Environmental Assessment (EA)

For

Construction of a Wastewater Treatment Plant (WWTP)

And

Main Pipeline Infrastructure for Water Reuse

At

Joint Base Lewis-McChord, Washington

January 2013

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Environmental Assessment For
Construction of a Wastewater Treatment Plant and Main Pipeline Infrastructure for Water Reuse

Joint Base Lewis-McChord, Washington

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SUMMARY

S1. Proposed Action

Joint Base Lewis-McChord (JBLM) proposes to construct a new Wastewater Treatment Plant (WWTP) and Reclaimed Water Distribution System (RWDS) extending from the new plant throughout the installation. JBLM, under the direction of the Joint Base Commander and Executive Order 13423, is moving toward a more sustainable future. The Army's goal at JBLM is to improve water quality and meet Federal regulatory requirements through the following objectives:

- Treat all wastewaters to meet a Class A reclaimed standard by 2025 to conserve water resources and improve Puget Sound water quality.
- Reduce potable water consumption by two percent (2%) per year by 2015.

The new WWTP reclaimed water distribution facility and system would support the Army's sustainability goal by re-using wastewater in areas of irrigation, industrial operations (equipment maintenance facilities, wash racks and boiler water feed), and toilet water. The existing WWTP would be demolished at a future date after the new WWTP is operational.

JBLM is located in western Washington, in Pierce and Thurston counties, approximately 35 miles south of Seattle. The base was formerly two separate installations, Fort Lewis (86,000 acres) and McChord Air Force Base (4,600 acres). In 2005, the Base Realignment and Closure (BRAC) Commission designated Fort Lewis and McChord Air Force Base as a joint base, one of 12 joint installations within the Department of Defense (DoD). JBLM is the second largest military installation on the West Coast behind Fort Hunter Liggett, with a total 90,600 acres (not including Yakima Training Center) available for the combined services of U.S. Army and U.S. Air Force stationed there.

S2. Purpose and Need

The purpose of the Proposed Action is to provide the necessary sewage treatment capability to improve water quality discharges into Puget Sound, reduce on-base potable water consumption by two percent (2%) per year by 2015 and to construct a state of the art facility that will meet the Federal water quality regulatory and sustainability requirements on JBLM.

The need for the Proposed Action is to improve the quality of wastewater leaving the installation with the construction of a new WWTP that will eliminate or reduce the permit exceedances that have been taking place with the outdated existing Solo Point WWTP. There is a need from a regulatory and environmental standpoint to reduce the amount of wastewater and improve the quality of discharge into Puget Sound and to provide a new source of water for irrigation and industrial facilities on the installation. The need to replace the existing Solo Point WWTP is based on past permit exceedances (18 since 2009) and projection of facility failure within the next five (5) to seven (7) years, which is not sufficient to accommodate future use.

S3. Environmental Process

This Environmental Assessment (EA) will be developed in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations, Title 40 of the Code of Federal Regulations (40 CFR) Parts 1500-1508 and the Army's implementing procedures published in 32 CFR Part 651 Environmental Analysis of Army Actions. The overall goal of the EA is to provide

sufficient analysis and evidence for the determination of whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FNSI).

S4. Summary of Alternatives Analyzed and Environmental Consequences

Alternative A: Under this Alternative, JBLM proposes to complete a two-phased construction effort to replace the existing Solo Point WWTP and further move JBLM toward reusing treated wastewater. Phase I consists of the construction and operation of a new WWTP. Phase II consists of the demolition of the existing WWTP and construction of an RWDS and outfall.

Alternative B: Under this Alternative, JBLM would only implement Phase I, which involves the construction and operation of a new WWTP. There would be no demolition of the existing WWTP, no construction of the RWDS system or outfall. Operation of the new WWTP would utilize the existing outfall and operation would occur under JBLM's existing NPDES permit.

No Action Alternative: Under this Alternative, the proposed construction of a new WWTP would not occur and the existing WWTP would continue operation. The WWTP would become inadequate to treat the quality of sewage received from the population at JBLM. The No Action Alternative would not meet the purpose and need for the Proposed Action, but represents the baseline/status-quo conditions against which potential consequences of the Proposed Action can be compared.

This EA includes an analysis of potential environmental impacts associated with the construction and operation of a new WWTP and installation of a main pipeline infrastructure for reclaimed water usage throughout JBLM. The level of analysis should be commensurate with the anticipated level of environmental impact. Valued Environmental Components (VECs) analyzed in this EA include:

- Air Quality
- Noise
- Soil/Geology
- Vegetation
- Water Resources
- Biological Resources (Threatened and Endangered Species)
- Socioeconomics
- Public Services (Utilities/Energy Demand/Generation)
- Hazardous Material and Wastes
- Aesthetics (Light and Glare)
- Traffic and Transportation Systems
- Cultural Resources

The following resources were not carried forward for analysis in this EA, as potential impacts were considered negligible or non-existent.

- **Air Space**
  Implementation of the Proposed Action or alternatives does not include any modifications or actions that involve use of the air space above and surrounding JBLM.

- **Land Use**
  Implementation of the Proposed Action or alternatives would not change existing land use and would be compatible with surrounding land uses. Although the WWTP would be replaced and removed and new pipeline infrastructure installed, no direct change in land use is expected as a result of the Proposed Action or alternatives.

Table S1-1 Summary Consequences of Alternatives Impacts

VEC	No Action Alternative	Alternative A (Phase I &II)	Alternative B (Phase I Only)
Air Quality	No Effect	Short-term, less-than significant adverse effect during construction. Improvement in long-term air quality with reduced methane burn-off.	Short-term, less than significant adverse effect during construction. Improvement in long-term air quality with reduced methane burn-off. The level of construction impacts without the RWDS would be substantially less on air quality with reduced fugitive dust.
Noise	No Effect	Short-term, less-than significant adverse effect during construction. There would be short term construction noise and effects on the school children, along the DuPont Alignment. No long-term noise effects.	Short-term, less-than significant adverse effect during construction. No long-term noise effects. The level of construction impacts without the RWDS would be substantially less on sensitive noise receptors along the RWDS alignments.
Soil/Geology	No Effect	Short-term, less-than significant adverse effect during construction. No long-term soil effects.	Short-term, less-than significant adverse effect during construction. No long-term soil effects. The level of construction impacts without the RWDS would be substantially less on soils.
Vegetation	No Effect	Short-term, less-than significant adverse effect during construction. Retention of existing tree buffer at WWTP site and landscape restoration will off-set any long term effects.	Short-term, less-than significant adverse effect during construction. The level of construction impacts without the RWDS would be substantially less on the vegetation. Retention of existing tree buffer at WWTP site will off-set any long term effects around the WWTP site.
Water Resources	Continued degradation of water quality and potential failure of meeting permit requirements	Short-term, less-than significant adverse effect during construction with implementation of JBLM environmental protection measures and the proposed mitigation. The water resource would not be directly impacted with directional boring. The impacts are avoided by constructing in existing utility corridors and road prisms. The long term operational effects of	Short-term, less-than significant adverse effect during construction. Retention of existing tree buffer at WWTP site will off-set any long term effects. The level of construction impacts without the RWDS would be less on adjacent water resources.

Table S1-1 Summary Consequences of Alternatives Impacts			
VEC	No Action Alternative	Alternative A (Phase I &II)	Alternative B (Phase I Only)
		reclaimed waste water would be beneficial to the base and regional water quality.	
Biological Resources	Near shore adverse impacts from degrading water quality discharge from existing WWTP	Short-term there would be impacts during the in-water work for the outfall that is associated with Phase II. However, less-than significant adverse effect during overall construction with implementation of WDFW/USACE in-water work BMP's and JBLM environmental protection measures. There are some fish, birds, and mammal species designated under the Endangered Species Act (ESA) that may have short-term effects. Specifically, the biological assessment determined that the Bull Trout, Chinook Salmon, Steelhead, Coho Salmon, Chum Salmon, Pacific Eulachon/Smelt, Marbled Murrelet, Streaked Horned Lark, and Southern Resident Killer Whale would have a construction determination of May Affect, Not Likely to Adversely Affect. The long term operational effects of reclaimed waste water would be beneficial to biological resources upland and in the fresh/marine water habitats.	Short-term, less-than significant adverse effect during construction with implementation of JBLM environmental protection measures and the proposed mitigation. There are some fish, birds, and mammal species designated under the Endangered Species Act (ESA) that may have short-term effects. Specifically, the biological assessment concluded that the Bull Trout, Chinook Salmon, Steelhead, Coho Salmon, Chum Salmon, Pacific Eulachon/Smelt, Marbled Murrelet, Streaked Horned Lark, and Southern Resident Killer Whale would have a construction determination of May Affect, Not Likely to Adversely Affect.
Socioeconomics	No Effect	The construction and operations of the new WWTP, new outfall, and demolition of the existing WWTP would not create disproportionate impacts to minority, low income, schools, or children. There are no Environmental Justice impacts from the Proposed Action. Short term negative impacts may be associated with the RWDS, specifically the Lewis Main Line. City of DuPont alignment would create impacts to the 35% minority school child population during construction activities. Iimpacts are	The construction and operations of the new WWTP would have no disproportionate impacts to minority, low income, schools, or children. There are no Environmental Justice impacts from the proposed action.

Table S1-1 Summary Consequences of Alternatives Impacts			
VEC	No Action Alternative	Alternative A (Phase I &II)	Alternative B (Phase I Only)
		not thought to be significant because of mitigation measures that would be put in place. Project activities would comply with local noise and dust control regulations, and generation of noise and dust would cease with the completion of proposed construction activities.	
Public Services	Increasing need for continual maintenance and improvements; emergency responses to adverse water quality discharges and permit violations.	Limited effects with Short-term construction activities that may require temporary shut-off of utilities in localized areas.	Limited effects with Short-term construction activities that may require temporary shut-off of utilities in localized areas
Hazardous Material & Waste	Increase in adverse water quality discharges, permit violations, and failure at meeting sustainability goals.	Limited effects that would be focused on the demolition of the existing WWTP which may contain lead/asbestos. This will be mitigated by appropriate application of abatement standards and operating procedures in addition to environmental protection measures and the proposed mitigation.	Limited effects that would be focused on the demolition of the existing WWTP which may contain lead/asbestos. This will be mitigated by appropriate application of abatement standards and operating procedures in addition to environmental protection measures and the proposed mitigation.
Aesthetics & Visual Quality	No Effect	Short term effects during construction activity, but not substantial adverse impacts.	No Effect
Transportation	No Effect	Short term construction activities will require detours and partial lane closures.	No Effect
Cultural Resources	No Effect	The new WWTP and RWDS system could have an impact on existing historical resources in the vicinity of the Logistics Center Line at the Madigan Gate of JBLM. An archaeological survey is being conducted to define the extent of the resource and directional bore methods are proposed to avoid the resources.	No Effect
Land Use	No Effect	No Effect	No Effect
Air Space	No Effect	No Effect	No Effect

Table S1-2 (and restated in Table 4-8), provides a summary of the mitigation measures and standard BMP's that JBLM requires the contractor to implement or consider for those VECs that have impacts and may require specific mitigation measures. The Hazardous Materials, Noise, Socioeconomics and Public Services did not have substantive or adverse impacts.

