

Joint Base Lewis-McChord Waste Water Treatment Plant Replacement

Biological Evaluation

October 2012

TABLE OF CONTENTS

1.0	INTRODUCTION	6
1.1	Background and Agency Consultation History	6
1.2	Project Description	7
1.3	Impact Avoidance and Minimization Measures	8
1.4	Action Area	9
2.0	Listed Species and Designated Critical Habitat in Action Area	10
3.0	Effects Analysis.....	12
3.1	Bull Trout	12
3.2	Chinook.....	13
3.3	Steelhead	13
3.4	Pacific Eulachon	13
3.5	Rockfish	13
4.0	CONCLUSIONS AND DETERMINATION OF EFFECTS	13

LIST OF TABLES

Table 1: All ESA-Listed Endangered, Threatened	10
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LIST OF FIGURES

Figure 1. Proposed JBLM WWTP Replacement Project Location and Action Area.....	10
Figure 2: Existing Solo Point WWTP Facilities	11
Figure 3. Site Layout for New Solo Point WWTP Facilities.....	8

ACRONYMS AND ABBREVIATIONS

Army	Department of Army
BA	Biological Assessment
BE	Biological Evaluation
BMP	Best Management Practices
CFR	Code of Federal Regulations
CWA	Clean Water Act
DoD	Department of Defense
DPS	distinct population segment
ESA	Endangered Species Act
ESU	evolutionarily significant unit
gpm	gallons per minute
JBLM	Joint Base Lewis-McChord
LEED	Leadership in Energy and Environmental Design
MBR	membrane bioreactor
mgd	million gallons per day
mg/L	milligrams per liter
NE	No Effect
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
PBDE	Polybrominated diphenyl ethers
PCE	primary constituent element
ROD	Record of Decision
RWDS	reclaimed water distribution facility and system
Services, the	USFWS and NOAA-NMFS
U.S.C.	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
WWTP	waste water treatment plant
WRIA	Water Resource Inventory Area

1.0 INTRODUCTION

1.1 Background and Agency Consultation History

In February 2011, the Executive Director for the Army Installation Management Command signed a Record of Decision (ROD) for Fort Lewis Army Growth and Force Structure Realignment Final Environmental Impact Statement (U.S. Army 2010) which allowed the stationing of up to 5,700 new active duty Soldiers at Joint Base Lewis-McChord (JBLM). Due to the identification of potential significant impacts to water quality associated with the increase of future demands at the existing Solo Point Waste Water Treatment Plant (WWTP), the Department of Army (Army) committed to the construction of a new WWTP to mitigate impacts to less than significant. The Army also reaffirmed their commitment to pursue funding and proposed general timeframes for plant construction and operation in a letter to the U.S. Environmental Protection Agency's (USEPA) Regional Administrator. This was a required conservation measure outlined in USEPA's Formal Consultation with the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) for the Reissuance of the Fort Lewis (JBLM) Wastewater Treatment Facility National Pollution Discharge Elimination System (NPDES) Permit (NMFS, 2012).

On April 23, 2012 the Army requested informal consultation on a Biological Assessment (BA) that was prepared for the construction of a new WWTP and Reclaimed Water Distribution System (RWDS) at JBLM. After review of the Biological Assessment (BA), the U.S. Fish and Wildlife Service (USFWS) indicated in a letter that was received by the Army on May 24, 2012, that additional information was needed before consultation could begin. After receipt of this letter, the Army scheduled an on-site meeting on May 30, 2012 between Gayle Kreitman from NMFS, Ryan Reynolds from USFWS, and JBLM Planning and Environmental Division staff to discuss concerns and potential issues with the project.

Following the meeting with the USFWS and NMFS (known collectively as the Services), the Army realized the scope of the proposed project that was outlined in the March 2012 BA needed to be clarified in order for consultation to continue. In the previous assessment, the Army set out a broad description of their proposed action, which mimicked the project's National Environmental Policy Act (NEPA) Environmental Assessment (EA), including its cumulative impact which discussed the full range of past and future federal activities. The BA stated that the proposed action would construct a new WWTP facility at JBLM, construct a new outfall, remove the existing Solo Point WWTP, and construct a reclaimed water distribution system, but then limited the effects determination to only the construction of the WWTP and RWDS. While the intention was to give the Services a general understanding of the long-term plan for the WWTP, the Army did not explicate the current proposed action from those long-term activities that are not programmed and currently remain unfunded.

This revised Biological Evaluation (BE) has been prepared to analyze the design-builds potential effects on proposed species, federally listed threatened and endangered species, as well as their critical habitat. Candidate species were also acknowledged within this BE, if determined to potentially be present in the action area. This BE will be used by the Army to facilitate compliance with the requirements of Section 7(c) of the Endangered Species Act (ESA).

This BE addresses all direct and indirect effects associated with the design and construction (design-build) of the proposed WWTP on listed species and their critical habitat. These effects were considered together with the effects of other activities that are interrelated or interdependent with the design and construction of the WWTP. Impacts associated with the WWTP operation were not considered within this evaluation. The WWTP operation and the discharge of effluent is covered by the consultation conducted for the NPDES permit and the Army is not required to reinitiate consultation for this impact at this time.

Environmental impacts associated with actions that fall under a separate Federal nexus (such as Federal permitting requirements) were not considered a direct and/or indirect effect associated with the project's proposed construction, but were considered part of the environmental baseline. The environmental baseline covers the past and present impact of all Federal actions within the action area. This includes the effects outlined in previous consultations and effects of existing Federal projects that have not yet come in for their Section 7 consultation (USFWS & NMFS, 1998).

The NPDES permitting program is authorized by Section 402 of the Clean Water Act (CWA) and implemented by regulations appearing in Part 122 of Title 40 Code of Federal Regulations (CFR). NPDES permits are administered by the USEPA and are required to be obtained for the operation of the proposed WWTP and the subsequent discharge of the treated water to the Puget Sound. The approval and issuance of a NPDES permit is a federal action, and consequently, requires a separate Section 7 consultation under the ESA. Current outfalls from the Solo Point WWTP are covered under the existing Solo Point WWTP NPDES permit which is valid through April 1, 2017 (USEPA 2009a, 2009b, 2009c, 2010a, 2010b, 2011b) which were previously discussed in formal and/or informal consultation with the Services (see USFWS 13410-2009-F-0394, NMFS 2009/03531).

1.2 Project Description

The purpose of the proposed project is to design and construct a new WWTP at JBLM Solo Point. JBLM's existing WWTP uses 1950-70's technology, relying primarily on trickling filters and bacteria for secondary treatment, and has a history of permit exceedances. The need to replace the existing Solo Point WWTP is based on a feasibility study which indicated that WWTP permit exceedances were not due to plant capacity, but rather its outmoded treatment processes. Furthermore, the study indicated that the aging WWTP had an overall remaining service life of five to seven years before facility failure (CH2M Hill, 2009). Failure to meet permit requirements violates the Clean Water Act and is grounds for an enforcement action or permit termination. Violations may also result in criminal and civil penalties.

