearing will occur within wetlands or riparian areas of Chimacum Creek regardless of the site selected. In total, approximately 16 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 Port Hadlock UGA Sewer 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 Chimacum Creek and the marine nearshore environment of Port Townsend Bay.

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). 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 pave 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. The construction contractor and/or Jefferson County staff could 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 storage facilities and emergency cleanup procedures. 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.
- Effluent 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 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 Port Hadlock UGA boundary and the candidate sites for the proposed wastewater treatment plant located immediately south of the UGA boundary. This area includes the existing towns of Port Hadlock and Irondale north to Chimacum Creek and defines the extent of potential sewer collection system expansions into the UGA. The Action Area also includes the lower reaches of Chimacum Creek extending from the confluence with the East and West Forks downstream to its discharge point in Port Townsend Bay and the marine nearshore along the UGA boundary, which represent the aquatic zones potentially affected by the wastewater treatment plant's effluent on water quality and direct and indirect effects related to sedimentation and turbidity (Figure 8).

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 within the Project Area.

Common Name	Scientific Name	ESA Status *	Jurisdiction	Critical Habitat
Coastal-Puget Sound DPS Bull Trout	*Salvelinus confluentus*	Threatened	USFWS	No
Hood Canal Summer-Run Chum Salmon ESU	*O. keta*	Threatened	NMFS	Yes
Puget Sound Chinook Salmon Evolutionarily Significant Unit (ESU)	*Oncorhynchus tshawytscha*	Threatened	NMFS	Yes
Puget Sound Steelhead Distinct Population Segment (DPS)	*O. mykiss*	Threatened	NMFS	No
Marbled Murrelet	*Brachyramphus marmoratus*	Threatened	USFWS	No

*__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, these species include Canada lynx (*Lynx Canadensis*), gray wolf (*Canis lupus*), grizzly bear (*Ursus arctos*), and northern spotted owl (*Strix occidentalis*). The Canada lynx, gray wolf, and grizzly bear are wide-ranging species that are found in critically small numbers in Washington; most reliable observations are from the North Cascades (Almack and Fitkin 1998; WDFW 1999). They generally require remote, dense, and mature forests free from human activity. The northern spotted owl nests and roosts in mature/old growth coniferous forests with high canopy closure, a multi-layered, multi-species canopy dominated by large (>30 inches diameter at breast height) trees, tree deformities such as cavities and broken tops, large snags, woody debris, and space for flying below the canopy (USFWS 1990). No forested habitats that provide trees of sufficient size or structure occur within the Action Area.

In summary, Canada lynx, gray wolf, grizzly bear, and northern spotted owl are not likely to occur on the site due to a lack of suitable habitat for these species. Therefore, these species or their designated critical habitats (where applicable) will not be affected by the project and these species are not addressed further in this BA.

4.2 Fish Species Evaluation

This section outlines the distribution, listing and stock status, and critical habitat designations for listed and proposed fish species within 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).

Similarly, Dolly Varden (*Salvelinus malma*) was proposed for listing as endangered by the USFWS in 2001 (66 Federal Register 6) due to similarity of appearance with bull trout and because they occur together only within the area occupied by the Coastal-Puget Sound bull trout DPS. A designation of threatened or endangered under the similarity of appearance provisions of the ESA extends the take prohibitions of Section 9 to cover the species. However, under section 4(e) of the ESA, a designation of threatened or endangered due to similarity of appearance, does not extend other protections of the ESA, such as the consultation requirements for federal agencies under section 7 of the ESA. Although not formally discussed in this document, the effects of the action upon Dolly Varden are anticipated to be similar to that of bull trout.

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 are cold water spawners, likely preferring the colder stream temperatures of snowmelt-fed streams originating on the slopes of the Olympic Mountains west of Port Hadlock. Port Hadlock is located on the west shore of Port Townsend Bay with a connection to the open marine waters of Admiralty Inlet where lowland streams are supported by generally warmer groundwater and surface water runoff. The upper optimal temperatures for juvenile bull trout have been proposed between 51.2°F and 55.5°F (11°C and 13°C) (USEPA 2002).

The USFWS (2004a) identifies six core areas (combination of core habitat and a core population) including the Quinault, Queets, Hoh, Dungeness, Elwha, and Skokomish River basins, that support the only known core populations of bull trout within the Olympic Peninsula Management Unit. They have also identified important areas for foraging, migration, and overwintering (FMO) and areas where additional research is needed. The closest core area is the Dungeness River basin located approximately 17 miles west of the project area. The closest FMO habitat is Hood Canal approximately 10 miles southeast and Bell Creek approximately 13 miles west of the project Action Area respectively. Outmigration of adults and smolts from natal streams typically occurs between April 1 and July 15, with a peak in mid May to early June (Nightingale and Simenstad 2001). Where they occur, bull trout may be present in marine habitats throughout the year. Bull trout, as smolts, subadults, and adults, tend to stay within tens of miles of their natal stream mouth and spend most of their time in shallow water (Nightingale and Simenstad 2001).

Bull trout have not been documented within the marine nearshore areas of Port Townsend Bay or within Chimacum Creek (WDFW 2009a and 2009b). However, it is possible that migratory life history forms of bull trout may use the marine nearshore environment adjacent to Port Hadlock and Irondale for migration and foraging. The marine nearshore areas of Port Townsend Bay adjacent to Port Hadlock 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 designated on September 26, 2005 (70 Federal Register 185). No designated habitat has been identified within Chimacum Creek or the marine nearshore adjacent to Port Hadlock. The closest designated critical habitat is the east shores of Discovery Bay located 2.3 miles west and overland of Port Hadlock.

4.2.2 Hood Canal Summer-run Chum Salmon

Hood Canal Summer-run chum salmon (*Oncorhynchus keta*) occurring in and near the Port Hadlock area are part of the Hood Canal Summer-run ESU population, which was listed as a threatened fish stock by NMFS on March 25, 1999 (64 Federal Register 57).