Table S1-2 Summary of Mitigation Measures & BMPs for those VEC with Potential Impacts

VEC	Preferred Alternative	Action Alternatives
Air	• Use of efficient construction techniques and effective job site management during construction activities. Reduction in vehicle idling on the job site can reduce emissions of all NAAQS pollutants. • If available from contractor newer construction equipment can be utilized to reduce emissions. Such construction equipment outfitted with the newest pollutant control equipment can reduce air quality impacts. • Construction site fugitive emissions (particulate matter) can be mitigated by utilizing dust management practices including, but not limited to water trucks and control of job site vehicle speed.	Same for all Action Alternatives
Noise	• Construction and demolition noise could be reduced by using quieter equipment, utilizing demolition/construction practices that minimize noise, turning off equipment not in use, and requiring mufflers on construction machinery. • Work hours can also be restricted to avoid undue disruption. • Temporary shielding could be installed during periods of high noise neighborhoods.	Same for all Action Alternatives
Soils	Project-specific mitigation measures (BMPs) would be developed as part of the required temporary erosion and sediment control (TESC) plan. At a minimum, the TESC plan would include the following measures: • Maintain vegetation in areas outside designated construction clearing areas. • Place straw, mulch, or other commercially available erosion control products on slopes that require protection. • Use straw bales or silt fences to reduce runoff velocity in conjunction with collection, transport, and disposal of surface runoff generated from the construction area. • Use only clean fill material. • Provide dust control. As a BMP, JBLM would utilize the above referenced appropriate BMPs and adhere to the terms of the NPDES General Permit for Stormwater Discharges for Construction Activity for Federal Facilities in Washington (a.k.a. Construction General Permit, or CGP) to minimize erosion and sedimentation (and consequent surface water quality) impacts during construction-phase activities. To the maximum extent possible, within existing, disturbed road or utility ROWs. This includes existing roads and trails, as well as existing electric, natural gas, and water utility corridors. When located within a utility ROW, JBLM would coordinate with the utility owner and would ensure the infrastructure is installed at least 10 feet (10') from the existing utility. CGP permit standards would be adhered to during all construction activities. The USEPA Region 10 would be responsible for reviewing and approving the JBLM's	Same for all Action Alternatives

Table S1-2 Summary of Mitigation Measures & BMPs for those VEC with Potential Impacts		
VEC	**Preferred Alternative**	**Action Alternatives**
	CGP Notice of Intent (NOI) application prior to construction. Stormwater runoff and erosion would be managed using BMPs, including but not limited to silt fencing, hay bales, vegetative buffers and filter strips, and spill prevention and management techniques, as detailed in the SWPPP. All disturbed areas would be re-vegetated and monitored to ensure success after construction is complete.	
Vegetation	• The laydown areas for new facilities would be actively managed. During construction and post-construction activities to avoid establishment of invasive or noxious plants which may spread into adjacent intact from the proposed disturbed areas. • Roadside restoration would be implemented following construction of the RWDS. • Regular landscaping and grounds maintenance, including planting and seeding desirable native plant species, mowing, weeding, and erosion control would help to minimize the establishment or spread of invasive plants to exposed soils on the site or on into adjacent undisturbed vegetation areas.	Same for all Action Alternatives
Water Resources and Wetlands	During the preparation of the final AutoCAD / Geographic Information System (GIS)-based WWTP and RWDS engineering design, the proponent shall: • Avoid surface waters and wetlands by locating the proposed "purple piping" alignment within previously disturbed areas, existing road or utility rights-of-way (ROWs), or other existing crossings to the maximum extent possible. • Field determine, at appropriate intervals, the depths of all surface water features to be crossed by the proposed RWDS "purple piping" to establish the appropriate boring depths. Depths shall be marked on the design drawings. • Field delineate and flag the boundaries of all jurisdictional wetlands and waters of the US in portions of the alignment that have not yet been delineated. Boundaries shall be marked on the design drawings. • Field flag the boundaries of all jurisdictional wetlands and waters of the US in portions of the alignment that have been delineated. Boundaries shall be marked on the design drawings. • Using the above data, locate all project construction components at a minimum distance of 50-feet (50') from the edge of the wetland boundary (i.e., the edge of wrested vegetation). This final WWTP and RWDS design shall be reviewed and approved by the Environmental Division (ED) via the JBLM environmental review process. Any changes required by the ED shall be made by the proponent. Prior to and during construction (i.e., the proposed construction would occur over a period of time) the proponent shall: • Insure that appropriate BMPs would be in place and the Installations SWPPP would be adhered to by contractor. • In-water construction of the outfall would comply with spill containment requirements. • In the unlikely event that a construction accident or spill releases contaminants into waterways or the surrounding environment, construction BMPs (such as oil booms and absorbent pillows) would be employed to contain and minimize the spill. This would be	Same as all Action Alternatives, all associated components at a minimum distance of 50-feet (50') from the edge of any delineated wetland per the buffer requirements and using directional boring under all wetlands/streams/ other bodies of water.

Table S1-2 Summary of Mitigation Measures & BMPs for those VEC with Potential Impacts		
VEC	**Preferred Alternative**	**Action Alternatives**
	followed by cleanup activities consistent with applicable Federal and state standards. By constructing the new WWTP, the Army will reduce the negative impacts of effluent discharges that exceed NPDES Standards. The Army will comply with 42 USC § 17094, which requires planning and design to maintain the hydrology of the site. • Re-validate each proposed project component, immediately prior to construction, via the JBLM Garrison de-confliction proposal review process to ensure that conditions have not changed. Implement any changes required by the ED. • Clearly field flag all wetlands and surface waters within and in the vicinity of the construction ROW, as well as the limits of the construction area. Comply with the limits of construction in accordance with the final design and any adjustments made during the immediately pre-project environmental review. All unavoidable wetlands and surface waters shall be bored under at a sufficient depth, as determined during the pre-construction analysis; boring entry and exit work locations shall be a minimum of 50 feet from the edge of the field-marked resource boundary. Following completion of construction, the proponent shall: • Restore and re-vegetate disturbed construction areas to pre-project conditions, in compliance with the NPDES permit and the SWPPP. Native species of vegetation should be used to the extent possible or on the approved list of acceptable species.	
Biological Resources	During the preparation of the final AutoCAD / GIS-based engineering design, the proponent shall: • Avoid areas supporting natural vegetation communities by locating the proposed "purple piping" alignment within previously disturbed areas, or existing road or utility ROWs to the maximum extent possible. This final design shall be reviewed and approved by the ED via the JBLM Garrison de-confliction review process. Any changes required by the ED shall be made. Prior to and during construction, the proponent shall: • Adhering to the in-water work period designated for Tidal Reference Area 3, south Puget Sound which occurs from July 16 to February 15 (USACE 2011). The construction can be phased over a two year period with the specific in-water work within the allowed work windows each year. • In addition, forage fish surveys may be conducted by WDFW (WDFW 2011) prior to in-water construction to avoid or minimize impacts to surf smelt that are known to breed in the area. • Consider additional mitigation that could be considered as part of the design process could include the removal of invasive blackberry bushes at the Solo Point boat launch and replanting the area with native species. Additionally, another area for consideration would be removal of existing old concrete that is no longer part of the functional boat ramp. Soft shore arming and placement of large woody debris (trees/root balls) would be placed at strategic points of	Same for all Action Alternatives.

Table S1-2 Summary of Mitigation Measures & BMPs for those VEC with Potential Impacts		
VEC	**Preferred Alternative**	**Action Alternatives**
	the shoreline. • Re-validate each proposed project component, immediately prior to construction, via the JBLM Garrison de-confliction review process to ensure that conditions have not changed. Implement any changes required by the ED. • Clearly field flag and comply with the limits of construction, in accordance with the final design and any adjustments made during the immediately pre-project environmental review. • Time construction to avoid nesting periods of migratory birds protected under the Migratory Bird Treaty Act (MBTA) during the migratory bird nesting season April through August so that nests are not disturbed. If it is not practical to conduct construction outside of this time frame, a qualified biologist shall survey the construction area in advance to ensure that no active nests are disturbed. Following completion of construction, the proponent shall: • Restore and re-vegetate disturbed construction areas to pre-project conditions, in compliance with the NPDES permit and the SWPPP. Native species of vegetation should be used to the extent possible and approved by JBLM Public Works Fish and Wildlife Staff.	
Socioeconomics	• Use of equipment that minimizes noise and dust. • Publicize construction dates and routes. • Notification of service providers on JBLM and within the City of DuPont, and appropriate school officials about the location and timing of construction activities. • Coordinate construction activities with City of DuPont officials to avoid conflicts with public events.	Same for all Action Alternatives
Public Services	• Conduct a sustainability review during WWTP system design to maximize energy usage and meet all applicable energy code requirements. • Implement energy conservation measures at the WWTP.	Same for all Action Alternatives
Hazardous Materials and Waste	• Contractors would be made aware of existing buffers in place for former training areas where UXOs could be encountered. Standard environmental protection measures and construction permit related mitigations are listed in Section 2.5	Same for all Action Alternatives
Traffic and Transportation	• Detours would be set up per JBML or applicable standards where there is a lane closure or sidewalk closures. • Fencing around open trenching to limit access to construction crews. • Signage for the construction zone. • Restoration of road pavement and sidewalk areas.	Same for all Action Alternatives
Cultural Resources	During the preparation of the final AutoCAD / GIS-based engineering design, the proponent shall: • Avoid areas containing National Register of Historic Places (NRHP)-eligible cultural resources by locating the proposed piping alignment within previously disturbed areas, or existing road or utility ROWs to the maximum extent possible. • Field determine and flag the boundaries of all NRHP-eligible cultural resources sites within the proposed alignments or adjacent to. All	Same for all Action Alternatives

Table S1-2 Summary of Mitigation Measures & BMPs for those VEC with Potential Impacts		
VEC	**Preferred Alternative**	**Action Alternatives**
	such sites occurring within and adjacent to the proposed 30-foot (30') construction ROW shall be identified. These sites shall be marked on the design drawings. • Using the above data, locate all project construction components at a minimum distance of 25-feet (25') from the edge of all NRHP-eligible cultural resources sites This final design shall be reviewed and approved by the ED via the JBLM Garrison de-confliction review process. Any changes required by the ED shall be made. Prior to and during construction, the proponent shall: • Re-validate each proposed project component, prior to construction, via the JBLM Garrison de-confliction review process to ensure that conditions have not changed. Implement any changes required by the ED. • Clearly field flag and comply with the limits of construction, in accordance with the final design and any adjustments made during the pre-project environmental review. All unavoidable cultural resources sites shall be bored under at a minimum depth of six feet (6'); boring entry and exit work locations shall be a minimum of 25-feet (25') from the edge of the field-marked resource boundary. • In the event of an inadvertent discovery of human remains or cultural items during project construction, construction shall be suspended and the area cordoned off until the JBLM Cultural Resources Manager is contacted to properly identify and appropriately treat discovered items in accordance with applicable State and Federal law(s). • Limit construction in historic districts to minimize short-term noise and visual intrusion within these areas. Do not conduct construction outside of normal business hours and limit the number of construction vehicles present to the absolute minimum required to accomplish the construction.	