The proposed project would construct a new WWTP facility on a roughly ten acre, undisturbed site immediately south of the existing Solo Point WWTP (Figure 1). The proposed design-build specifies a tertiary treatment plant that will produce Class A reclaimed water, using activated sludge treatment with a tertiary filter capable of treating the effluent to less than 1 mg/l Biological Oxygen Demand and less than 1 mg/L Total Suspended Solids (TSS). The design also includes nitrogen removal to less than 3 mg/l. The design-build will also consider technology upgrades, including treatment of Polybrominated diphenyl ethers (PBDEs). In addition to meeting all state water quality standards, the goal of the WWTP is to be capable of producing reclaimed water that would meet Class A standards, which would be

suitable for reuse in the future (JBLM 2011b). Class A reclaimed water treatment requirements are listed in the Washington Administrative Code under WAC- 173-219-420. Class A reclaimed water would be suitable for reuse on JBLM for recharging of upstream aquifers, vehicle wash racks, fire protection, irrigation, and heating ventilation and air conditioning systems.

The proposed design-build would also include a new administration building, shop and laboratory building, and associated vehicle parking lots. The administration building would be designed to meet Leadership in Energy and Environmental Design (LEED) Silver Certification standards and the intent of Executive Order 13423, Strengthening Federal Environmental, Energy, and Transportation Management.

The project's action area covers all interrelated and interdependent actions associated with the WWTP construction, including all utilities and connections, lighting, connecting roadways, and landscaping.

Specific project elements and/or construction activities will include significant site preparation and construction. Substantial site clearing, including tree and brush removal, will be required. Construction methods, materials, and techniques will not differ from those of typical military construction project. Heavy equipment will be used, including but not limited to, the use of excavators, graders, concrete mixers, etc. The general project timeline states that the project award for the design-build would occur August 2013 with design to follow immediately thereafter. Project construction is to be completed by August 2015.

The proposed WWTP will tie into the existing 24-inch diameter outfall which discharges effluent to Puget Sound through a 130-foot long, 14 port diffuser. Each of the 6-inch diameter ports is separated by a distance of 10 feet. The outfall extends from its closest point, approximately 370 feet from shore, to 500 feet at its furthest point. The diffuser depth at mean low water ranges from 70 feet at its deepest point. There are no plans to modify this structure at this time. The mixing zone of the proposed WWTP will remain the same as that under the current NPDES permit.

1.3 Impact Avoidance and Minimization Measures

Previous project designs included the construction of a new outfall as part of the proposed WWTP project. Recent inspection of the outfall, including the outfall diffusers, associated piping and manhole cover showed the pipe was not in need of replacement. In order to avoid the need for in-water work and impacts to marine species, the culvert replacement has been removed from the proposed project.

While NEPA and ESA must be completed in order for the Army to move forward with contract approval for the design and construction (design-build) of a new WWTP; the proposed WWTP will legally not be operational until it is approved for a NPDES permit, or otherwise authorized by the USEPA to use the existing permit. The USEPA has administrative authority for the issuance NPDES permit at JBLM Solo Point. The issuance of a permit constitutes a Federal action requiring consultation under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*). USEPA has requested review of the Army's WWTP beginning at 35% design and will continue to work with the Army through the designing process. Although ESA consultation cannot be completed for the NPDES permit and associated effluent at this stage of the process (prior to project design), any constructed WWTP will not be operational until authorized by the USEPA and any required ESA consultation is completed with the Services. Any required mitigation or minimization measures that result from USEPA's NPDES Section 7

consultation will be incorporated into the WWTP design plans and subsequent construction. Recommendations that are provided by the Services that would reduce impacts to species will also be considered.

1.4 Action Area

The action area for a proposed project is defined as all areas to be affected directly and indirectly by the Federal action, and not merely the immediate area involved in that action (50 CFR 17.11). The limits of the action area are based upon the geographic extent of the farthest reaching physical, chemical and/or biological effects resulting from the proposed action, including direct and indirect effect, as well as effects from interrelated and interdependent activities. Direct effects of the proposed action include the immediate impacts associated with the project construction, such as noise disturbance, potential sedimentation/erosion, etc. Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonably certain to occur (50 CFR 402.02). Although considered, no indirect effects were identified with the construction of the proposed WWTP¹. Operation was not considered because it is covered by the consultation that occurred for the NPDES permit and is not part of this project.

Because all new construction at JBLM requires on-site infiltration and best management practices (BMPs) associated with the projects Stormwater Management Plan, noise impacts associated with construction were considered the farthest reaching effect associated with the proposed action. The project's action area was defined by equating the distance construction point source noise attenuates to ambient sound over soft ground (forested area). The proposed projects ambient baseline was taken from the Fort Lewis Noise Management Plan which indicates that the day-night sound level is between 65-75 dBA (Noise Zone II). Maximum noise levels for non-impact construction equipment ranges from 73-100 dBA. Using the most conservative numbers, it was determined that construction noise has the potential to travel 1256 feet (383 meters) before attenuating to background ($D=50*10^{((100-65)/25)}$).

¹ Indirect effects are those effects that are caused by or will result from the proposed action and are later in time, but are still reasonable certain to occur (50 CFR 402.02). These effects can include impacts that result from the operation of the project and/or future activities related to the project. During project scoping, the *operation* of the WWTP and the associated outfall was discussed as a potential indirect effect of the projects construction. Although "reasonably certain to occur", the proposed operation of the WWTP was considered a direct/indirect impact of USEPA's NPDES permitting decision, not that of the Army's decision to move forward with the design and construction. Although these projects in many ways go hand in hand, the Department of Army is required to complete a NEPA analysis (including a review of other relevant environmental laws) prior to agency decision-making to ensure that the potential environmental impacts of construction of a new WWTP do not outweigh the environmental impacts associated with the 'no action' alternative (the continued operation of the existing WWTP). Prior to the decision to allocate funds in order to pursue the design and construction of a new WWTP, the Department of Army must also ensure that the decision to pursue 'new construction' does not have significant environmental impacts (impacts to wetlands, threatened and endangered species, cultural resources, etc).