4.2.2.1 Life History

The life history and habitat requirements of Hood Canal Summer-run chum salmon are described by Ames et al. (2000). 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

Hood Canal Summer-run chum are found in several WRIA 17 watersheds, including Chimacum Creek (Correa 2002; WDFW 2009a and 2009b; and Williams et al. 1975). Typically, they begin their upstream migrations between mid- to late-August through mid-October with emergence occurring toward the end of March through the end of April, depending upon water temperatures (Correa 2002). Juvenile chum immediately migrate seaward after incubation and subsequent emergence (Williams et al. 1975). Upon their arrival in tidal waters, chum fry inhabit shallow estuarine habitats and migrate along marine shorelines (Nightingale and Simenstad 2001). Once juvenile chum reach a size of 1.75 to 2 inches (45- to 50-mm), they move to deeper off-shore areas (Ames et al. 2000). Hood Canal chum juveniles that migrate during February and March usually are found in close association with subtidal marine vegetation. Residence time in these habitats is typically about one week (Ames et al. 2000).

The Chimacum Creek summer chum population collapsed sometime in the mid-1980s. A significant culvert failure occurred in 1985-1986, which resulted in the deposition of large quantities of fill material into the reaches of Chimacum Creek that provide the majority of spawning habitat. Following the catastrophic event, the gravels became cemented with the fines deposited during the event, which effectively eliminated spawning gravels for redd construction and eliminated the stock from Chimacum Creek (Correa 2002). In her 2002 report Correa provided a summary of local salmon restoration organizations that worked together to reestablish the summer run chum to Chimacum Creek. A local salmon restoration organization, the North Olympic Salmon Coalition, and WDFW worked together to initiate a stock restoration program to reestablish the summer chum run in Chimacum Creek using summer run chum in Salmon Creek as donor stock. The first release of fish in the lower watershed and estuary occurred during the spring of 1997 (28,788 fry). A net pen at Kala Point also served to provide additional rearing capacity, and in the spring of 2001, an additional 73,000 fish were released. At the same time the stock recovery efforts were underway, efforts to protect and improve spawning habitat in the lower watershed was also occurring. Adult chum returns observed in 1999, 2000, and 2001 were 38, 52, and 903 respectively (Correa, 2002).

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 Hood Canal Summer-run chum salmon 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 Hood Canal summer-run chum salmon in the vicinity of Port Hadlock includes all marine waters extending from the line of extreme high tide out to a depth of 30 meters (98 feet) and Chimacum Creek extending from the mouth upstream and out of the project Action Area.

Specific primary constituent elements (PCEs) for chum salmon in freshwater and marine/estuarine areas, as defined by NMFS (70 Federal Register 170) include:

- Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development.
- Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions, and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
- Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival.
- 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.

Of the PCEs listed above, all except offshore marine areas occur within the project Action Area.

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4.2.3 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).

4.2.3.1 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.

4.2.3.2 Occurrence of Species in the Action Area

Chinook salmon in Hood Canal are managed as a single stock of mixed origin with composite production (WDFW and WWT 1994). Chinook are of the summer/fall variety and typically spawn from mid-September to late October. Chinook salmon within WRIA 17 and the Action Area are not found in abundant numbers. When found, they are either the result of hatchery production or strays from other watersheds (Correa 2002).

Several efforts have been undertaken to increase Chinook use of WRIA 17 streams, including an effort by the USFWS hatchery on the Big Quilcene River. In 1980, the USFWS began a spring Chinook program that continued until 1994. That population has not sustained itself and recent spawner surveys indicate that no adults have been returning to the river. A small local volunteer Chinook rearing program on Tarboo Creek released some 100,000 fry/smolts from George Adams stock in 1994, 1995, and 1996. Small numbers of adults and their associated redds have been observed in the lower river since 1997. Whether or not the population is sustainable is yet to be seen (Correa 2002).

Estuarine and nearshore habitats are critical for juvenile Chinook rearing, foraging, and migration. Chinook juveniles were captured during beach seine efforts in Port Townsend Bay near the mouth of Chimacum Creek as part of the Chimacum Beach Baseline Study performed in 2003 (NOSC 2003); however, these numbers were small (only 2) and were not encountered again during more intensive follow up seining and ocular surveys performed in 2005 and 2006 (NOSC 2006). It appears that there is definitely a potential for juvenile Chinook occurrence along the marine nearshore areas adjacent to Irondale and Port Hadlock; however, their occurrence appears to be sporadic and never occurring in great numbers.

In summary, Chinook use of Chimacum Creek has not been documented (Correa 2002; WDFW 2009a and 2009b); however, juvenile Chinook are documented as occurring, although in extremely low numbers, along the marine nearshore adjacent to Chimacum Creek, Irondale, and Port Hadlock (NOSC 2003).

4.2.3.3 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 Port Hadlock UGA 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 Chimacum Creek or any other 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.

4.2.4 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.

4.2.4.1 <u>Life History</u>

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.

4.2.4.2 <u>Occurrence of Species in the Action Area</u>

Winter steelhead have been documented as occurring and spawning within Chimacum Creek extending upstream from the mouth to the upper reaches of the west fork of Chimacum Creek (WDFW 2009a and 2009b), which includes the Action Area. Winter steelhead spawn from winter to spring with emergence occurring from April to June in WRIA 17, including Chimacum Creek. They then spend one to two years in the stream rearing and then migrate to the sea in the spring (Correa 2002). It is anticipated that rearing juveniles will be present year round within Chimacum Creek.

4.2.4.3 Critical Habitat

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

4.3 Terrestrial Species Evaluations

4.3.1 Marbled Murrelet

4.3.1.1 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.

4.3.1.2 Occurrence of Species in the Action Area

The project Action Area is located within the developed and developing areas of Port Hadlock and Irondale, Washington. 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 projects 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 Port Townsend Bay and Admiralty Inlet, 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).

4.3.1.3 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 10 miles southwest of the project Action Area in Clallam County.