S5. Conclusion

When considering other past, present, and reasonably foreseeable future actions with regards to the VECs reviewed and analyzed for this EA, it has been determined that the direct, indirect, and cumulative effects of constructing a new WWTP (Phase I only) would not be significant.

S6. Decisions to Be Made

The JBLM Joint Base Commander is the decision-maker for this action. Based on the findings of this EA, the Army will determine whether to implement the Proposed Action or another alternative. If the EA determines that there would be no significant environmental impacts, an FNSI will be published. If it is determined that the Proposed Action would have significant environmental impacts, the decision-maker can decide to publish a Notice of Intent (NOI), leading to the preparation of an EIS or to issue a mitigated FNSI, in which mitigation measures to reduce impacts to less-than-significant levels would be included as part of the action.

The EA, the FNSI (if applicable), and all other related planning documents will be provided to the appropriate decision-maker for review and consideration. The signature page for the EA and FNSI package will be signed by the decision-maker to indicate his or her review or approval.

The Army will cooperate with other Federal, State, and local agencies, Native American tribes, and the public during development of this EA. JBLM will consult with the State Historic Preservation Officer (SHPO) by submitting a letter that evaluates likely impacts to buildings, structures, and objects that are eligible for listing in the National Register of Historic Places. JBLM will also consult with the Nisqually, Puyallup, and Squaxin Island tribes. Agencies to receive the Final EA for review are listed in Appendix D.

This document contains references to "Fort Lewis" pre-2010. Some are legacy references and the identification of "Fort Lewis" will not change over time. Other references are temporary and "Fort Lewis" will change to "Joint Base Lewis McChord" post 2010, when a revision or update occurs to the reference."

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Summary Table of Contents

Chapter Table of Contents

List of Appendices

List of Tables

List of Figures

List of Images

CHAPTER 1.0
PURPOSE, NEED, AND SCOPE

1.1 INTRODUCTION

Joint Base Lewis-McChord (JBLM) proposes to construct a new Wastewater Treatment Plant (WWTP) and Reclaimed Water Distribution System (RWDS) extending from the new plant throughout the installation. The Installation, under the direction of the Joint Base Commander to implement Executive Order 13423, is moving toward a more sustainable future. The new WWTP would support the Army's goal at JBLM to improve water quality and meet Federal regulatory water quality requirements through the following objectives:

- Treat all wastewaters to meet a Class A reclaimed standard by 2025 to conserve water resources and improve Puget Sound water quality.
- Reduce potable water consumption by two percent (2%) per year by 2015.

The new WWTP and RWDS would support the Army's sustainability goal by reusing wastewater in areas of irrigation, industrial operations, and bathroom facilities (Fort Lewis 2007). The existing WWTP would be demolished at a future date after the new WWTP is operational. This Environmental Assessment (EA) has been developed in accordance with the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations, Title 40 of the Code of Federal Regulations (40 CFR) Parts 1500-1508, and the Army's implementing procedures published in 32 CFR Part 651 Environmental Analysis of Army actions. The overall goal of the EA is to provide sufficient analysis and evidence for determining whether to prepare an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FNSI).

1.2 LOCATION

JBLM is located in western Washington, in Pierce and Thurston counties, approximately 35 miles south of Seattle (Figure 1-1). The base was formerly two (2) separate installations: Fort Lewis and McChord Air Force Base. In 2005, the Base Realignment and Closure (BRAC) Commission designated Fort Lewis and McChord Air Force Base as a joint base, one (1) of twelve (12) joint installations in the Department of Defense (DoD). JBLM is the largest military installation on the West Coast of the United States with a area of 90,600 acres (Yakima Training Center – not included) serving the combined services of the U.S. Army and U.S. Air Force (JBLM 2011a).

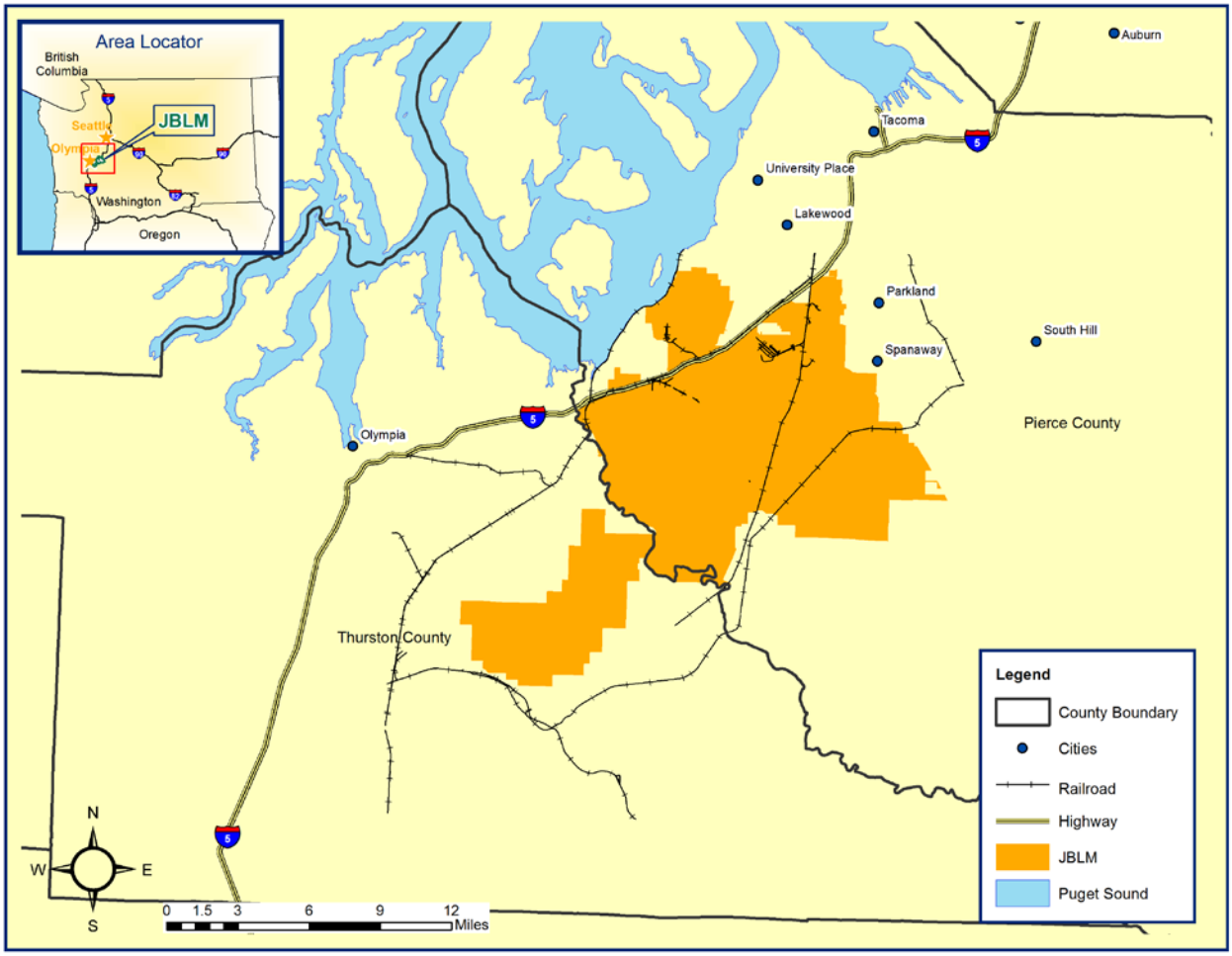
1.3 BACKGROUND

The existing Solo Point WWTP was built in 1955 and upgraded to secondary treatment in 1974. The need to replace the existing Solo Point WWTP is based on an assessment of high probability of facility failure within the next five (5) to seven (7) years. The facility is also unable to accommodate the anticipated future increase in use (CH2M Hill 2009). Since 2002, there have been new equipment and buildings added to the facility to improve water quality systems, support recycling efforts on the base, and to replace aging equipment. Nevertheless, the plant has experienced 18 exceedances of thresholds for meeting the secondary treatment discharge permits requirements since 2009. The preferred goal of JBLM is to eliminate permit exceedances, produce reclaimed water to achieve net zero water quality impacts, and minimize consumption of potable water resources. By constructing a new WWTP and an RWDS system, JBLM will meet regulatory requirements, improve water quality, substantially reduce nitrogen discharges into Puget Sound, and reduce the on-base potable water consumption by two percent (2%) per year by 2015.

New WWTP capacities will provide JBLM the ability to increase military and civilian population on the installation when required or necessary. JBLM is one of the Army's premier stationing locations. The Installation provides state of the art training for Soldiers to prepare for deployment, as well as a high quality of life for Soldiers and their Families when at their home station. As of January 2010, the military population at JBLM was approximately 34,000 Soldiers.

In February 2011, the Executive Director for the Army Installation Management Command signed a Record of Decision (ROD) to station up to 5,700 Active Duty Soldiers to augment existing units at JBLM. Construction of a new WWTP facility is identified as a need for regulatory upgrades, sustainability, and just one of many mitigation commitments identified to support the potential increase in the February 2011 ROD for the Fort Lewis Growth and Force Structure Realignment Final Environmental Impact Statement (FEIS) (U.S. Army, 2011).

Figure 1-1 Vicinity Map



1.4 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to construct a new WWTP that will provide the necessary sewage treatment capability to meet Federal regulatory requirements and sustainability goals at JBLM. The need for the Proposed Action is to improve the quality of wastewater leaving the Installation as the existing Solo Point WWTP is expected to fail within the next five (5) to seven (7) years and is insufficient to accommodate projected future use (CH2MHill 2009).

1.4.1 Deficiencies of Existing Solo Point WWTP

The existing Solo Point WWTP treats wastewater from JBLM, which is the combined total volume from Fort Lewis and McChord. This also includes Madigan Army Medical Center, the Veteran's Hospital at American Lake, and the Washington National Guard's Camp Murray. Several studies have revealed deficiencies in the existing WWTP. The original primary treatment plant portion was built in 1955 and was upgraded in 1974 to include secondary treatment. A feasibility study conducted in 2009 concluded that the existing WWTP has a remaining life of approximately five (5) to seven (7) years, which accounting for the time elapsed since then, leaves a true remaining life expectancy of two (2) to four (4) years. The cost of upgrading the plant would be too great to be feasible for long-term use. The plant is quickly reaching its maximum capacity for treatment of wastewater and needs to be upgraded in order to improve the water quality, achieve sustainability goals, and support potential increases in troops (when necessary) at JBLM (CH2MHill 2009).

The Solo Point WWTP currently discharges treated water from JBLM into the Puget Sound under permitted authorization from the U.S. Environmental Protection Agency (USEPA). The plant uses treatment processes incapable of meeting increasingly stringent effluent requirements. During the 2004 to 2008 permitting period, the Army reported six (6) exceedances of permit thresholds. Despite best efforts to maintain compliance, 18 permit exceedances have occurred since January 2009, partially due to population increase (JBLM 2011b). In addition, a new discharge permit will be issued in the near future with more stringent effluent standards than the existing permit.