Although the permitting of the proposed WWTP is related to its construction, information needed in order to quantify and evaluate impacts associated with the NPDES permit will not be available until the Army is able to allocate funding to pursue a design-build (Federal nexus). Farther into the project design, but no later than 180 days prior to construction and/or operation, the Department of Army will provide the USEPA plans and specifications for the proposed WWTP (likely at 35% design). These plans will be able to provide the USEPA information needed for NPDES approval including, but not limited to: amounts of the pollutant/effluent flow, effluent characteristics, average flow, mixing zones, etc. Under Section 511(c)(1) of the Clean Water Act, NEPA applies to any permitting decisions for the discharge of any pollutant by a 'new source'. In addition to NEPA, USEPA will be required to enter into ESA consultation to address the potential impacts NPDES permitting and effluent discharges have on marine species within the Puget Sound.

FIGURE 1. Proposed JBLM WWTP Replacement Project Location and Action Area

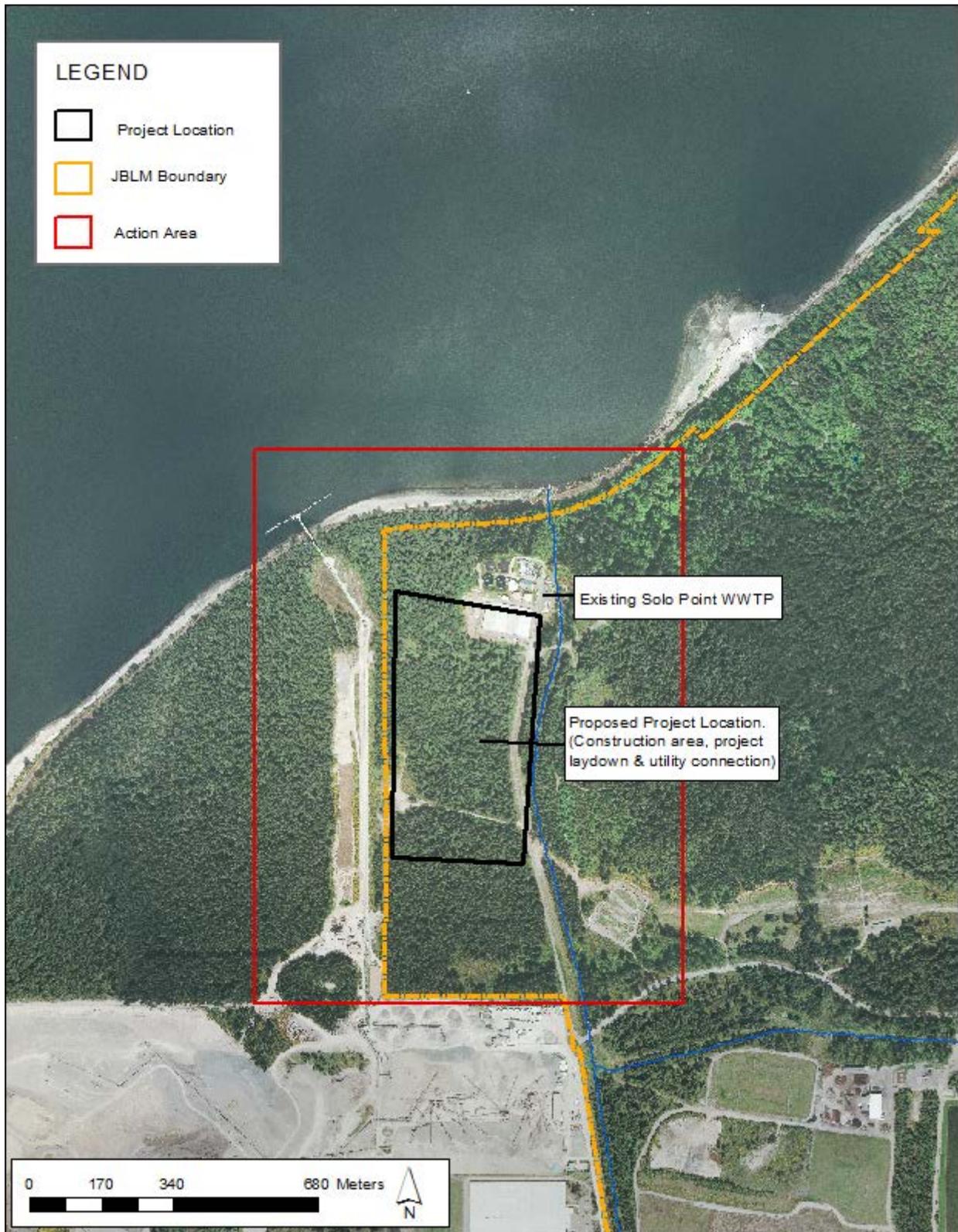
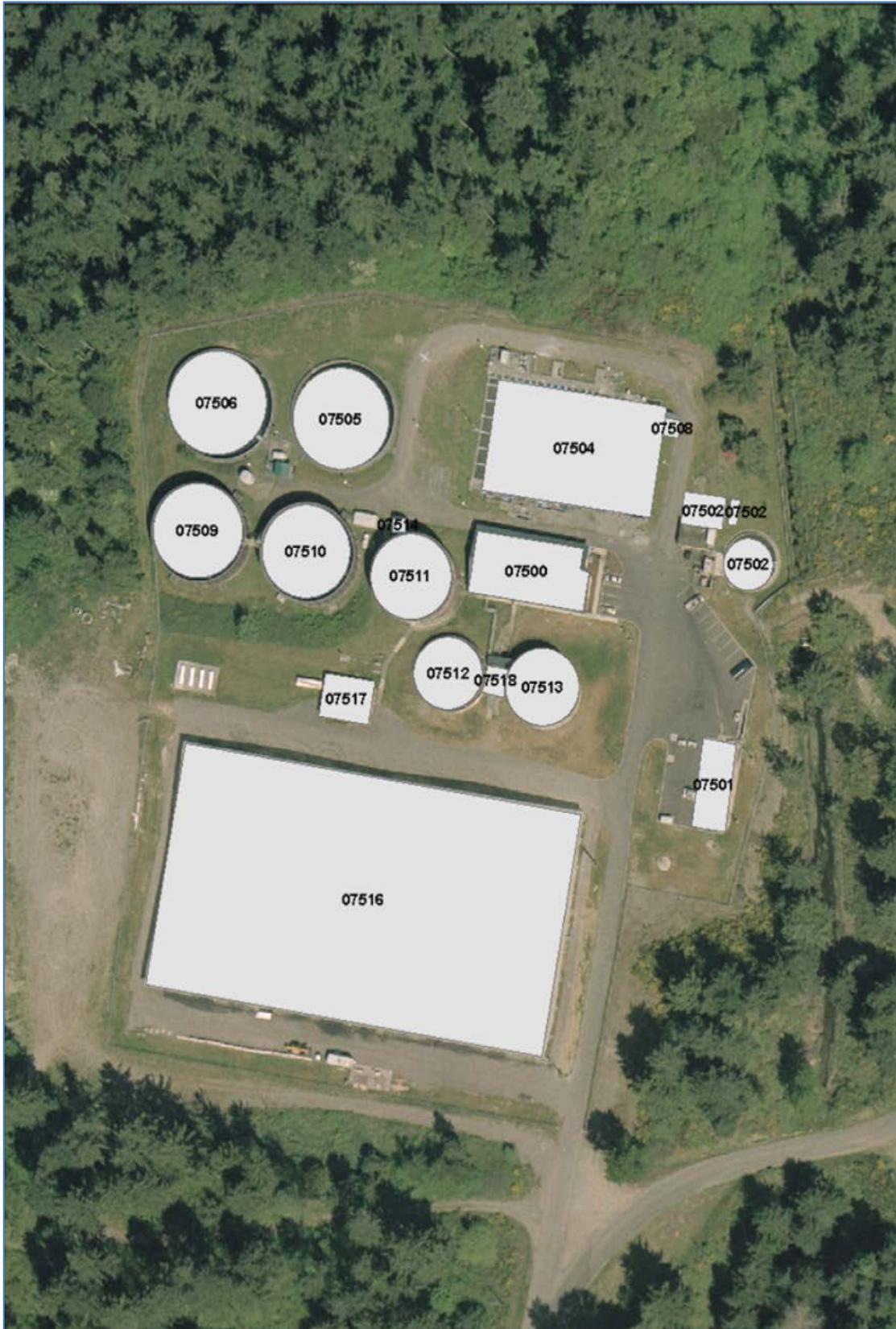