5.0 ENVIRONMENTAL BASELINE

5.1 Freshwater Aquatic Species

Chimacum Creek is located in the Puget Lowland Ecoregion and is the largest basin on the Quimper Peninsula. Located on the northeastern side of the Olympic Peninsula, the Chimacum basin drains approximately 37 square miles of land and contains 29.5 miles of low gradient (0-4 percent) streams (Nightengale 2009). The forested hills of glacial outwash material are the headwaters of the Chimacum basin and contain slightly higher gradients than the lower reaches, including the project Action Area. These higher elevation areas carry large amounts of fine sediment bedload to the lower gradient reaches, which contain dominant substrates of silt sand peat, and gravel. The Chimacum basin lies in the rain shadow of the Olympic Mountains; however, the flow of groundwater to the stream has historically provided adequate stream flow and habitat conditions to support salmonid populations (Nightengale 2009). Current and historic land use practices, including logging, agriculture, and commercial and residential development have reduced the stream's productivity and ability to support healthy populations of native salmonids.

5.1.1 Summary of Baseline Conditions within Chimacum Creek

Properly functioning conditions (PFCs) are 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 1996). Indicators of PFCs vary between different landscapes based on unique physiographic and geologic features. Since aquatic habitats are inherently dynamic, PFCs are defined by the persistence of natural processes that maintain habitat productivity at a level sufficient to ensure long-term survival (NMFS 1996). NMFS (1996) identifies that PFCs commonly include the following elements: water quality, habitat accessibility, the suitability of various habitat elements, channel condition and dynamics, and overall watershed conditions. Estimates in the PFC assessment are summarized in Table 5-1 below. A more detailed assessment of PFCs based on observations made during the field visit and on information in background materials can be found in Appendix D.

Table 5-1. Summary of Chimacum Creek Baseline Conditions

Pathways: Indicators:	Environmental Baseline			Effects of the Action(s)		
	Properly functioning	At risk	Not Properly Functioning	Restore	Maintain	Degrade
WATER QUALITY						
Temperature			X	X		
Sediment		X			X	
Chemical (contaminants and nutrients)			X	X		
HABITAT ACCESS						
Physical barriers	X				X	
HABITAT ELEMENTS						
Substrate		X			X	
LWD		X			X	
Pool frequency		X			X	
Pool quality		X			X	
Refugia		X			X	
Off-channel habitat		X			X	
CHANNEL CONDITIONS AND DYNAMICS						
Width/Depth ratio	X				X	
Streambank condition	X				X	
Floodplain connectivity		X			X	
FLOW/HYDROLOGY						
Peak/Base flows		X			X	
Drainage network		X			X	
WATERSHED CONDITIONS						
Road density and		X			X	
Disturbance history		X			X	
Riparian Reserves		X			X	

6.0 EFFECTS OF THE ACTION

The 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, not 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, reuse field, and pump stations. In general, direct effects as a result of the construction of the treatment plant and associated facilities will be minimal. The facilities will be established within a minimum of 300 feet east of Chimacum Creek. 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 Chimacum Creek. Sedimentation is a concern since it can degrade 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 field, collection system, and pump houses; however these facilities would be constructed a minimum of 300 feet from the stream. 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 Jefferson County and Ecology standards for construction. Because of the implementation of Best Management Practices, sedimentation and turbidity within the Chimacum Creek resulting from construction activities is expected to be minimal. Specific conservation measures are detailed in Section 2.4.

6.1.1.2 <u>Construction Noise and Disturbance</u>

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 marbled murrelet, is expected to be discountable.

6.1.2 Operational Effects

The primary operational effects of the proposed action would occur in relation to the discharge of highly treated effluent to a rapid rate infiltration basin. The highly treated water would be land applied to the infiltration basin and percolate into the subsurface groundwater system. There are two separate aquifers in the project area including a deep aquifer and a shallow aquifer (Simonds et al. 2004). The shallow groundwater aquifer in this area has a strong hydrologic connection with Chimacum Creek and it is anticipated that the majority of the effluent will mix with this shallow groundwater and be discharged to Chimacum Creek (Arnie Sugar, Personal Communication, 2009). It is likely that the proposed action will result in some benefits to Chimacum Creek through additional groundwater recharge, especially during the late summer and low flow conditions. 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. A discussion of the operational effects of the rapid rate infiltration is included in Chapter 3 (Water and Wetlands) and Chapter 3 (Biological Resources) of the *Port Hadlock UGA Sewer Facility Plan Environmental Report and SEPA Checklist, Volume II of II* (Tetra Tech 2008b).

The potential effects to water quality associated with wastewater discharge are generally related to temperature, bacteria and viruses, nutrients, turbidity, and chemical contamination. Under Phase I, the wastewater treatment plant will treat and discharge approximately 0.25 million gallons per day (MGD) maximum monthly flow and contribute approximately 0.38 cubic feet per second (cfs) of flow to the groundwater. At full build-out and by the year 2030, the treatment plant will have been expanded to treat approximately 1.0 MGD maximum monthly flow (Tetra Tech 2008a) and contribute approximately 1.54 cfs to the local groundwater table. This is roughly equivalent to 6 and 22 percent of the stream flow during August through September based upon flows in Chimacum Creek downstream of the project area. The average net exchange between groundwater and Chimacum Creek is a gain of about 6.0 cfs (Simonds et al. 2004). It appears that contributions of highly treated effluent into groundwater that is hydrologically connected to Chimacum Creek may increase both peak and base flows.

Increasing peak flows can be detrimental to salmonids for a variety of reasons including, an increased potential for scouring of spawning beds, an increased potential for erosion and sedimentation, and increased turbidity. Although the proposed action has a potential to contribute to increased peak flows, the project has been designed to include a storage volume of three days. If peak flow events are occurring and the storage capacity of the groundwater table is decreased due to excessive precipitation, all effluent can be routed to the on-site storage tanks and held until the peak event has passed.

6.1.2.1 Temperature

Elevated temperature can have a variety of effects in aquatic systems. Species intolerant of heated water may disappear, while other species that are rare in cooler water may thrive, so that the structure of the community changes (Mason 1991). However, fish are often able to acclimate to temperature changes, and as a result, large-scale mortalities of fish due to thermal pollution are infrequent (Mason 1991). The optimal temperature for adult salmon it is about 12° C. Although successful salmon spawning has occurred in waters from 2° to 21° C, streams and rivers should not exceed 17.5° C. Temperatures over 21° C are considered unacceptable.