1.5 SCOPE OF THE ANALYSIS

This EA includes an analysis of potential environmental impacts associated with the construction of a new WWTP and installation of a main pipeline infrastructure for reclaimed water usage throughout the Installation. The level of analysis should be equal to the anticipated level of environmental impact. The Valued Environmental Components (VECs) analyzed in this EA include:

- Air Quality
- Noise
- Soil/Geology
- Vegetation
- Water Resources
- Biological Resources (Threatened and Endangered Species)
- Socioeconomics
- Public Services (Utilities/Energy Demand/Generation)
- Hazardous Material and Wastes
- Aesthetics (Light and Glare)
- Traffic and Transportation Systems
- Cultural Resources

The following resources were not carried forward for analysis in this EA as potential impacts were considered to be negligible or nonexistent.

- Air Space

  Implementation of the Proposed Action or alternatives does not include any modifications or actions that involve use of the air space above or surrounding JBLM. Therefore, implementation of the Proposed Action or alternatives would have no impacts to air space.

- Land Use

  Implementation of the Proposed Action or alternatives would not change existing land use and would be compatible with surrounding land uses. Although the WWTP would be replaced and removed, and new pipeline infrastructure installed, no direct change in land use is expected as a result of the Proposed Action or alternatives. Therefore, implementation of the Proposed Action or alternatives would have no impacts to land use.

1.6 PUBLIC INVOLVEMENT

As required by NEPA regulations, the Army invites public participation in the EA process. Comments from all interested persons promote open communication and enables better decision making. All agencies, organizations, and members of the public with a potential interest in the Proposed Action, including Native American groups, will be provided the opportunity to participate in the process. Due to the limited and focused level of impacts within JBLM, as documented in the EA, and since the proposed action is directly linked to mitigation for the GTA EIS, it was determined that formal scoping meetings were not required. JBLM has coordinated with the Nisqually, Squaxin Island, and Puyallup tribes throughout project planning and will continue dialog to ensure that there are no tribal resources concerns. A Notice of Availability will be published in area newspapers announcing the availability of this Final EA. Public comments will be reviewed and addressed as necessary and implemented into the Final EA and FNSI, if applicable, or EIS.

1.7 LEGAL FRAMEWORK

The scope of this EA is to evaluate the environmental and socioeconomic impacts of the Proposed Action. The timing for implementing the Proposed Action is contingent on numerous factors, such as mission requirements, schedule, availability of funding, and environmental considerations. In addressing environmental considerations at JBLM, Army Regulations 200-1 *Environmental Protection and Enhancement* mandates compliance with:

- All applicable Federal, State, and local environmental laws and regulations,
- Requirements of environmental permits,
- Executive Orders that establish standards and provide guidance on environmental and natural resources management and planning, and
- Army and JBLM regulations that define overall management of the land at JBLM.

It is important to note that a future NEPA document (32 CFR, Part 651.24 Subpart C) would be required at a future date analyzing the RWDS and the proposed outfall replacement at more than the current 20 percent (20%) design level. This would include the infiltration galleries, pumps location, depth, and operations. It could be a supplemental EA or other NEPA documentation depending on the level of analysis. The supplemental process allows significant impacts to be identified, mitigation defined, while detailed planning and engineering continues to evaluate the best location and depth of the proposed action

elements (e.g., the storage tanks, infiltration galleries, etc.). Therefore, there will be future NEPA documents that detail the final reclaimed water end-user and infiltration system.

The short-term uses and long-term productivity and maintenance of the natural environment, as well as the irreversible and irretrievable resources (40 CFR 1502.16) were considered for the Proposed Action in this EA.

Regarding 40 CFR 1502.16, the short-term impacts of the construction activity in the natural and built environment would not have adverse effects to the environment. The long-term productivity and maintenance of the natural environment would be enhanced with the reuse of water and the potential of augmenting low-flow streams and creeks on JBLM. The construction of the facilities and operations would not significantly impact the long-term natural resource productivity of the area. The Proposed Action would not result in any impacts that would significantly reduce environmental productivity or permanently narrow the range of beneficial uses of the environment.

Concerning resources that are irreversibly or irretrievably committed to a project are those that are used on a long-term or permanent basis. This includes the use of non-renewable resources such as metal and fuel, as well as natural or cultural resources. These resources are irretrievable in that they would be used for this project when they could have been used for other purposes. Another impact that falls under this category is the unavoidable destruction of natural resources that could limit the range of potential uses of that particular environment.

Implementation of the Proposed Action would involve the consumption of fuel, oil, and lubricants for construction vehicles and loss of natural resources (less than one percent (1%) of the Installation's forest). Implementation of the Proposed Action would not result in significant irreversible or irretrievable commitment of resources.

CHAPTER 2.0
DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The Proposed Action is to:

- Construct a new WWTP facility at JBLM.

Following is an overview for future construction of an RWDS adjacent to the new WWTP and in the footprint of the existing Solo Point WWTP. Included in this overview are the following elements:

- Construct a new outfall and abandon, but leave in place, the old outfall.
- Demolish the existing Solo Point WWTP.
- Construct pump stations to bring water back up grade from the new WWTP toward the cantonment area.
- Construct an RWDS comprised of three primary corridors with alternative alignments within those corridors. Those corridors include:
    - **Lewis North Line**
      Running south of the WWTP site, then north and east to serve the Lewis North Base area.
    - **Logistics Center Line**
      Connecting to the southern leg of the Lewis North Line and running south under Interstate Five, southeast in 41st Division, northeast in Colorado Ave., north in Jackson Ave., connecting to an infiltration gallery at the Madigan Hospital Helipad, and then northeast connecting to E. Lincoln Ave.
    - **Lewis Main Line**
      Running south of the WWTP site and then at the intersection of Solo Point Road and Wharf Road and splitting off onto one of the following optional legs/alignments:
        - *Option A – City of DuPont*
          Running west on Wharf Road to Powerline Road, south in an existing utility corridor in the city of DuPont. That utility line runs approximately south under Tolmie Road and Palisades Boulevard through the Palisade Village neighborhood. It would cross directly under Chloe Clark Elementary School, to again run alongside public open space, across Interstate 5 (I-5) and back onto Lewis Main then southwest to various parade grounds and open space infiltration galleries.
        - *Option B – JBLM Dupont Steilacoom Road Alignment*
          Running east on Wharf Road to DuPont Steilacoom Road, south on the eastern side of the DuPont-Steilacoom Road, then south under Interstate Five onto Lewis Main and then southwest to various parade grounds and open space infiltration galleries.
        - *Option C (Preferred) – JBLM Plant Road Alignment*
          Running east on Wharf Road within JBLM fence line, then east to southeast along Plant Road, then south in Main Street/Flora Road and under Interstate Five on the northern edge of Pendleton Ave., onto Lewis Main base and then connecting to the parade grounds for an infiltration gallery south of Liggett Ave. Additional loops

would be constructed to the east, south, and northeast for additional infiltration galleries and irrigation use.

2.2 DEVELOPMENT OF REASONABLE ALTERNATIVES

Regulations that implement NEPA provide guidance on the consideration of alternatives in an EA. These regulations require that environmental effects of the Proposed Action and a range of alternatives to the Proposed Action be considered. The range of alternatives includes reasonable alternatives, which must be rigorously and objectively explored, as well as other alternatives that are eliminated from detailed analysis. To be "reasonable", an alternative must meet the stated purpose of and need for the Proposed Action.

2.2.1 Alternative Selection Criteria

The Army developed a set of criteria for use in assessing whether possible alternatives meet the purpose of and need for the Proposed Action. Any alternative considered for further analysis needed to meet the following requirements:

- **Sustainability**
  Each alternative should enhance or support the JBLM sustainability program. Alternatives that degrade the natural environment or require significantly greater resources than the Proposed Action and other alternatives without corresponding increased benefit should be eliminated from detailed evaluation. The alternatives should lend themselves toward sustainable design prior to the start of construction.

- **Mission Support**
  Each alternative must promote, support, and be consistent with the Army's mission requirements, which include (1) Base Realignment and Closure Division (BRAC), (2) Global Defense Posture Realignment (GDPR), (3) Grow the Army (GTA), (4) Modularity, (5) Transformation, (6) Training, and (7) Functional Efficiency.

- **Technical Viability**
  Each alternative must be practicable to an extent that once completed will satisfy the Purpose and Need.

- **Economic Feasibility**
  Each alternative must be achievable within a reasonable cost. Alternatives whose implementation is significantly more expensive without increased benefit appropriate with the additional cost should be eliminated from detailed evaluation.

- **Public Relations**
  To the extent feasible, each alternative should reflect positively on the Army and enhance the relationship between JBLM and the surrounding community. Alternatives that encroach on the adjacent civilian population can often be met with public resistance and erode relationships between the JBLM and local community. Alternatives with the potential to have substantial impacts to the surrounding community without additional benefits should be eliminated.

2.3 ALTERNATIVES CARRIED FORWARD FOR ANALYSIS

2.3.1 Alternative A (Preferred Alternative)

Under Alternative A, JBLM proposes to complete a two-phased construction effort to replace the existing Solo Point WWTP and further progress JBLM toward reusing treated wastewater. Phase I consists of

construction and operation of a new WWTP. Phase II consists of demolition of the existing WWTP, and construction of the RWDS and outfall. These phases are described in more detail below.

2.3.1.1 Phase I - Construction and Operation of a New WWTP

Construction of New WWTP

Phase I of Alternative A would be to construct a new WWTP facility on an approximately ten (10) acre undisturbed site (Figure 2-1) immediately south of the existing Solo Point WWTP.

A new administration building would be required to support the facility in order to meet plan operation requirements (e.g., proximity to controls). The administation building would be designed to meet Leadership in Energy and Environmental Design (LEED) Silver Certification standards and intent of the Executive Order (EO) 13423. The WWTP itself would not be LEED certified as LEED does not apply to treatment plant structures.

The new plant would have 4.3 million gallons per day (MGD) capacity, capable of producing reclaimed water that would meet Class A standards (JBLM, 2011c). 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 upstream aquifers, vehicle wash racks, fire protection systems, irrigation, and heating ventilation and air conditioning systems (HVAC).

The new WWTP would have a membrane bioreactor (MBR) treatment with primary and secondary disinfection processes to achieve the quality necessary to be classified as Class A reclaimed water (HDR, 2011b). Table 2-2 lists the proposed facilities and treatment processes for the new WWTP.

The new WWTP would be sized to serve until year 2025 conditions (e.g. a maximum monthly flow of 4.34 MGD). The proposed wastewater treatment facilities would be arranged so that adequate space is available for up to a 50 percent (50%) increase in capacity for future needs and/or requirements. The estimated completion date for design is September 2013, with construction immediately following the design. The construction of the WWTP is estimated to take two (2) years and be completed by September 2015 (HDR, 2011b).

Operation of New WWTP

Operation of the new facility would not differ from existing day-to-day operations of the existing Solo Point WWTP facility and would fall under JBLM current NPDES permit that was issued April 1, 2012 and will remain effective until April 1, 2017.