FIGURE 2: Existing Solo Point WWTP Facilities



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2.0 LISTED SPECIES AND DESIGNATED CRITICAL HABITAT IN ACTION AREA

TABLE 1: ALL ESA-LISTED ENDANGERED, THREATENED

Listing status and likelihood of occurrence in the action area is provided.

Common Name (<i>Scientific name</i>)	Listing Status (Federal)	Critical Habitat	Likelihood of Occurrence	Rationale for Absence
Plants				
Golden paintbrush (<i>Castilleja levisecta</i>) ¹	Threatened	Not designated	Not present	Extirpated from range by agricultural/urban development; several surveys on JBLM found no individuals (U.S. Army 1997; USFWS 2000b; Dunwiddie 2009; WDNR2011).
Marsh sandwort (<i>Arenaria paludicola</i>) ¹	Endangered	Not designated	Not present	Extirpated from range by elimination or degradation of habitat; two surveys on JBLM found no individuals (U.S. Army 1997; Ecologic 2009; WDNR2011).
Water howellia (<i>Howellia aquatilis</i>) ¹	Threatened	Not designated	Not present	Population present on eastern edge of JBLM but no known individuals in or near action area (Gamon 1997, 1998; Lynch 2005; WDNR2011).
Whitebark pine (<i>Pinus albicaulis</i>) ¹	Candidate	N/A	Not present	Habitat supporting this species is not present in the action area; historical records indicate this species has never been present in the action area (USFWS 2011a).
Insects				
Taylor's checkerspot (<i>Euphydryas editha taylori</i>) ¹	Proposed	N/A	Not present	Suitable habitat not present in the action area; no recent known occurrence in the action area (McAllister et al. 1997; U.S. Army 2006).
Fishes				
Bull trout (<i>Salvelinus confluentus</i>); Coastal-Puget Sound DPS ¹	Threatened	Designated	Potentially present in marine nearshore	
Chinook salmon (<i>Oncorhynchus tshawytscha</i>); Puget Sound ESU ²	Threatened	Designated	Potentially present in marine nearshore	
Steelhead (<i>Oncorhynchus mykiss</i>); Puget Sound DPS ²	Threatened	Under review	Potentially present in marine nearshore	
Pacific eulachon/smelt (<i>Thaleichthys pacificus</i>); Southern DPS ⁵	Threatened	Designated ⁶	Potentially present in marine nearshore	

Common Name (<i>Scientific name</i>)	Listing Status (Federal)	Critical Habitat	Likelihood of Occurrence	Rationale for Absence
Canary rockfish (<i>Sebastes pinniger</i>); Puget Sound/Georgia Basin DPS ⁵	Threatened	Not designated	Potentially present in marine nearshore	
Yelloweye rockfish (<i>Sebastes ruberrimus</i>); Puget Sound/Georgia Basin DPS ⁵	Threatened	Not designated	Potentially present in marine nearshore	
Bocaccio (<i>Sebastes paucispinis</i>); Puget Sound/Georgia Basin DPS ⁵	Endangered	Not designated	Potentially present in marine nearshore	
Reptiles and Amphibian				
Oregon spotted frog (<i>Rana pretiosa</i>) ¹	Candidate	N/A	Not present	Suitable habitat not present in the action area; no recent known occurrence in the action area (McAllister et al. 1997; U.S. Army 2006).
Birds				
Marbled murrelet (<i>Brachyramphus marmoratus</i>) ¹	Threatened	Designated ⁶	Not present	Although species have been observed near JBLM on the Nisqually River and in Puget Sound near Solo Point, suitable foraging habitat for species is not found in the proposed action which is typically 1-2km from shore (USFWS, 1997).
Northern spotted owl (<i>Strix occidentalis caurina</i>) ¹	Endangered	Designated ⁶	Not present	Although habitat is present on JBLM, none is found in the action area. No records of this species in the action area exist (U.S. Army 2010).
Streaked horned lark (<i>Eremophila alpestris strigata</i>) ¹	Proposed	N/A	Not present	Although habitat is present on JBLM, none is found in the action area. No records of this species in the action area exist (U.S. Army 2010).
Yellowbilled cuckoo (<i>Coccyzus americanus</i>) ¹	Candidate	N/A	Not present	Decline due to reduction of suitable habitat and habitat fragmentation. No habitat or known population is present in the action area (USFWS 2000a).
Mammals				
Southern resident killer whale (<i>Orcinus orca</i>) ⁴	Endangered	Designated	Not present	Although occasional visitors of South Puget Sound, the intertidal and nearshore environments of the action area is not suitable habitat for SRKW (City of Tacoma 2007; Orca Network 2011).
Humpback whale (<i>Megaptera novaeangliae</i>) ⁴	Endangered	Not designated	Not present	They are only infrequent visitors to waters near the Nisqually National Wildlife Refuge and are considered an accidental migrant to