Chimacum Creek has been listed on the 303(d) list of impaired water bodies for the temperature parameter (Ecology 2009). Chum salmon begin their upstream spawning migrations in late August through mid-October with emergence occurring from the end of March through the end of April. Spawning activity and egg incubation may overlap with summer low flow conditions and elevated stream temperatures. The proposed action will not result in the direct discharge of highly treated effluent to Chimacum Creek, rather highly treated influent will be land applied to a rapid rate infiltration basin and allowed to percolate into the groundwater. It is anticipated that there will be some groundwater and surface water interaction and that the infiltration of effluent and subsequent mixing with groundwater will minimize any elevated temperatures of groundwater that may provide recharge to Chimacum Creek. It is also anticipated that through groundwater recharge, the base flows of Chimacum Creek will increase and have a positive effect on lowering overall stream temperatures during the warmer summer months.

6.1.2.2 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 effluent to Chimacum Creek, rather highly treated influent will be land applied to a rapid rate 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 and surface water interaction and that the infiltration of effluent and subsequent mixing with groundwater will minimize and dilute concentrations of nutrients within the groundwater that provides recharge to Chimacum Creek.

6.1.2.3 <u>Organic Contaminants</u>

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 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.

6.1.2.4 <u>Metals</u>

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 Chimacum Creek 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 Chimacum Creek, the overall dilution that would occur within the groundwater and additional binding that may occur with soils between the rapid rate infiltration basin and within the hyporheic zone of Chimacum Creek.

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 (WSDOT 2008). 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. The County will employ a monitoring program for metals in both the influent and effluent and make process upgrades, if necessary, to account for any observable trends in increasing copper and zinc concentrations. .

6.1.2.5 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, Lester et al. 2004, 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 (WERF 2005). 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 WWTP 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 WWTP effluent because the facility is new and no data has been collected at this time. In addition, there is no monitoring data available for Chimacum Creek or Puget Sound at the confluence with Chimacum Creek.

King County has an active monitoring program and has the most current information on presence of conventional pollutants and unregulated chemicals in Puget Sound. BPA, a plasticizer was detected in both marine and freshwaters, but at concentrations lower than any effects reported in the literature. Nonylphenol was detected at relatively high concentrations in stormwater samples and was also detected at lower levels throughout King County lakes, streams, and marine waters at concentrations above some literature-based effect levels. Quantification of source loadings was not part of the study's design and is not possible with the available data. The limited data from marine waters suggests wastewater treatment plant outfalls may not be a significant source for these chemicals; however, the sampling in marine waters was spatially limited. Additional data would be required to provide more certainty regarding the spatial extent and concentrations of these chemicals in marine waters (King County, 2007). Other studies in Washington State, have detected plasticizers and reproductive hormones, with the highest concentrations and greatest frequency found at stream stations (Lester et al. 2004).

Effects of Common Unregulated Contaminants/Microconstituents

The review of studies has shown that endocrine disruption is undoubtedly adversely affecting wild fish populations, including salmonids, all over the world through a variety of pathways including hormone receptor interactions, interference with biosynthesis of sex steroids, disruption of hormonal control by the pituitary or reproductive and adrenal processes. However, in most cases the exact process or mode of action are poorly understood and the data that has been collected is largely confined to a few select species. Chemical compounds responsible for the adverse effects may be due to both synthetic and natural compounds (WHO 2002).

Specific effects documented in teleost fish (bony fishes) exposed to estrogens and androgens include the following: kidney, liver and gonadal cell death; intersex; altered breeding behavior; fibrosis and inhibition of testicular development; ovarian follicle growth; and changes in the timing of maturation.

It has also been demonstrated that low concentrations (0.025 μg/L) of environmental estrogens can affect reproductive behavior (Martinovic et al. 2003). Abnormal breeding behavior is considered a sub-lethal effect of exposure to endocrine disrupting compounds. Clotfelter et al.

(2004) have compiled a summary of the variety of behavioral effects noted in numerous fish species exposed to endocrine disrupting chemical.

Other wastewater-related chemicals known to cause endocrine disruption in fish are more commonly detected in surface waters, including those in Washington State. These include plasticizers, fire retardants, and detergent metabolites such as nonylphenol (which has been banned in Canada). In general and with the exception of nonylphenol (Servos 1999), the majority of toxicity testing focuses on reproductive steroids. While we do not have a characterization of non-regulated chemicals discharged that could be potentially discharged from the proposed WWTP, we anticipate that the composition of the effluent would be similar to municipal wastewater discharged in other areas.

The question with respect to the proposed facility is really one of exposure potential. The proposed WWTP will discharge highly treated effluent to an infiltration basin where it will percolate into the soil and mix with the local shallow groundwater aquifer. This aquifer does have a hydrologic connection with Chimacum Creek; therefore, exposure will occur but it is anticipated that the concentrations would be much lower than that which would occur during a direct marine or freshwater discharge scenario. If exposure does occur, it is likely they are experiencing sublethal effects as noted above resulting in reduced reproductive success. It's also possible salmonids may experience other sublethal effects as a result of repeated exposure to municipal wastewater, but we are unable at this time to determine to what extent effects related to unregulated compounds would result in a significant impairment or disruption of behavioral patterns such as foraging, reproduction, or migration.

6.1.2.6 Flows

The effluent discharge under Phase 1 is expected to be 0.25 MGD maximum monthly flow or approximately 0.38 cfs, which would be roughly equivalent to six percent of Chimacum Creek flow during July through September. The effluent discharge at full build-out would be approximately 1.0 MGD maximum monthly flow or approximately 22 percent of Chimacum Creek flow during July through September based on flows in Chimacum Creek downstream of the project area. The actual contribution of effluent discharge to stream flow is likely lower than that illustrated above due to the fact that the effluent is being discharged into groundwater and not directly into Chimacum Creek. These processes will likely act to prevent loss of flow in losing reaches and add flow in gaining reaches. It is likely that the proposed action will improve flow conditions during the dryer summer months, which will improve overall conditions for spawning and egg incubation.