2.3.1.2 Phase II - Demolition of Existing Structures and Proposed Future Construction of the RWDS and Outfall

The basic elements of Phase II include the construction of the RWDS and new outfall, which is still being designed and will require further soil tests for locating the optimal infiltration galleries. The analysis of this phase is programmatic, with the expectation that supplemental NEPA document(s) will be produced at a future date when the design information and final locations of the infiltration galleries are determined.

Phase II of Alternative A (Figure 2.3) would include the following activities:

- Demolition of the existing Solo Point WWTP.
- Construction of the RWDS facility adjacent to the new WWTP. This new facility would be within the old footprint of the current Solo Point WWTP
- Construction of pump stations for bringing water back up-grade from the new WWTP toward the cantonment area.

- Construction of RWDS pipelines that will lead to existing irrigation systems, industrial facilities, and other uses described below:

    - **Irrigation**
      Parade areas, grounds maintenance, golf courses, athletic fields, housing areas, school lawns, and cemeteries. Irrigation occurs during a five-month period between May and September, with most occurring between July and September.

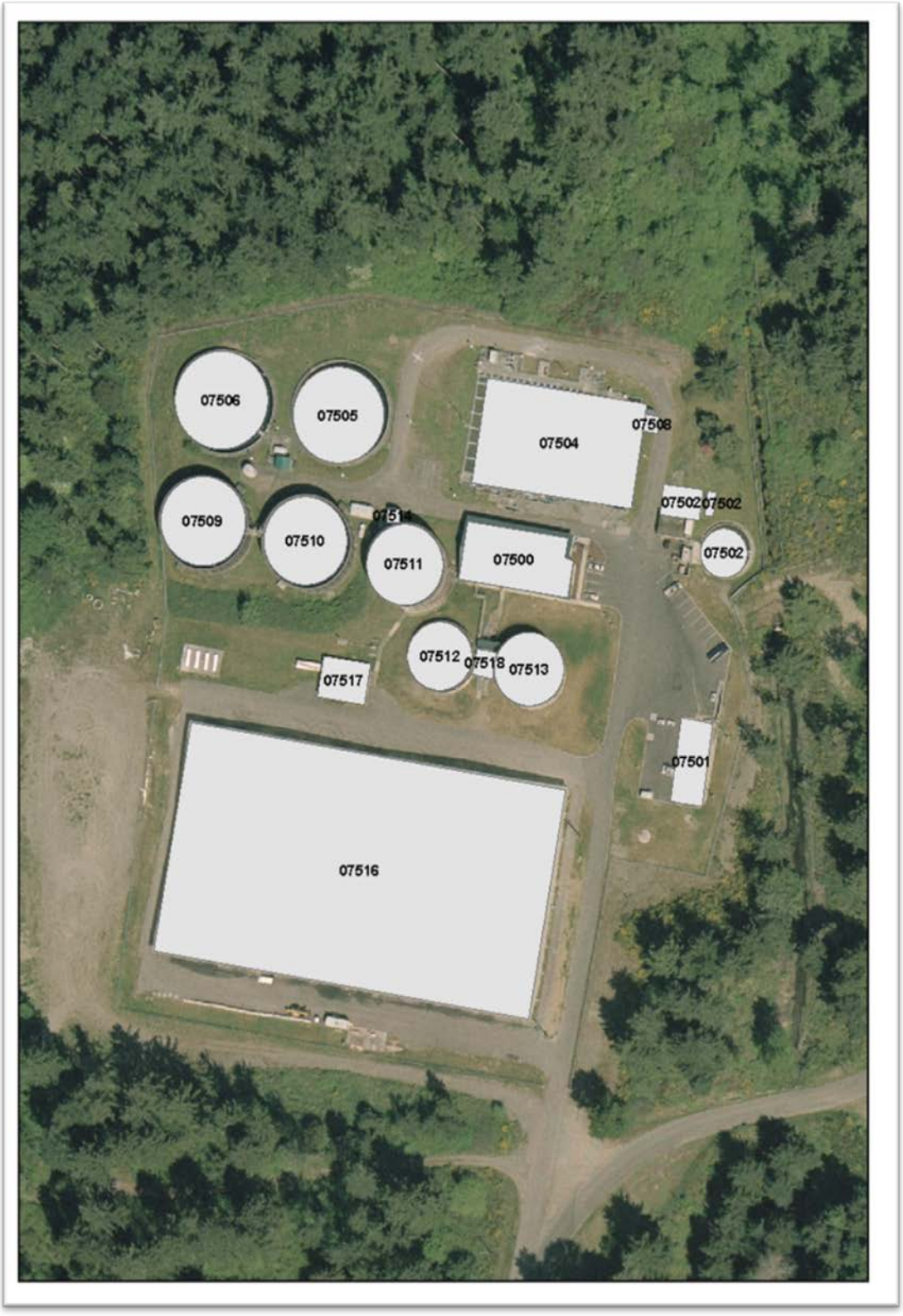
    - **Stream Flow Augmentation**
      Potential linkage to headwaters of Murray Creek during low flow seasons.

    - **Industrial**
      Equipment maintenance facilities, wash racks, commercial car washes, boiler water feeds, the weapons recoating facility (Parkerizing process), and concrete manufacturing facilities. Industrial water demand is considered to be year-round.

    - **Other Uses**
      Toilet flush water for new barrack facilities and ground water recharge. The ground water recharge would be accomplished through, at a minimum, three major infiltration galleries located at the end of the three proposed pipeline corridors. Water demand for other uses is also considered to be year-round.

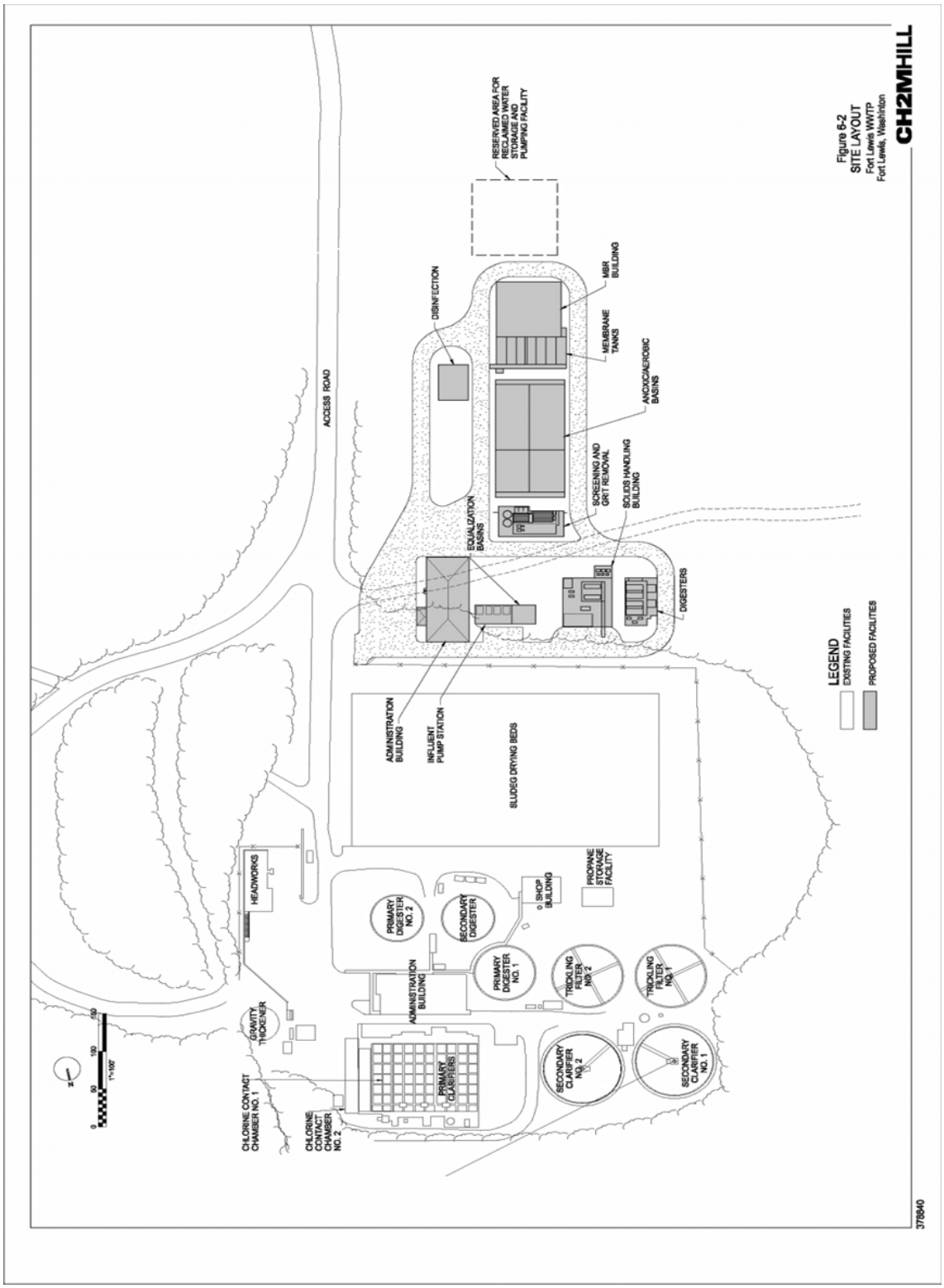
Figure 2-1 General Location of Proposed WWTP

Figure 2-2 Existing WWTP Plant Facilities



Source: JBLM NEPA Program NOTE: Existing WWTP Plant Building Numbers (See Table 2-1)

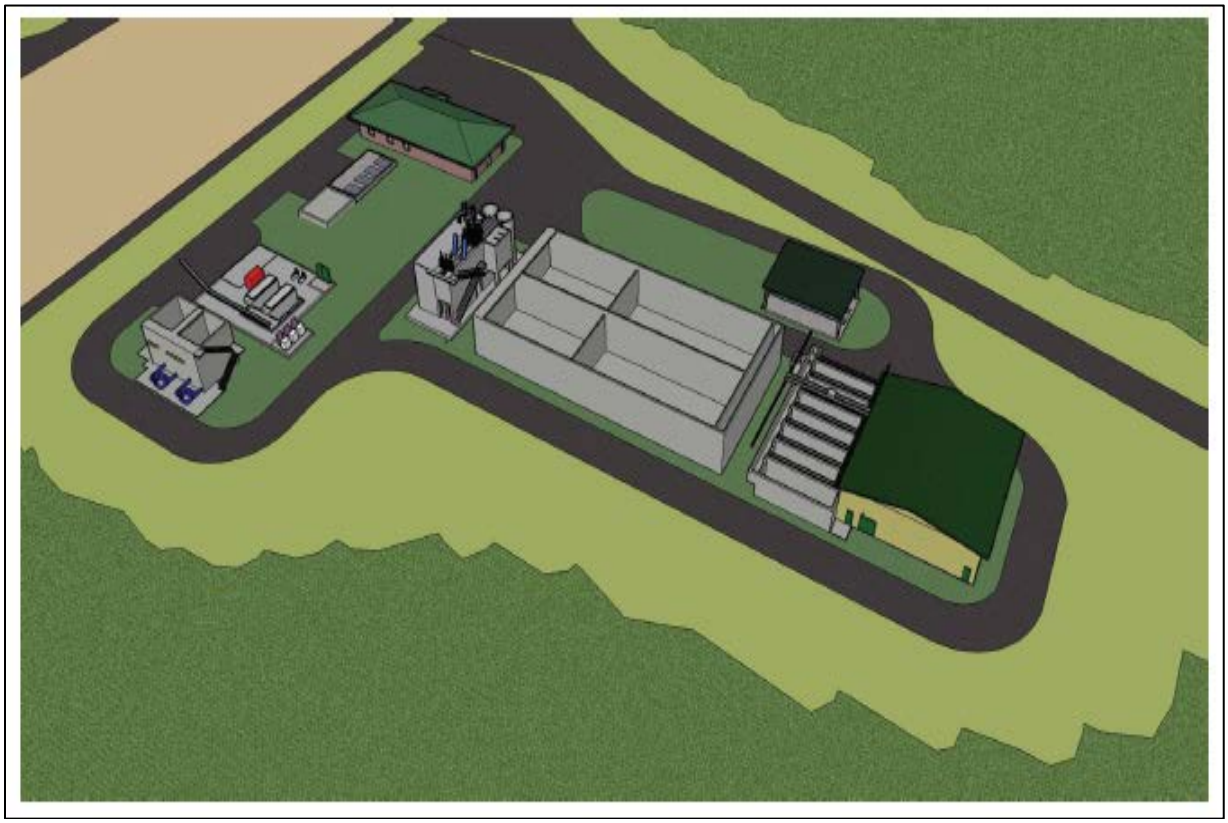
Figure 2-3 Existing and Future Solo Point WWTP Facilities