Common Name (<i>Scientific name</i>)	Listing Status (Federal)	Critical Habitat	Likelihood of Occurrence	Rationale for Absence
				Puget Sound (U.S. Army 2010).
Steller sea lion (<i>Eumetopias jubatus</i>); eastern population ⁴	Threatened	Designated ⁶	Not present	No breeding rookeries are found in Washington; no haul-out sites are found in or near the action area (Jefferies et al. 2000).
Mazama pocket gopher (<i>Thomomys mazama</i> ssp. <i>glacialis</i> and <i>tacomensis</i>) (Roy Prairie and Tacoma) ¹	Candidate	N/A	Not present	Suitable habitat is not present in the action area; no populations have been identified in the action area (U.S. Army 2006). Decline due to reduction of native prairie habitat. They avoid areas with high densities of Scotch broom or Douglas-fir (Stinson 2005).
Fisher (<i>Martes pennanti</i>); West Coast DPS ¹	Candidate	N/A	Not present	Decline due to over trapping and loss and fragmentation of low- and mid-elevation late-successional forests. No habitat or known population is present in the action area (Hayes and Lewis 2006).
North American wolverine (<i>Gulo gulo luteus</i>); contiguous U.S. DPS ¹	Candidate	N/A	Not present	Decline due to habitat fragmentation and climate change. No habitat or known population is present in the action area (USFWS 2010a).

3.0 EFFECTS ANALYSIS

Section 7 of the ESA requires federal agencies to ensure that any action authorized, funded, or carried out by a Federal agency is not likely to jeopardize the continued existence of any threatened or endangered species. The species considered in this discussion are those that are listed as endangered or threatened under the ESA. Although considered in this BE, there were no Candidate species identified to be potentially present within the proposed action area. Of those species listed in Table 1, which have the potential to occur in Pierce County, only seven species have been identified to be potentially present within the projects action area. The effects analysis will discuss the direct and indirect effects the proposed project may have on listed species within the action area, as well as any associated critical habitat. The effects of the interrelated and interdependent actions, that have been identified with this action, will also be considered.

3.1 Bull Trout

Juveniles and/or foraging Coastal-Puget Sound Bull trout (*Salvelinus confluentus*) have the potential to be found in the intertidal areas of Solo Point, Puget Sound. Although noise attenuation from construction activities may extend into the nearshore areas of Solo Point, they are not expected to propagate underwater and the proposed project is expected to have no effect on Coastal-Puget Sound bull trout.

3.2 Chinook

Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*) have the potential to be found in the intertidal areas of Solo Point, Puget Sound. Although noise attenuation from construction activities may extend into the nearshore areas of Solo Point, they are not expected to propagate underwater and the proposed project is expected to have no effect on Chinook salmon.

3.3 Steelhead

Puget Sound Steelhead (*Oncorhynchus mykiss*) have the potential to be found in the intertidal areas of Solo Point, Puget Sound. Although noise attenuation from construction activities may extend into the nearshore areas of Solo Point, they are not expected to propagate underwater and the proposed project is expected to have no effect on steelhead.

3.4 Pacific Eulachon

The Southern DPS Pacific eulachon/smelt (*Thaleichthys pacificus*) have the potential to be found in the intertidal areas of Solo Point, Puget Sound. Although noise attenuation from construction activities may extend into the nearshore areas of Solo Point, they are not expected to propagate underwater and the proposed project is expected to have no effect on Pacific Eulachon.

3.5 Rockfish

Juvenile canary (*Sebastes pinniger*), yelloweye (*Sebastes ruberrimus*), and Bocaccio (*Sebastes paucispinis*) rockfish have the potential to be found in the intertidal areas of Solo Point, Puget Sound. Although noise attenuation from construction activities may extend into the nearshore areas of Solo Point, they are not expected to propagate underwater and the proposed project is expected to have no effect on any listed rockfish species.

4.0 CONCLUSIONS AND DETERMINATION OF EFFECTS

An evaluation of all ESA-listed threatened or endangered species in Pierce County indicated that seven marine species have the potential to occur within the projects action area. After review of the project and the potential impacts that are associated with the proposed action, it was determined that the proposed WWTP design and construction will have no effect (NE) on any ESA-listed, or candidate species within the projects vicinity.

While a NE determination has been made for the proposed WWTP design and construction, any changes in the project location and/or new species listings within the project vicinity will trigger further review by JBLM Fish and Wildlife Staff to ensure additional Section 7 consultation is not warranted. This documentation allows the Army to pursue funding for a contract award that would design and construct a new WWTP at Solo Point, but does not complete the agencies Section 7 requirements for the plants operation and/or future RWDS plans. Preferably at 35% design, but no later than 180 days prior to construction, the Army will initiate review of WWTP design plans with the USEPA. In addition to initial design review, the Army will also provide any information requested by the USEPA in furtherance of

their Section 7 requirements for NPDES approval at this time and/or as the project planning proceeds through 35%, 65%, 95%, and 100% design.

LITERATURE CITED

- Beason, R.C. 1995. Horned Lark (*Eremophila alpestris*). Birds of North America No. 195. A. Poole and F. Gill (eds.). Academy of Natural Sciences, Philadelphia, and American Ornithologists' Union, Washington, D.C. 24 pp.
- Beauchesne, S., and J. Cooper. 2003. COSEWIC Status Report on the Horned Lark *Strigata* Subspecies *Eremophila alpestris strigata*. Status report prepared for the Committee on the Status of Endangered Wildlife in Canada. COSEWIC Secretariat c/o Canadian Wildlife Service, Environment Canada, Ottawa, Ontario.
- Bottorff, J.A., B. Gilber, and T. Williams. 1991. 1991 Northern Spotted Owl Survey: Fort Lewis Military Reservation, Pierce County, Washington. Unpublished Report for U.S. Department of Defense by U.S. Fish and Wildlife Service (USFWS). Olympia, Washington.
- Brown and Caldwell, Inc. 1985. Clover/Chambers Creek Basin Geohydrologic Study. Prepared for the Tacoma-Pierce County Health Department. As cited in U.S. Army 1994.
- Carter, H., and S. Sealy. 1990. Daily Foraging Behavior of Marbled Murrelets. *Studies in Avian Biology* 14:93-102.
- CH2M HILL. 2009. Fort Lewis Wastewater Feasibility Study. Prepared for U.S. Army Corps of Engineers and Fort Lewis Public Works under Contract No. W912DW-06-D-1001, Task Order No. 0010.
- City of Tacoma. 2007. Final Draft; Tacoma Shoreline Inventory and Characterization. December 2007.
- Dunwiddie, P. 2009. Evaluating Suitability of Prairies for Golden Paintbrush (*Castilleja levisecta*) Recovery by Experimental Outplanting in South Puget Sound. Final Report. The Nature Conservancy, Seattle, Washington. 17 pages.
- Eco-logic (Eco-logic Botanical Consulting). 2009. 2009 Plant Surveys, Fort Lewis Prairies. Bellingham, Washington.
- Ford, J.K.B., G.M. Ellis, and K.C. Balcomb. 2000. Killer whales: the Natural History and Genealogy of *Orcinus orca* in British Columbia and Washington State. 2nd Ed. University of British Columbia Press, Vancouver, B.C.
- Fort Lewis Public Works. 2006. Draft Endangered Species Management Plan for the Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss*), and bull trout – costal/Puget Sound (*Salvelinus confluentus*). Environmental and Natural Resources Division. Fort Lewis, Washington.
- Fresh, K. 2006. Juvenile Pacific Salmon and the Nearshore Ecosystem of Puget Sound. Puget Sound nearshore partnership Report No. 2006-06. Published by Seattle District, U.S. Army Corps of Engineers, Seattle, Washington. Available at:
http://www.pugetsoundnearshore.org/technical_papers/juv_salmon.pdf.