6.1.2.7 Summary of Operational Effects

The wastewater treatment plant will produce a high quality effluent. The expected low concentrations of pollutants in highly treated water from the wastewater treatment plant and dilution within subsurface groundwater will produce a high quality effluent 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 PHSPA and UGA.

The County will monitor both effluent and final receiving waters 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.

6.2 Indirect Effects

This section identifies potential indirect effects related to the proposed Port Hadlock UGA Sewer System.

6.2.1 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).

Based on 2003 data, the PHSPA covers approximately 1,320 acres of which approximately 18 percent or 237.6 acres is impervious surface coverage (Tetra Tech 2008a and 2008b). The proposed action will add approximately 3 acres of impervious surface area to the PHSPA and the Chimacum Creek drainage basin (includes the wastewater treatment plant and pump station facilities) bringing the total impervious surface area within the PHSPA to 18.2 percent. Based on project development due to designation as a UGA, the impervious surface area within the PHSPA is expected to increase to approximately 28 percent (370 acres) by the year 2024 (Tetra Tech 2008b).

Most of the roads in the PHSPA 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 Port Townsend Bay. 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. No degradation of marine water quality was documented. A stormwater management plan has been created for the Port Hadlock UGA. The proposed action 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, for quantity and quality and that all stormwater will be infiltrated and no discharge will occur to marine or freshwater environments. Stormwater generated within the process area will be directed to the treatment plant, processed, and discharged to the reuse field.

It is unlikely that the small amount of additional impervious surface that will occur in conjunction with the construction of the wastewater treatment plant and pump station 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 County 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.

6.2.2 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 Port Hadlock's UGA 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), unincorporated areas like Port Hadlock and Irondale 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, Jefferson County was required to (and did) develop a comprehensive land use plan to designate where future population growth and development would occur (Jefferson County 1998 and 2004). As reflected in the comprehensive plan, land within the Port Hadlock/Irondale UGA 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 Jefferson County to allow even more intensive land use within its UGA, in order to concentrate development there, to preserve rural areas and open space, and to avoid sprawl. Figure 2 shows future land use and zoning within the Port Hadlock/Irondale UGA and the corresponding PHSPA.

The GMA also required Jefferson 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" Jefferson 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 Jefferson 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 (9th Cir. Cal. 1997); *Laguna Greenbelt, Inc. v. U.S. Dep't of Transportation*, 42 F.3d 517, 525 (9th Cir. Cal. 1994)).

There are additional reasons why the impacts of future development in Port Hadlock's UGA 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).

Another reason that the impacts of future growth and development are not indirect effects of the proposed action is that a portion of the planned growth and development will occur within the Chimacum Creek floodplain. Practically speaking, all local regulations governing development in floodplains must comply with Federal Emergency Management Agency (FEMA) requirements (44 CFR Ch. 60). FEMA has consulted with the Services on its regulations (see *Nat'l Wildlife Fed'n v. FEMA*, 345 F.Supp. 2d 1151 (W.D. Wa 2004); *Florida Key Deer v. Stickney*, 864 F. Sup. 1222 (S.D. Fla 1994)). However, due to a recent lawsuit against FEMA and their implementation of the Flood Insurance Program, FEMA developed a Biological Evaluation that addressed their federal activity within the 100-year floodplain of Washington streams.

NOAA Fisheries disagreed with their effect determination and indicated that development within the floodplain as authorized by FEMA did in fact result in a "likely to adversely affect" determination for listed salmonid species and their critical habitat; thus imposing a building moratorium within the regulated floodplain, until such time that FEMA can demonstrate that the activities they are authorizing will have no adverse affect upon listed species or their designated or proposed critical habitat.

Jefferson County's existing development regulations are consistent with existing FEMA requirements. As such, those regulations (and their effects) are part of the environmental baseline, not an indirect effect of the proposed action (50 CFR 402.02). The Services believe FEMA's existing requirements are insufficient; therefore, Jefferson County's development regulations are not sufficiently protective. It is likely that Jefferson County will have to update its floodplain development regulations and thereby reduce the impacts of future floodplain development on listed species and designated critical habitat. The impacts of actions subject to future Section 7 consultations are not considered in ongoing consultations (see for example USFWS and NMFS 1998, p. 4-30). For all of these reasons, the impacts of future population growth are more appropriate in a cumulative effect analysis; however, since the proposed action as described herein will not result in a "likely to adversely affect" determination for any listed species or designated critical habitat, a cumulative effects discussion is not warranted.

6.3 Analyses of Effects to Critical Habitat Primary Constituent Elements

6.3.1 Hood Canal ESU Summer-Run Chum Salmon Critical Habitat

6.3.1.1 <u>Freshwater Spawning Sites</u>

Summer-run chum salmon are known to use the reach of Chimacum Creek within the Action Area for spawning (WDFW 2009a and 2009b; Correa 2002). The proposed action will not require any in-water work. Construction of the wastewater treatment plant will not require work within 300 feet of Chimacum Creek. Installation of the collection pipes will require the crossing of Chimacum Creek near Ness's Corner (SR 116) within the existing road right-of way, and construction of the pump station may occur within 300 feet of Chimacum Creek. 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 rearing habitat within Chimacum Creek. In addition, water quality is anticipated to improve as a result of treatment plant operations. Therefore, there are no anticipated adverse affects to the freshwater spawning site primary constituent element in Chimacum Creek.