Source: CH2Mhill 2009 Feasibility Study

NOTE: Relationship between existing and new facilities.

Figure 2-4 Proposed Future WWTP Plant



Source: WWTP Feasibility Study (CH2Mhill 2009)

Demolition of Existing Solo Point WWTP

The existing Solo Point WWTP facilities (Figure 2-2) would be demolished due to their age and the majority of the facilities nearing the end of their life cycle. There is limited reuse with new technologies proposed for the new WWTP-reclaimed wastewater processes. The WWTP consists of influent control structures, screens, an aerated grit basin, sludge thickening, three (3) anaerobic digesters, two (2) trickling filters, one (1) primary clarifier, one (1) scum concentrator, two (2) secondary clarifiers, sludge drying beds, two (2) chlorine contact chambers, and associated piping and pumps (CH2M Hill 2009).

The existing administrative building may be retained for continued use of the lab facilities for testing and wastewater quality monitoring under the NPDES permit. However, for the purposes of analyses, this assessment is assuming that all 18 structures listed in Table 2.1 (119,117 square feet) would be demolished starting in late 2015 after the operation of the new WWTP (Figure 2-4) begins.

Construction of New Outfall

A new outfall and diffuser would be constructed near the current location of the existing outfall (500-feet [500'] offshore, approximately 70 feet [70'] below surface). Construction of the new outfall would require trenching or a directional bore within the sediment of the Puget Sound shoreline. The current reinforced concrete pipe-diffuser assembly would be abandoned in place to minimize additional and unnecessary sedimentation and turbidity in the marine environment. Although the RWDS would essentially remove the need for the outfall, as the water would no longer be discharged through it in the future, the new outfall would serve as both an interim function and backup operational precaution. The new outfall would also serve as backup should the RWDS encounter a problem where temporary use of it would cease. Thus, the new outfall could resume discharging Class A water to the Puget Sound.

Table 2-1 Existing Facilities for Demolition		
Facility or Treatment Process	**Total Quantity**	**Unit of Measure**
Administration/Control Bldg. - 7500	5,371	SF
Headworks - 7501	15,000,000	Gallon (GA)
Gravity Thickener - 7502	13,600	KG
Chlorine contact chamber 7503	400	KG
Primary Clarifiers - 7504	1,100	KG
Secondary Clarifier No. 2 - 7505	570	KG
Secondary Clarifiers No. 1 - 7506	570	KG
Secondary Sludge Pump Station 7507	529	SF
Support Equipment/Clarifiers - 7508	"-"	KG
Trickling Filter No. 1 - 7509	10	KG
Trickling Filter No. 2- 7510	10	KG
Primary Digester No. 1 - 7511	763	KG
Secondary Digester - 7512	486	KG
Primary Digester No. 2 - 7513	486	KG
Lift Station7514	142	SF
Sludge Drying Facility 7516	74,880	SF
Shop Building - 7517	1,200	SF
Propane Storage Facility 7518	4,000	GA

Source: HDR, 2011b

Proposed Future Construction of RWDS and Associated Facilities

The RWDS would support the storage and distribution of the Class A reclaimed water effluent from the new WWTP. The elements of the RWDS and associated facilities (Table 2-2) are listed below:

- Reclaimed water pumping station at new WWTP site.
- Reclaimed water hypochlorite feed and chlorine contact tank for additional disinfection at the WWTP site.
- Reclaimed water storage tank at the new WWTP site.
- RWDS composed of three (3) pipeline corridors (Lewis North Line, Logistics Center Line, and Lewis Main Line. Lewis Main Line has two options for alignments: Option A – City of DuPont, Option B – Dupont Steilacoom Road JBLM Alignment or Option C (Preferred) – Plant Road JBLM Alignment) that will lead to existing irrigation systems, stream flow augmentation, and industrial uses throughout JBLM Main and North (See Figure 2-5).
- Three to five (3-5) reclaimed water booster pump stations with storage tanks at various locations on JBLM (see Figure 2-5).
- Reclaimed water infiltration galleries at various locations around JBLM (See Figure 2-5) (HDR, 2011).

Depending upon the sustainability program and goals in 2018 and beyond, the stream flow augmentation; irrigation of parade fields and parks; industrial uses; and consideration of aquifer recharging are the initial planned reuses for the reclaimed water. However, the long-term goal is to reuse all water from the WWTP by 2020 and have no discharge to the Puget Sound.

The reclaimed water facility would be constructed to the west of the new WWTP within the footprint of the existing treatment plant. Additionally, pump houses would have to be constructed to pump the reclaimed water back through JBLM. The three (3) pipeline sections of the RWDS would consist of 12 to 16 inch (12" to16") ductile iron pipe. The length of the corridors would be:

Lewis North Line – 27,751 lineal feet

Lewis Logistics Center Line – 31,899 lineal feet

Lewis Main Line – 21,758 lineal feet (Cantonment Area)

The following options are the northern leg of the **Lewis Main Line** without the Cantonment lineal feet:

Option A – City of DuPont Alignment - 17,664 lineal feet

Option B – DuPont Steilacoom Road Alignment – 16,800 lineal feet

Option C – Plant Road Alignment 20,371 lineal feet

Figure 2-5illustrates the approximate location of RWDS and associated facilities. Table 2-2 lists the facilities that would be included in the RWDS. The majority of the pipelines would be installed by open trenching method on JBLM properties. The excavated trench would vary from thirty (30') feet wide and ten (10') feet in depth. The actual construction impact zone analyzed is 30-feet, 15-feet on each side to accommodate construction vehicles and station areas. The disturbed areas would be restored to JBLM construction standards (or to those of the City of DuPont, if applicable) for paving and landscaping.

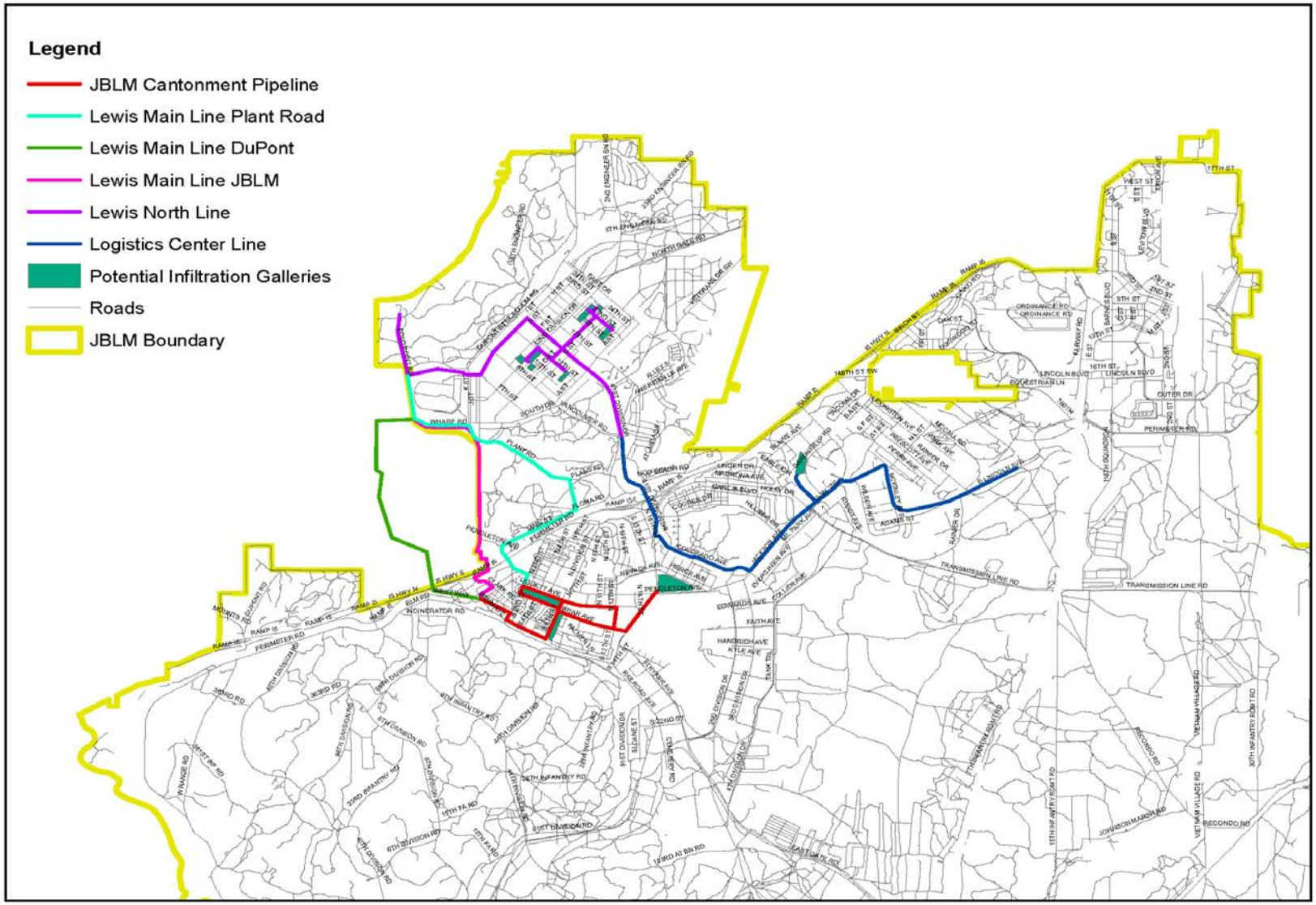
Where applicable and necessary in established residential neighborhoods, the directional boring or jack-and-bore methods would be the construction methods. This same process would be deployed to extend pipes under Interstate 5 (I-5), the railroads, and the two (2) creeks along the proposed pipeline corridors. In general, the bore and receiving pits on each side of the freeway would likely measure approximately 20 feet long by 10 feet wide (20' x10') and up to 25 feet (25') deep.