- Gamon, J.G. 1997. Endangered Species Management Plan for the Water Howellia (*Howellia aquatilis*): Fort Lewis, Washington. Unpublished Report Prepared for ENRD/Fish and Wildlife Branch of Fort Lewis.
- Gamon, J.G. 1998. Inventory of Fort Lewis for Water Howellia (*Howellia aquatilis*): A Federally Threatened Species. Washington Department of Natural Resources, Division of Forest Resources. Natural Heritage Program. Olympia, Washington.
- Goetz, F.A. 1989. Biology of the Bull Trout, (*Salvelinus confluentus*): a Literature Review. U.S. Department of Agriculture (USDA), Forest Service, Willamette National Forest. Eugene, Oregon.
- Goetz, F.A., E. Jeanes, and E. Beamer. 2004. Bull trout in the Nearshore. Unpublished preliminary draft report, U.S. Army Corps of Engineers, Seattle, Washington.
- Good, T.P., R.S. Waples, and P. Adams (editors). 2005. Updated Status of Federally Listed ESUs of West Coast Salmon and Steelhead. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-66, 598 p. Available at: <http://www.nwr.noaa.gov/Publications/Biological-Status-Reviews/upload/SR2005-allspecies.pdf>.
- Gustafson, R.G., M.J. Ford, D. Teel, and J.S. Drake. 2010. Status Review of Eulachon (*Thaleichthys pacificus*) in Washington, Oregon, and California. U.S. Department of Commerce, NOAA Technical Memo. NMFS-NWFSC-105, 360 p. Available at: http://www.nwfsc.noaa.gov/assets/25/7092_06162010_142619_EulachonTM105WebFinal.pdf.
- Hallock, L.A., and W.P. Leonard. 1997. Herpetofauna of Fort Lewis Military Reservation, Pierce and Thurston Counties, Washington. Washington Department of Natural Resources, Washington Natural Heritage Program, in Cooperation with the Nature Conservancy of Washington, Olympia, Washington.
- Hamer Environmental, L.P. 2009. Use of Radar to Determine the Presence/Absence of Marbled Murrelets at Fort Lewis, Washington. Prepared for The Nature Conservancy. Mount Vernon, Washington.
- Hayes, G.E., and J.C. Lewis. 2006. Washington State Recovery Plan for the Fisher. Washington Department of Fish and Wildlife, Olympia. 62+ viii pp.
- HDR (HDR Engineering Inc.). 2011a. Project Definition Report FY13 Water Reclamation System PN 78533 Joint Base Lewis-McChord, WA. 30 September 2011.
- HDR (HDR Engineering Inc.). 2011b. Project Definition Report FY13 Wastewater Treatment Plan PN 75615 Joint Base Lewis-McChord, WA. 24 August 2011.
- Healey, M. C. 1991. The Life History of Chinook Salmon (*Oncorhynchus tshawytscha*). In C. Groot and L. Margolis (eds.), Life history of Pacific salmon, p. 311–393. University of British Columbia Press, Vancouver, BC.
- Jeffries, S.J., P.J. Gearin, H.R. Huber, D.L. Saul, and D.A. Pruett. 2000. Atlas of Seal and Sea Lion Haulout Sites in Washington. Washington Department of Fish and Wild life, Wildlife Science Division, 600

- Capitol Way North, Olympia WA. pp. 150. Available at:
<http://wdfw.wa.gov/publications/00427/wdfw00427.pdf>.
- JBLM (Joint Base Lewis-McChord). 2011a. Solo Point Waste Water Treatment Plant, diver inspection data.
- JBLM (Joint Base Lewis-McChord). 2011b. Project 78533 Phase 2 Army Construction Planning Documentation Waste Water Treatment Reuse System. 17 August 2011.
- Kriete, B. 2007. Orcas in Puget Sound. Puget Sound Nearshore Partnership Report No. 2007-01. Published by Seattle District, U.S. Army Corps of Engineers, Seattle, Washington. Available at:
http://www.pugetsoundnearshore.org/technical_reports.htm.
- Love, M.S., M. Yoklavich, and L. Thorsteinson. 2002. The Rockfishes of the Northeast Pacific. University of California Press. 404 p.
- McAllister, Kelly R., and William P. Leonard. 1997. Washington State Status Report for the Oregon Spotted Frog. Washington Department of Fish and Wildlife, Olympia. pp38.
- Myers, J.M., R.G. Kope, B.J. Bryant, D. Teel, L.J. Lierheimer, T.C. Wainwright, W.S. Grant, F.W. Waknitz, K. Neely, S.T. Lindley, and R.S. Waples. 1998. Status Review of Chinook Salmon from Washington, Idaho, Oregon, and California. U.S. Department of Commerce, NOAA Technical Memo NMFS-NWFSC-35.
- NMFS (National Marine Fisheries Service). 2008. Recovery Plan for Southern Resident Killer Whales (*Orcinus orca*). National Marine Fisheries Service, Northwest Region, Seattle, Washington. Available at: <http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/ESA-Status/upload/SRKW-Recov-Plan.pdf>.
- NMFS (National Marine Fisheries Service). 2012. Endangered Species Act Section 7(a)(2) Biological Opinion and Section 7(a)(2) "Not Likely to Adversely Affect" Determination and Magnuson-Stevens Fishery Conservation Management Act Essential Fish Habitat Consultation for the Reissuance of the Fort Lewis Wastewater Treatment Facility NPDES Permit (WA-002195-4). Consultation Tracking # 2009/03531. January 31, 2012.
- NOAA (National Oceanic and Atmospheric Administration). 1999. Endangered and Threatened Wildlife and Plants; 90-day Finding for a Petition to list Columbia River Eulachon (*Thaleichthys pacificus*) as Endangered or Threatened. 50 CFR Parts 223 and 224. Available at:
http://ecos.fws.gov/docs/federal_register/fr3477.pdf.
- NOAA (National Oceanic and Atmospheric Administration). 2011a. EFH Text Descriptions & GIS Data Inventory. NOAA Habitat Program. Accessed: February 1, 2011. Available at:
http://sharpfin.nmfs.noaa.gov/website/efh_mapper/newinv/efh_inventory.html.
- NOAA-NMFS (National Oceanic and Atmospheric Administration–National Marine Fisheries Service). 2005. Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California. 70 FR 52488 52627. 2 September 2005. Available at:
<http://www.gpo.gov/fdsys/search/citation.result.FR.action?federalRegister.volume=2005&federalRegister.page=52488&publication=FR>.