6.3.1.2 <u>Freshwater Rearing Sites</u>

Chum salmon fry typically spend less than 30 days in the freshwater following emergence. They spend a greater amount of time in the estuary and nearshore environments feeding primarily on copepods, euphausiids, and tunicates prior to migrating out to the open ocean (Lichatowich 1993). The proposed action will not require any in-water work. Construction of the wastewater treatment plant will not require work within 300 feet of Chimacum Creek. Installation of the collection pipes will require the crossing of Chimacum Creek near Ness's Corner (SR 116) within the existing road right-of way, and construction of the pump station may occur within 300 feet of Chimacum Creek. 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 rearing habitat within Chimacum Creek. In addition, water quality is anticipated to improve as a result of treatment plant operation. Therefore, there are no anticipated adverse affects to the freshwater rearing site primary constituent element in Chimacum Creek.

6.3.1.3 Freshwater Migration Corridor

No man-made fish passage barriers are known to occur within the aquatic Action Areas of the Chimacum Creek. Chimacum Creek has access to the floodplain throughout the project Action Area, although the stream has been ditched and channelized in the vicinity of Ness's Corner (RM 2.0). The area between Hunt Road and the confluence with the East Fork Chimacum Creek (upstream end of project Action Area) was historically impounded by a beaver dam. This area is now a wetland and maintains its wetland characteristics (TAG 2002).

The condition of Chimacum Creek's floodplain habitat is fair to good. The lower one mile is confined within a ravine with mixed forest cover that provides spawning habitat for coho salmon, fall and summer chum salmon, winter steelhead in addition to rearing habitat for coho and steelhead. The majority of the ravine and associated estuary/nearshore marine habitats are largely protected through conservation easements maintained by the Jefferson County Land Trust. Areas upstream of the ravine have been degraded through past land uses; however, these areas are in recovery (TAG 2002). The proposed action will not result in any disturbance to the floodplain or floodplain habitats.

Some portions of the stream, including the Action Area, are on the State's 303d list of impaired water bodies for temperature. It is possible that under some circumstances areas of high temperatures may result in temporary migration blockages. The proposed action will not result in the direct discharge of highly treated effluent to surface waters. All effluent will be land applied to a rapid rate infiltration basin and percolate into subsurface groundwater. It is anticipated that this groundwater will provide recharge to the stream during low flow periods. Based on the distance between the infiltration basin and the stream (greater than 300 feet) and the mixing that would occur with cooler groundwater, the proposed actions effect on stream temperatures is expected to be insignificant.

The project's effects on temperature are discussed above. The proposed action is anticipated to increase base flows during the warmer summer months; however, juvenile chum are anticipated to have outmigrated prior to the late summer months, when low flows and temperatures can be an issue for migrating salmonids. The proposed action will not require in-water work; therefore, barriers to migration are not anticipated. Water quality, as a result of treatment plant operation and discharge of Class A reclaimed water to an infiltration basin with hydraulic connectivity to Chimacum Creek, is expected to improve as septic systems are taken off-line and phased out over the planning horizon. The proposed action is not anticipated to have an adverse affect to this primary constituent element in Chimacum Creek.

6.3.1.4 Estuarine Areas

As stated above, chum fry move to the estuarine areas shortly after emergence. Chimacum Creek enters its narrow estuary near the southwest corner of Port Townsend Bay. The estuary begins in a formerly degraded nearshore environment (recent restoration efforts by WDFW and the Chumsortium, a cooperative consortium of public agencies and local non-profit organizations, have preserved much of the lower watershed, including the estuary, through acquisition and/or conservation easements allowed for restoration activities to occur) but develops more pristine conditions as it flows approximately 3,500 feet landward toward a forested ravine (Correa 2002). The lower portion of the estuary and nearshore environment was filled for use as a log storage site and has since been restored by WDFW. This area is very important to chum fry as they move out of Chimacum Creek and undergo the physiological changes necessary for life in the marine environment.

The proposed wastewater treatment plant and associated facilities are several miles from the Chimacum Creek estuary. 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 Chimacum Creek and subsequently the Chimacum Creek estuary. In addition, water quality is anticipated to improve within both Chimacum Creek and the Chimacum Creek estuary as a result of treatment plant operations. Therefore, there are no anticipated adverse affects to the estuarine site primary constituent element.

6.3.1.5 Nearshore Marine Areas

Chum fry rely upon the estuary and nearshore environments for rearing far greater than the freshwater environment. Juvenile chum salmon account for the greatest density of salmonids within the marine nearshore environment adjacent to the Port Hadlock/Irondale UGA (NOSC 2003 and 2006). The proposed wastewater treatment plant and associated facilities would be located approximately one-half mile west of Port Townsend Bay 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 Chimacum Creek and subsequently the marine nearshore. In addition, water quality is anticipated to improve within both Chimacum Creek and the marine nearshore. Therefore, there are no anticipated adverse affects to the nearshore site primary constituent element Port Townsend Bay.

6.3.1.6 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 ESU Chinook Salmon Critical Habitat

6.3.2.1 Freshwater Spawning Sites

The project Action Area contains no freshwater spawning sites for Puget Sound ESU Chinook salmon. The proposed action is not anticipated to have an adverse affect to this primary constituent element.

6.3.2.2 Freshwater Rearing Sites

The project Action Area contains no freshwater rearing sites for Puget Sound ESU Chinook salmon. The proposed action is not anticipated to have an adverse affect to this primary constituent element.

6.3.2.3 Freshwater Migration Corridor

The conditions of Chimacum Creek and use as a migration corridor are discussed in Section 6.3.1.3 above for chum salmon. Chinook salmon are not known to utilize Chimacum Creek or any streams within the project Action Area; therefore, the proposed action is not anticipated to have an adverse affect to this primary constituent element.

6.3.2.4 Estuarine Areas

As with chum salmon, estuarine areas also 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 Chimacum Creek 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 several miles from the Chimacum Creek estuary. 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 Chimacum Creek and subsequently the Chimacum Creek estuary. In addition, water quality is anticipated to improve within both Chimacum Creek and the Chimacum Creek estuary as a result of treatment plant operations. Therefore, there are no anticipated adverse affects to the estuarine site primary constituent element.