Due to the conceptual level of information available on the RWDS system at this time, this EA will only evaluate the general construction effects of the RWDS in regards to the pipeline corridors and proposed infiltration galleries. The final infiltration galleries locations, depth, size, and detailed linkage to irrigation, or in-building water reuse will be analyzed in a future tiered-NEPA document(s). Although, there are known uses for reclaimed water, the overall capacity for the reclaimed water facilities has not been determined. The exact sizes of proposed irrigation areas have not been delineated. The exact size and location of infiltration galleries cannot be determined until soil investigations are complete. Specific buildings with secondary reclaimed water distribution systems that will be designed to use reclaimed water for toilet flushing have not been identified (HDR, 2011).

Table 2-2 Facilities Required for Reclaimed Water Distribution System				
Item	**Est. Const. Year**	**Quantity**	**Units**	**Description of Work**
24-inch Pipeline	2018	10,000	lf	Include roadway restoration
Lewis Main Reclaimed Water Pipeline	2018			Jack and Bore may be needed
16-inch Pipeline	2018	20,000	lf	Include roadway restoration
12-inch Pipeline	2018	20,000	lf	Include roadway restoration
Interstate 5 (I-5) Crossing	2018	2,000	lf	Jack and Bore will be needed
16-inch Pipeline	2018	20,000	lf	Include roadway restoration
12-inch Pipeline	2018	10,000	lf	Include roadway restoration
Logistics Center Reclaimed Water Pipeline	2018			Jack and Bore and roadway restoration
16-inch Pipeline	2018	22,100	lf	Include roadway restoration
Interstate 5 (I-5) Crossing	2018	2,000	lf	Jack and Bore will be needed
Reclaimed Water Disinfection	2018	10	MGD	Construct on-site
Storage Tank	2018	2.5	MG	Prebuilt – Install on-site
Reclaimed Water Pump Station	2018	10	MGD	Construct on-site
Cantonment Area Storage Tank	2018	0.5	MG	Prebuilt – Install on-site
North Fort Storage Tank	2018	0.5	MG	Prebuilt – Install on-site
McChord Storage Tank	2018	1.0	MG	Prebuilt – Install on-site
North Fort Booster Station	2018	1.5 (est.)	MG	Construct on-site
Cantonment Area Booster Station	2018	1.5 (est.)	MG	Construct on-site
McChord Booster Station	2018	2.5 (est.)	MG	Construct on-site
Infiltration Gallery M1	2018	1,159,000 (est.)	SF	To-be-determined – Tier II
Infiltration Gallery M2	2018	864,000 (est.)	SF	To-be-determined – Tier II
Infiltration Gallery N1	2018	507,000(est.)	SF	To-be-determined – Tier II
Infiltration Gallery N2	2018	134,000(est.)	SF	To-be-determined – Tier II
Infiltration Gallery N3	2018	522,000(est.)	SF	To-be-determined – Tier II
Infiltration Gallery N4	2018	402,000(est.)	SF	To-be-determined – Tier II
Infiltration Gallery L1	2018	1,717,000(est.)	SF	To-be-determined – Tier II
North Fort	2018	16	Each	200’ - 4” piping, backflow preventer, meter
Cantonment	2018	24	Each	200’ - 4” piping, backflow preventer, meter
McChord	2018	3	Each	200’ - 4” piping, backflow preventer, meter

Source: HDR, 2011

Figure 2-5 Phase II Components - Reclaimed Water System



2.3.2 Alternative B - Phase I only (Construction of WWTP)

Alternative B would be implementation of Phase I, as described under 2.3.1.1, which involves the construction of a new WWTP. No actions that are included under Phase II would be included in this alternative, including the demolition of the existing WWTP, or construction of the RWDS system and outfall. All treated wastewater would discharge to the Puget Sound through the existing outfall, under the Army's current NPDES permit.

2.3.3 No Action Alternative

Under the No Action Alternative, the proposed construction of a new WWTP would not occur. The existing WWTP would continue to degrade from continued age and use and become inadequate to treat the quantity of sewage received from the anticipated increase in population at JBLM. The No Action Alternative would not meet the purpose and need for the Proposed Action, but represents the baseline conditions against which potential consequences of the Proposed Action can be compared. As required by CEQ guidelines, the No Action Alternative is carried forward for analysis in this EA.

2.4 ALTERNATIVES CONSIDERED BUT DISMISSED FROM FURTHER ANALYSIS

The following alternatives were analyzed in feasibility studies and for this NEPA EA document.

1. Relocation of the existing WWTP to another location either within the Installation or just off the Installation.

The alternative to relocate the WWTP was eliminated because the cost to move the plant away from the existing main sanitary sewer line that feeds the plant was excessive.

2. Send effluent to another government agency's WWTP.

The alternative to send the effluent to another agency's WWTP was analyzed during the 2009 Feasibility Study and was determined to be unfeasible due to costs (CH2M Hill 2009 & Fort Lewis 2007).

2.5 ENVIRONMENTAL PROTECTION MEASURES

As part of this Proposed Action, JBLM would implement environmental protection measures also considered best management practices (BMPs) to ensure that none of the action components would result in significant adverse effects to sensitive environmental resources on the Installation. These "*mitigation by design"* measures would include the following overarching requirements, which are incorporated into the Proposed Action for both proposed aboveground and underground components. These measures include locating the Proposed Action components:

- To the maximum extent possible, construction will occur within existing, disturbed road or utility ROWs. This includes existing roads and trails, as well as existing electric, natural gas, and water utility corridors. When located within a utility ROW, JBLM would coordinate with the utility owner and would ensure the infrastructure is installed at least 10 feet (10') from the existing utility.
- Where the Proposed Action coincides with a *"designed"* construction area that is ongoing, the Proposed Action would be located within that footprint. In such cases, JBLM would coordinate the Proposed Action carefully with the other approved construction to ensure that projects are timed and conducted in a manner conducive to one another.

- In a manner that avoids adverse impacts to all known locations of federally listed species on the Installation. In addition, in a manner that avoids impacts to all known locations of State-listed threatened species.
- In a manner that avoids all known, NRHP-eligible cultural resources sites. This would include boring under such sites by a minimum depth of 10 feet (10') (Cultural SME 2012).
- In a manner that avoids all impacts to wetlands, stream buffers, and other regulated surface water features. This would include boring at a sufficient, pre-determined and measured depth beneath the water feature, and excluding any construction equipment or work within the water feature. This would also include observing a minimum 50-meter exclusionary setback, in accordance with JBLM regulations, from the edge of wrested vegetation to either side of the water feature.
- JBLM would utilize appropriate BMPs and adhere to the terms of the NPDES General Permit for Stormwater Discharges for Construction Activity for Federal Facilities in Washington (a.k.a. Construction General Permit, or CGP) to minimize erosion and sedimentation (and consequent surface water quality) impacts during construction-phase activities. CGP permit standards would be adhered to during all construction activities. The USEPA Region 10 would be responsible for reviewing and approving the JBLM's CGP Notice of Intent (NOI) application prior to construction. Stormwater runoff and erosion would be managed using BMPs, including but not limited to silt fencing, hay bales, vegetative buffers and filter strips, and spill prevention and management techniques, as detailed in the Stormwater Pollution Prevention Plan (SWPPP). All disturbed areas would be revegetated and monitored to ensure success after construction is complete.
- Avoid impacts to migratory birds protected under the Migratory Bird Treaty Act (MBTA) and to comply with the USFWS's guidance concerning migratory birds.
- During proposed construction activities, traffic would be maintained in all locations at current levels through the use of temporary signals, signage, and other routine traffic control measures typical of utility construction. JBLM would ensure that project components do not inhibit traffic flow, both during construction and operation of the Proposed Action.
- Prior to undertaking each Proposed Action component, JBLM would ensure the above measures are included through the deconfliction review process. At JBLM, the proponent provides the NEPA office not only with initial plans for preparation of EISs and EAs (or other appropriate documentation), but also with information at various stages of design. For each new proposed action and stages of a project through design and implementation, the proponent submits plans to the Environmental Division (ED) for appropriate NEPA documentation (i.e., a record of environmental consideration). All proposed actions are then reviewed by the various environmental Program Managers and/or Subject Matter Experts (SMEs), including in the areas of cultural resources, biological resources (wetlands, protected species, etc.), solid and hazardous waste management, storm water management, environmental compliance, and the like. A subject matter expert (SME) from each environmental technical area ensures the proposed action would not produce significant adverse effects to the resource under their purview. If potential adverse effects are identified, appropriate mitigation measures are developed and implemented in concert with the proposed action to reduce that potential impact to acceptable, less-than-significant levels. The designed/component of the project is then introduced to the deconfliction meeting to ensure there are no other concerns with the project moving forward from an Installation-wide

perspective (i.e., Range Control, Planning, Real Estate, etc.). By adhering to this process, this would ensure that any future changes in the locations of environmental resources (e.g., such as changes in the locations of the protected species), utilities, or other elements are addressed with the most current information available. This would equally ensure that significant adverse impacts are avoided. Finally, this process would take advantage of the locational flexibility of the Proposed Action. For example, a segment of cable could be relocated to the other side of the road or to within the road to avoid a resource impact at the time its installation is proposed. Given the nature of the Proposed Action, such flexibility is possible. Given the extent of environmental constraints and the nature of significant environmental resources present at JBLM, such flexibility is required.

CHAPTER 3.0
AFFECTED ENVIRONMENT

This chapter describes the affected environment for JBLM. The affected environment is the portion of the existing environment that could be affected by project activities. The affected environment varies for each VEC. Both the nature of the resource and components of the alternatives dictate this variation. The following sections concentrate on providing only the specific baseline environmental information necessary for each component/resource to assess the potential effects of the alternatives analyzed in Chapter 4.

3.1 AIR QUALITY

3.1.1 Regulatory Setting

The Region of Influence (ROI) for air quality is defined as the Puget Sound Air Quality Control Region (PSAQCR) (40 CFR 81.32). This AQCR includes the Washington counties of King, Snohomish, Pierce, and Kitsap. The affected portions of JBLM for this NEPA document are within Pierce County. Air quality in Pierce County is protected by Federal regulations administered by the USEPA, State regulations administered by the Washington State Department of Ecology (Ecology), and the local clean air agency, Puget Sound Clean Air Agency (PSCAA). PSCAA serves all of the PSAQCR (PSCAA, 2010).

For the purposes of this analysis, air quality is defined as the ambient air concentrations of specific pollutants determined by the USEPA, Ecology, and PSCAA to be of concern to the health and welfare of the public. The specific pollutants include the criteria pollutants and hazardous air pollutants.