- NOAA-NMFS (National Oceanic and Atmospheric Administration–National Marine Fisheries Service). 2011f. Endangered Species Act Status of West Coast Salmon & Steelhead. Updated: 11 August 2011.
- NOAA-NMFS (National Oceanic and Atmospheric Administration–National Marine Fisheries Service). 2011b. ESA-Listed Marine Mammals. Under the jurisdiction of NOAA Fisheries that may occur in Puget Sound. Updated: 1 November 2011.
- NOAA-NMFS (National Oceanic and Atmospheric Administration–National Marine Fisheries Service). 2011c. Endangered and Threatened Species, Designation of Critical Habitat for Southern Distinct Population Segment of Eulachon. (Proposed rule). 50 CFR Part 226. 5 January 2011. Available at: <http://www.nmfs.noaa.gov/pr/pdfs/fr/fr76-515.pdf>.
- NOAA-NMFS (National Oceanic and Atmospheric Administration–National Marine Fisheries Service). 2011d. Other ESA-Listed Species. Under the jurisdiction of NOAA Fisheries that may occur off Washington & Oregon. Updated: 1 November 2011.
- NOAA-NMFS (National Oceanic and Atmospheric Administration–National Marine Fisheries Service). 2011e. Cetaceans: Whales, Dolphins, and Porpoises. Accessed: 7 December 2011. Available at: <http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/>.
- Olesiuk, P.F., M.A. Bigg, and G.M. Ellis. 1990. Life History and Population Dynamics of Resident Killer Whales (*Orcinus orca*) in the Coastal Waters of British Columbia and Washington States. Report of the International Whaling Commission, Special Issue 12:209-243.
- Orca Network. 2011. Recent Whale Sightings in the Salish Sea (Puget Sound, Northwest Straits, Gulf Islands and Georgia Strait). Accessed: 7 December 2011. Available at: <http://www.orcanetwork.org/sightings/map.html>.
- Osborne, R.W. 2008. The Whale Museum, Southern Resident Killer Whale Sighting Compilation 1990-2008. Accessed: 29 November 2011. Available at: <http://www.whalemuseum.org/>.
- Palsson, W.A., T. Tsou, G.G. Bargmann, R.M. Buckley, J.E. West, M.L. Mills, Y.W. Cheng, and R.E. Pacunski. 2009. The Biology and Assessment of Rockfishes in Puget Sound. Fish Management Division, Fish Program. Washington Department of Fish and Wildlife. Olympia, Washington. Available at: <http://wdfw.wa.gov/publications/00926/wdfw00926.pdf>.
- Pearson, S.F. 2003. Breeding Phenology, Nesting Success, Habitat Selection, and Census Methods for the Streaked Horned Lark in the Puget Lowlands of Washington. Natural Areas Program Report 2003-2, Washington Department of Natural Resources, Olympia, Washington. 38 pp.
- Pearson, S.F., and M. Hopey. 2004. Streaked Horned Lark Inventory, Nesting Success and Habitat Selection in the Puget Lowlands of Washington. Natural Areas Program Report 2004-1. Washington Department of Natural Resources, Olympia, Washington.
- Pearson, S.F., and M. Hopey. 2005. Streaked Horned Lark Nest Success, Habitat Selection, and Habitat Enhancement Experiments for the Puget Lowlands, Coastal Washington and Columbia River Islands. Natural Areas Program Report 2005-1. Washington Department of Natural Resources. Olympia, Washington.

- Pearson, S.F., M. Hopey, W. D. Robinson, and R. Moore. 2005. Range, Abundance and Movement Patterns of Wintering Streaked Horned Larks in Oregon and Washington. Natural Areas Program Report 2005-2. Washington Dept. of Natural Resources. Olympia, Washington.
- Potter, A., J. Fleckenstein, S. Richardson, and D. Hays. 1999. Washington State Status Report for the Mardon Skipper. Washington Department of Fish and Wildlife, Olympia. 39 pp. Available at: <http://wdfw.wa.gov/publications/00376/wdfw00376.pdf>.
- Pratt, L.K. 1992. A Review of Bull Trout Life History. In Proceedings of the Gearhart Mountain Bull Trout Workshop. Howell, P.J. and D.V. Buchanan, (eds.). Oregon Chapter of American Fisheries Society. Corvallis, Oregon.
- Richardson, J. 2009. 2009 Steelhead Spawning Survey. Fort Lewis, Washington.
- Rogers, R.E. 2000. The Status and Microhabitat Selection of Streaked Horned Lark, Western Bluebird, Oregon Vesper Sparrow, and Western Meadowlark in Western Washington. Masters Thesis, The Evergreen State College, Olympia, Washington.
- Stinson, D.W. 2005. Washington State Status Report for the Mazama Pocket Gopher, Streaked Horned Lark, and Taylor's Checkerspot. Washington Department of Fish and Wildlife, Olympia. 129+ xii pp. Available at: <http://wdfw.wa.gov/publications/00390/wdfw00390.pdf>.
- StreamNet. 2011. Digital Data for Pacific Northwest Fish Distribution. Accessed: 30 November 2011. Available at: <http://www.streamnet.org/>.
- Swarts, S., and M. Salema. 1997. Survey for the Presence of Bull Trout and Potential Habitat on Fort Lewis. Environmental and Natural Resource Division.
- U.S. Army (United States Army). 1997. A Status Report on Endangered, Threatened and Sensitive Plants known to Occur on Fort Lewis Military Reservation, Washington. Fort Lewis Land Condition Trend Analysis Field Reports 1997. Fort Lewis, Washington.
- U.S. Army (United States Army). 2006. Fort Lewis Fish and Wildlife Management Plan (an Ecosystem Based approach to Sustainability). August 2006.
- U.S. Army (United States Army). 2007. Final Integrated Natural Resources Management Plan 2007 to 2011 for Fort Lewis, Washington. ENSR, Redmond, Washington. 108 pages + appendices.
- U.S. Army (United States Army). 2010. Final Environmental Impact Statement for the Fort Lewis Army growth and force structure realignment. July 2010.
- U.S. Army (United States Army). 2011. Record of Decision for the Fort Lewis Army Growth and Force Structure Realignment. February 2011.
- USEPA (United States Environmental Protection Agency). 2009a. Fact Sheet NPDES Permit Number: WA-002195-4. 28 August 2009.
- USEPA (United States Environmental Protection Agency). 2009b. The U.S. Environmental Protection Agency Plans to Reissue a Wastewater Discharge Permit to: Solo Point Wastewater Treatment