6.3.2.5 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 documented, although in extremely low numbers, within the marine nearshore environment adjacent to the Port Hadlock/Irondale UGA (NOSC 2003 and 2006). The proposed wastewater treatment plant and associated facilities would be located approximately one-half mile west of Port Townsend Bay 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 Chimacum Creek and subsequently the marine nearshore. In addition, water quality is anticipated to improve within both Chimacum Creek and the marine nearshore. Therefore, there are no anticipated adverse affects to the nearshore site primary constituent element in Port Townsend Bay.

6.3.2.6 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.

6.4 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 "no effect."

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

- Bull trout have not been identified as occurring within Chimacum Creek or any streams within the Quimper Peninsula. Chimacum Creek is a low gradient stream and provides no spawning habitat for bull trout.
- 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 light disinfection would not result in exceedences of water quality criteria within Chimacum Creek. 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 flow augmentation within Chimacum Creek. Reclaimed water will be directed to a rapid rate infiltration basin

where it will percolate into the groundwater table and interact with surface waters of Chimacum Creek.

- 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 Chimacum Creek during installation of collection lines and construction of the pump station; 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 Chimacum Creek.
- The majority of site work will occur approximately 300 feet or more from the right bank of Chimacum Creek.
- All equipment and materials will be stored and staged within the construction footprint located approximately 300 feet or of more from the right bank of Chimacum Creek.
- Refueling will occur farther than 300 feet from any surface water feature, including the Chimacum Creek. 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.* 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.
- Tree removal, if necessary, will be conducted a minimum of 300 feet from the right bank of Chimacum Creek. The County is looking at potential areas for riparian restoration, including tree planting and to assist with a reduction in stream temperatures.

7.1.2 Puget Sound DPS Steelhead

The overall effect determination for Puget Sound DPS steelhead 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:

- Steelhead use the portion of Chimacum Creek within the Action Area has been documented.
- 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. 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 wastewater to a rapid rate infiltration

basin where highly treated effluent will percolate into groundwater. This groundwater is hydrologically connected to Chimacum Creek and will provide recharge to the stream during the drier summer months.

- The wastewater treatment plant will utilize MBR treatment technology and UV light 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 12 acres of clearing and grading and limited vegetation removal.
- The proposed action will result in an increase in impervious surface within the basin (3.0 acres).
- The proposed action will likely include soil disturbing activities within 300 feet of Chimacum Creek during installation of collection lines and during construction of the influent pump station.

A "not likely to adversely affect" determination is warranted for this proposed action for steelhead 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 light disinfection would not result in exceedences of water quality criteria within Chimacum Creek. 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 flow augmentation within Chimacum Creek. Reclaimed water will be directed to a rapid rate infiltration basin where it will percolate into the groundwater table and interact with surface waters of Chimacum Creek.
- 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 Chimacum Creek.
- The majority of site work for the wastewater treatment plant will occur approximately 300 feet or more from the right bank of Chimacum Creek.
- All equipment and materials will be stored and staged within the construction footprint located approximately 300 feet or of more from the right bank of Chimacum Creek.

- Refueling will occur farther than 300 feet from any surface water feature, including the Chimacum Creek. 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.* 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.
- Tree removal, if necessary, will be conducted a minimum of 300 feet from the right bank of Chimacum Creek. The County is looking at potential areas for riparian restoration, including tree planting and to assist with a reduction in stream temperatures.

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 the portion of Chimacum Creek within the Action Area has not been documented; however, a small number of juveniles are known to occur along the marine nearshore and likely extend into the Chimacum Creek estuary.
- 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. 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 wastewater to a rapid rate infiltration basin where highly treated effluent will percolate into groundwater. This groundwater is hydrologically connected to Chimacum Creek and will provide recharge to the stream during the drier summer months.
- The wastewater treatment plant will utilize MBR treatment technology and UV light 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 12 acres of clearing and grading and limited vegetation removal.
- The proposed action will result in an increase in impervious surface within the basin (3.0 acres).
- The proposed action will likely include soil disturbing activities within 300 feet of Chimacum Creek during installation of collection lines and during construction of the influent pump station.

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 Port Townsend Bay by juvenile Chinook have been identified during baseline studies and follow up surveys, adults Chinook are not known to spawn or have been documented within any of the streams in the project Action Area, including Chimacum Creek. Only two juveniles were collected during the initial baseline beach seining efforts along the Port Hadlock/Irondale marine nearshore in 2002 and none were identified in follow up surveys in 2005 and 2006. 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 a high quality effluent 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 Port Hadlock/Irondale UGA.
- The use of MBR treatment technology and UV light disinfection would not result in exceedences of water quality criteria within Chimacum Creek, estuarine, or 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 with the primary goal of flow augmentation within Chimacum Creek. Reclaimed water will be directed to a rapid rate infiltration basin where it will percolate into the groundwater table and interact with surface waters of Chimacum Creek.
- 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 Chimacum Creek.
- The majority of site work for the wastewater treatment plant will occur approximately 300 feet or more from the right bank of Chimacum Creek.
- All equipment and materials will be stored and staged within the construction footprint located approximately 300 feet or of more from the right bank of Chimacum Creek.
- Refueling will occur farther than 300 feet from any surface water feature, including the Chimacum Creek. 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.* 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.
- Tree removal, if necessary, will be conducted a minimum of 300 feet from the right bank of Chimacum Creek. The County is looking at potential areas for riparian restoration, including tree planting and to assist with a reduction in stream temperatures.

7.1.4 Hood Canal Summer Run Chum Salmon

The overall effect determination for Hood Canal summer run chum 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:

- Chum salmon use of Chimacum Creek, estuary, and marine nearshore environment within the Action Area for spawning, rearing, and migration.
- 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. 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 wastewater to a rapid rate infiltration basin where highly treated effluent will percolate into groundwater. This groundwater is hydrologically connected to Chimacum Creek and will provide recharge to the stream during the drier summer months.
- The wastewater treatment plant will utilize MBR treatment technology and UV light 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 12 acres of clearing and grading and limited vegetation removal.
- The proposed action will result in an increase in impervious surface within the basin (3.0 acres).
- The proposed action will likely include soil disturbing activities within 300 feet of Chimacum Creek during installation of collection lines and during construction of the influent pump station.

A "not likely to adversely affect" determination is warranted for this proposed action for Hood Canal summer run chum salmon 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 light disinfection would not result in exceedences of water quality criteria within Chimacum Creek. 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 flow augmentation within Chimacum Creek. Reclaimed water will be directed to a rapid rate infiltration basin where it will percolate into the groundwater table and interact with surface waters of Chimacum Creek.
- The proposed action will not prevent upstream or downstream migration of adults or juveniles. The proposed action is anticipated to improve base flows by providing

groundwater recharge during critical upstream spawning migrations and during incubation.

- 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 Chimacum Creek.
- The majority of site work for the wastewater treatment plant will occur approximately 300 feet or more from the right bank of Chimacum Creek.
- All equipment and materials will be stored and staged within the construction footprint located approximately 300 feet or of more from the right bank of Chimacum Creek.
- Refueling will occur farther than 300 feet from any surface water feature, including the Chimacum Creek. 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.* 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.
- Tree removal, if necessary, will be conducted a minimum of 300 feet from the right bank of Chimacum Creek. The County is looking at potential areas for riparian restoration, including tree planting and to assist with a reduction in stream temperatures.

7.1.5 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. Port Hadlock and Irondale are 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 Port Hadlock and Irondale. No critical habitat has been designated within Chimacum Creek.
- The project will result in the construction of a new wastewater treatment plant, conventional gravity collection system, reuse field, and pump stations. The primary effect to critical habitat is related to the discharge of highly treated effluent from the wastewater treatment plant to the groundwater, which will provide recharge to Chimacum Creek. There is a potential for water quality impacts both to Chimacum Creek, the Chimacum Creek estuary, and the marine nearshore as a result.
- The proposed action will likely include soil disturbing activities within 300 feet of Chimacum Creek during installation of collection lines and during construction of the influent pump station. This action may increase erosion and sedimentation of Chimacum Creek. No in-water work will be required.
- The proposed action will add approximately 3.0 acres of new impervious surface to the basin.
- The following PCE's are present within the project Action Area: 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 and 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.

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 work within estuarine or nearshore habitats.
- The use of MBR treatment technology and UV light 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 with the primary goal of flow augmentation within Chimacum Creek. Reclaimed water will be directed to a rapid rate infiltration basin where it will percolate into the groundwater table and interact with surface waters of Chimacum Creek and then indirectly to the estuarine and marine nearshore habitats.

- 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. 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.
- The proposed action is not likely to have an adverse affect on aquatic invertebrates or fish species that may provide forage for Chinook salmon adults and juveniles.
- While some new impervious surface will be added to the basin (3.0 acres), 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.* In addition, all stormwater will be directed to a stormwater detention pond and infiltrated into subsurface soils and groundwater.
- TESC measures and a Stormwater Pollution Prevention Plan will be in place to minimize the potential for turbidity and sedimentation of Chimacum Creek 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.

7.2.2 Critical Habitat for Hood Canal Summer Run ESU Chum Salmon

The overall effect determination for critical habitat for the Hood Canal Summer Run ESU chum salmon as a result of the proposed action is “may affect, not likely to adversely affect.”

A “may affect” determination for Hood Canal Summer Run ESU chum salmon critical habitat is warranted based on the following rationale:

- The project lies within designated critical habitat.
- The project will result in the construction of a wastewater treatment plant, conventional gravity collection system, reuse field, and pump stations. The primary effect to critical habitat is related to the discharge of highly treated effluent from the wastewater treatment plant to the groundwater, which will provide recharge to Chimacum Creek. There is a potential for water quality impacts both to Chimacum Creek, the Chimacum Creek estuary, and the marine nearshore as a result.
- The proposed action will likely include soil disturbing activities within 300 feet of Chimacum Creek during installation of collection lines and during construction of the influent pump station. This action may increase erosion and sedimentation of Chimacum Creek. No in-water work will be required.
- The proposed action will add approximately 3.0 acres of new impervious surface to the basin.
- The following PCE’s are present within the project Action Area: 1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development; 2) Freshwater rearing sites with water quantity and

floodplain connectivity to form and maintain physical habitat conditions, and support juvenile growth and mobility; water quality and forage supporting juvenile development; and natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks; 3) Freshwater migration corridors free of obstruction with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival; 4) 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; and 5) 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.

A "not likely to adversely affect" determination is warranted for this proposed action for Hood Canal Summer Run ESU chum salmon critical habitat because:

- The proposed action will not require any work within Chimacum Creek or estuarine and nearshore habitats.
- The use of MBR treatment technology and UV light disinfection would not result in exceedences of water quality criteria within Chimacum Creek or 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 with the primary goal of flow augmentation within Chimacum Creek. Reclaimed water will be directed to a rapid rate infiltration basin where it will percolate into the groundwater table and interact with surface waters of Chimacum Creek and then indirectly to the estuarine and marine nearshore habitats.
- 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. This is anticipated to have an overall benefit to the Chimacum Creek and marine and estuarine environments by reducing nutrient inputs from leaking septic systems and improving overall water quality.
- The proposed action is anticipated to improve migration conditions for adults and incubating conditions for eggs by providing recharge to the local groundwater table and subsequently Chimacum Creek. Adults spawning overlaps with summer low flow conditions within Chimacum Creek. The addition and recharge of the local groundwater table will supplement flows in Chimacum Creek and help reduce elevated stream temperatures that generally coincide with low flow conditions during this critical time period.
- The proposed action is not likely to have an adverse affect on aquatic invertebrates or fish species that may provide forage for Chum salmon adults and juveniles.
- While some new impervious surface will be added to the basin (3.0 acres), 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.* In addition, all stormwater will be directed to a stormwater detention pond and infiltrated into subsurface soils and groundwater.

- TESC measures and a Stormwater Pollution Prevention Plan will be in place to minimize the potential for turbidity and sedimentation of Chimacum Creek 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.
- BMP's will be in place to prevent spills of oils, hydraulic fluids, or other contaminants into the surface waters.

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