- Plant. U.S. Department of Defense, Department of the Army Fort Lewis Army Base Fort Lewis, Washington 98433-5000 and the State of Washington proposes to certify the permit and issue a consistency determination. Permit No.: WA-002195-4 Fort Lewis - Solo Point WWTP. October 13, 2009.
- USEPA (United States Environmental Protection Agency). 2009c. Biological Evaluation for Reissuance of the Fort Lewis NPDES Permit USEPA Region 10 Office of Water and Watersheds.
- USEPA (United States Environmental Protection Agency). 2010a. ADDENDUM II to the Biological Evaluation for Reissuance of the Fort Lewis (Joint Base Lewis McChord) NPDES Permit No. WA-002195-4. Prepared in Response to the Listing of the Rockfish USEPA Region 10 Office of Water and Watersheds.
- USEPA (United States Environmental Protection Agency). 2010b. ADDENDUM to the Biological Evaluation for Reissuance of the Fort Lewis (Joint Base Lewis McChord) NPDES Permit. Prepared in Response to a Request for Additional Information From NOAA National Marine Fisheries Service; USEPA Region 10 Office of Water and Watersheds.
- USEPA (United States Environmental Protection Agency). 2011a. State and County Emission Summaries. Accessed: 1 December 2011. Available at: <http://www.epa.gov/air/emissions/where.htm>.
- USEPA (United States Environmental Protection Agency). 2011b. Authorization to Discharge under the National Pollutant Discharge Elimination System Permit No.: WA-002195-4.
- USFWS (United States Fish and Wildlife Service). 1997. Recovery Plan for the Threatened Marbled Murrelet in Washington, Oregon, and California. Portland, Oregon. Available at: http://ecos.fws.gov/docs/recovery_plan/970924.pdf/.
- USFWS (United States Fish and Wildlife Service). 1999. ETWP; Determination of Threatened Status for Bull Trout in the Coterminous United States. 64 FR 58909 58933. 1 November 1999. Available at: http://ecos.fws.gov/docs/federal_register/fr3456.pdf.
- USFWS (United States Fish and Wildlife Service). 2000a. Endangered and Threatened Wildlife and Plants; Notice of 90-Day Finding for a Petition to List the Yellow-Billed Cuckoo as Endangered and Commencement of a Status Review. 50 CFR Part 17. Available at: http://ecos.fws.gov/docs/federal_register/fr3541.pdf.
- USFWS (United States Fish and Wildlife Service). 2000b. Golden Paintbrush, *Castilleja levisecta*. Portland, Oregon. Available at: <http://www.fws.gov/oregonfwo/Species/Data/GoldenPaintbrush/>.
- USFWS (United States Fish and Wildlife Service). 2004a. Draft Recovery Plan for the Coastal-Puget Sound Distinct Population Segment of Bull Trout (*Salvelinus confluentus*). Volume I: Puget Sound Management Unit, 389+xvii pp and Volume II: Olympic Peninsula Management Unit, 277+xvi pp. Portland, Oregon.
- USFWS (United States Fish and Wildlife Service). 2004b. Marbled Murrelet Critical Habitat Designation in Pierce County, Washington. October 8, 2004. Sacramento, California. Available at: http://sacramento.fws.gov/es/where_is_critical_habitat.htm.

- USFWS (United States Fish and Wildlife Service). 2005. Endangered and Threatened Wildlife Plants; Designation of Critical Habitat for the Bull Trout; Final Rule. 70 FR 56211 56311. 26 September 2005. Available at: http://ecos.fws.gov/docs/federal_register/fr5253.pdf.
- USFWS (United States Fish and Wildlife Service). 2008b. Bull Trout (*Salvelinus confluentus*) 5 Year Review: Summary and Evaluation. U.S. Department of Fish and Wildlife Service, Portland, Oregon, April 25, 2008. 55 pp.
- USFWS (United States Fish and Wildlife Service). 2008a. Revised Designation of Critical Habitat for the Northern Spotted Owl; Final Rule. Federal Register 73:47326-47522.
- USFWS (United States Fish and Wildlife Service). 2010a. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List the North American Wolverine as Endangered or Threatened. 50 CFR Part 17. Available at: <http://www.gpo.gov/fdsys/pkg/FR-2010-12-14/pdf/2010-30573.pdf#page=1>.
- USFWS (United States Fish and Wildlife Service). 2010b. Endangered and Threatened Wildlife and Plants; Recovery Plan for the Prairie Species of Western Oregon and Southwestern Washington. 75 FR 37460 37461. Available at: <http://www.gpo.gov/fdsys/pkg/FR-2010-06-29/pdf/2010-15766.pdf#page=1>.
- USFWS (United States Fish and Wildlife Service). 2011. Listed and Proposed Endangered and Threatened Species and Critical Habitat; Candidate Species; and Species of Concern in Pierce County. U.S. Fish and Wildlife Service, Washington Fish and Wildlife Office. Revised: 1 August 2011.
- USFWS (United States Fish and Wildlife Service). 2011a. Endangered and Threatened Wildlife and Plants; 12-Month Finding on a Petition to List *Pinus albicaulis* as Endangered or Threatened with Critical Habitat. 50 CFR Part 17. Available at: <http://www.gpo.gov/fdsys/pkg/FR-2011-07-19/pdf/2011-17943.pdf>.
- USFWS & NMFS (United States Fish and Wildlife Service and National Marine Fisheries Service). 1998. Endangered Species Act Consultation Handbook: Procedures for Conducting Section 7 Consultations and Conferences. Available at: http://www.nmfs.noaa.gov/pr/pdfs/laws/esa_section7_handbook.pdf
- WDFW (Washington State Department of Fish and Wildlife). 1998. 1998 Washington Salmonid Stock Inventory Appendix Bull Trout and Dolly Varden. Olympia, Washington.
- WDFW (Washington State Department of Fish and Wildlife). 2011. SalmonScape GIS Data. Accessed: 30 November 2011. Available at: <http://wdfw.wa.gov/mapping/salmonscape/>.
- WDNR (Washington State Department of Natural Resources). 2011. List of Plants Tracked by the Washington Natural Heritage Program. Available at: <http://www1.dnr.wa.gov/nhp/refdesk/lists/plantrnk.html>.