The criteria pollutants include ozone, carbon monoxide (CO), nitrogen dioxide (NO2), sulfur dioxide (SO2), particulate matter less than 10 microns in diameter (PM10), particulate matter less than 2.5 microns in diameter (PM2.5), and lead. National Ambient Air Quality Standards (NAAQS) have been established by the USEPA for these criteria pollutants (USEPA, 2011a) (Table 3-1). The NAAQS provide definitions of the maximum concentrations of the criteria pollutants that are considered safe, with an additional adequate margin of safety, to protect human health and welfare. Short-term standards (1, 8, and 24-hour periods) are established for pollutants contributing to acute health effects. Long-term standards (quarterly and annual averages) are established for pollutants contributing to chronic health effects.

As described in 40 CFR Part 51, Determining Conformity of General Federal Actions to State or Federal Implementation Plans (the “General Conformity Rule”), and all Federal actions occurring in air basins designated in nonattainment or maintenance area must conform to an applicable implementation plan. As required by the Clean Air Act (CAA) Amendments of 1990, Washington State has prepared a State Implementation Plan (SIP). The SIP is a compilation of goals, strategies, schedules, and enforcement actions that help lead a state into compliance with the NAAQS. Should a Proposed Action result in emissions that exceed de minimis levels (based on the nonattainment status for each applicable criteria pollutant in the area of concern), a conformity determination would be required (USEPA 2011b).

Table 3-1 National and Washington State Ambient Air Quality Standards				
Pollutant	**Averaging Time**	**Washington Standards**	**National Standards**	
			Primary	**Secondary**
Carbon Monoxide (CO)	8-hour	9 ppm	9 ppm	None
	1-hour	35 ppm	35 ppm	None
Lead	Quarterly Average	None	1.5 µg/m^3	1.5 µg/m^3
	Rolling 3-month Average	None	0.15 µg/m^3	0.15 µg/m^3
Nitrogen Dioxide (NO2)	Annual Average	0.05 ppm	0.053 ppm	0.053 ppm
	1-hour	None	0.100 ppm	0.053 ppm
Particulate Matter (PM10)	Annual Arithmetic Mean	50 µg/m^3	None	None
	24-hour	150 µg/m^3	150 µg/m^3	150 µg/m^3
Particulate Matter (PM2.5)	Annual Arithmetic Average	None	15.0 µg/m^3	15.0 µg/m^3
	24-hour	None	35 µg/m^3	35 µg/m^3
Ozone	8-hour (2008 standard)[(a)]	None	0.075 ppm	0.075 ppm
	8-hour (1997 standard)[(a)]	None	0.08 ppm	0.08 ppm
Sulfur Dioxide (SO2)	Annual Average	0.02 ppm	0.03 ppm	None
	24-hour	0.10 ppm	0.14 ppm	None
	3-hour	None	None	0.50 ppm
	1-hour	0.40 ppm[(b)]	0.075 ppm[(c)]	None
Total Suspended Particulates	Annual Geometric Mean	60 µg/m^3	None	None
	24-hour average	150 µg/m^3	None	None

Notes

(a) 8-hour ozone standard went into effect on September 16, 1997, but implementation is limited. The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as USEPA undertakes rulemaking to address the transition from the 1997 to the 2008 ozone standard.+

(b) Volume average for 1-hour period more than once per 1-year period. 0.25 ppm not to be exceeded more than two (2) times in any seven (7) consecutive days.

(c) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitoring station within an area must not exceed 75 ppb. USEPA also revoked the annual and 24-hour primary standards when enacting the 1-hour standard.

ppm = parts per million

Source: WDOE, 2011; USEPA, 2011a

In addition to the ambient air quality standards for criteria pollutants, national standards exist for hazardous air pollutants (HAPs). HAPs are pollutants that may cause cancer or other serious health effects, and they have adverse ecological or environmental effects. Examples of HAPs include benzene, which is found in gasoline, methylene chloride, which can be used as a solvent and paint stripper, and particulate matter released by diesel engines. The majority of HAPs are volatile organic compounds (VOCs) (USEPA 2009b). HAP emissions from wastewater treatment plants are regulated under 40 CFR Part 63 National Emission Standards for Hazardous Air Pollutants (NESHAP) for Source Categories Subpart VVV. Subpart VVV regulated major sources of HAPS (emission of 10 ton per year (tons/year) of any individual HAP or 25 tons/year of total HAPs). Washington State regulates new sources of HAPs (also known as toxic air pollutants) under WAC Chapter 173-460.

The clean air act also includes measures to prevent significant deterioration of air quality (PSD) in areas where air quality is better than the national standards established by the USEPA to protect human health and welfare. These areas are protected by restricting the amount of certain air pollutants over baseline level. These restricted amounts (known as PSD increments) vary based on the pristine classification of the area. Certain national parks and wilderness areas have the greatest degree of air quality protection. These areas are designated as "Class I" and only a small amount of new pollution is allowed. Additionally, there are special mechanisms for protecting Class I area resources that may be affected by air pollution called Air Quality Related Values (AQRV). The closest PSD Class I area to JBLM is Mount Rainier National Park, which is located approximately 50 miles (80 kilometers) to the east.

Greenhouse Gas Emissions (Climate Change)

GHGs are gases that trap heat in the atmosphere. These emissions occur from natural processes and human activities. The accumulation of GHGs in the atmosphere affects the earth's climate. Scientific evidence indicates a trend of increasing global temperature over the past century due to an increase in GHG emissions from human activities. The climate change associated with this global warming is predicted to produce negative economic and social consequences across the globe. The most common GHGs emitted from natural processes and human activities include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Combustive emission sources are a prime source of these GHG emissions. Additionally, hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) in the atmosphere threaten the public health and welfare of current and future generations. These GHGs are emitted primarily through human activities. The CEQ issued guidance for considering GHG in the NEPA process. The guidance suggests that analyses of direct and indirect GHG emissions from proposed actions will be evaluated, and if alternatives would be reasonably anticipated to annually emit greater than 25,000 metric tons of CO_2-equivalent (CO_2-e) then they should be evaluated. However, the proposed action would not reach the threshold of 25,000 metric tons and therefore further evaluation would not be considered necessary. (CEQ 2010a; USEPA 2011d).

3.1.2 Affected Environment

The area of JBLM affected by the Proposed Action is located in Pierce County, WA (Figure 1-1). Pierce County is part of the Seattle-Tacoma, maintenance area for the carbon monoxide standard, therefore a General Conformity Rule review is included in the determination of the CO emissions impacts of Alternative A and Alternative B (USEPA 2010b). Pierce County is also part of the Seattle-Tacoma, WA maintenance area for the one-hour ozone standard. The maintenance designation for ozone requires a maintenance plan under Section 110(a)(1) of the CAA to prevent back-sliding of the area to nonattainment status, however the maintenance plan does not carry with it any conformity obligations (USEPA 2010a; 40 CFR Subpart 51.905(a)(3) and (4)). On 5 August 2004, the USEPA approved the Central Puget Sound CO and Ozone Second 10-Year Maintenance Plan, which demonstrated that the area will maintain air quality standards through the year 2016 (69 FR 47365). Portions of Pierce County including southern Tacoma, WA, are designated nonattainment for PM2.5 (USEPA 2011b). The boundary for the nonattainment area is adjacent to the eastern boundary of JBLM, but does not include the Installation. The applicable General Conformity Rule (GCR) de minimis levels for JBLM (Pierce County portion) are 100 tons/year of CO (40 CFR 93.153).

JBLM contributes air pollutant emissions from both mobile and stationary sources. Stationary sources at JBLM are permitted under "synthetic minor" air permit through the PSCAA. The PSCAA issued U.S. Army Fort Lewis, Public Works a General Regulatory Order in 2005 for base-wide emissions. Stationary sources at JBLM include aerospace maintenance, fuel burning, fuel storage, and dispensing, degreasing,

woodworking, operation of the wastewater treatment plant, operation of the landfill, and painting operations. The primary pollutants emitted from stationary sources include NOx, CO, SO2, VOC, PM10, and methane (CH4). JBLM completes annual emissions inventories to ensure compliance and utilizes controls to ensure that stationary sources emit under the following permit requirements:

- Less than 9.9 tons of any single listed HAP per year,
- less than 24.9 tons of all HAPs per year,
- less than 99.0 tons per year of total criteria pollutants including CO, NOx, PM, SO2 and VOCs, and
- flare no more than 20,000,000 cubic feet of WWTP gas unless calculating total emissions for the previous 12 months.

A 2009 inventory of emissions from the major stationary air pollution sources on the installation is provided in Table 3-2. These emissions are given in tons per year, which is how they are submitted to regulatory agencies.

Table 3-2 2009 Installation Inventory Emissions

Pollutant	Tons/Year (unless where noted)
CO	64
Total HAPs	4
NOx	55
PM10	5
Sox	6
VOC	35
WWTP gas flared	9,580,000 cubic feet

Source: (Olsen 2011)

The current Solo Point WWTP is a stationary source of VOCs and methane. JBLM tracks millions of cubic feet (mmcf) of methane recovered and flared by the current Solo Point WWTP as well as VOC emissions in tons per year. In 2010, 7.54 mmcf of methane were recovered and 9.58 mmcf were "flared" off. The flaring off of methane is essentially burning of the excess gas produced during wastewater treatment that is not recoverable. The recovered methane is used to fuel alternative-fueled vehicles. Recovery is limited by the quality of the methane gas from the WWTP.

Increased production of VOCs due to the increased population at JBLM is included in the impact analysis for the Grow the Army Environmental Impact Statement (GTA EIS); therefore, those impacts will not be discussed in this document. It was determined in the GTA EIS that there was no significant impact to air quality based on the increased population (U.S. Army 2010).

3.2 NOISE

Noise is the term generally used to identify unwanted sound that interferes with normal activities or diminishes the quality of life or the environment. Sound is transmitted by mechanical vibrations through different mediums like air. When sound energy increases, the noise is perceived as being louder. The ambient (or surrounding) noise level of an area includes sounds from both natural (wind, waves, birds)

and artificial (aircraft, vehicle/ship engines, horns) sources. A number of factors affect how the human ear perceives sound: the energy level of the sound, vibration frequency or "pitch," actual air pressure changes being experienced, the period of exposure, and fluctuations in these characteristics during noise exposure. Noise impacts result from perceptible changes in the overall noise environment that increase annoyance or affect human health. Human health effects such as hearing loss and awakenings can result from noise. Annoyance is a subjective impression of noise wherein people apply both physical and emotional variables. To increase in annoyance, the cumulative noise energy must increase measurably. Sensitive noise receptors are best defined as locations or areas of frequent human use such as dwellings, schools, libraries, commercial areas, etc.

Typically, noise is measured on a logarithmic decibel (dB) scale. The measurement of sounds can be noted in weighted scales based on frequency or human hearing. The most common unit of sound frequency is the hertz (Hz), which corresponds to one crest of a sound wave per second. For low-frequency sounds that can cause vibrations, such as blasts, a C-weighting metric is used, noted as dBC. The noise-weighted metric to reflect what people hear is called the A-weighted decibel (dBA). A-weighting is typically utilized when measuring noise for activities such as construction and industrial ship yards. Both metrics screen out very high- and low-frequency sound that cannot be heard by humans.

The dBA system of measuring sound provides a simplified relationship between the physical intensity of sound and its perceived loudness to the human ear. Since the dBA scale is logarithmic sound intensity increases or decreases exponentially with each dBA of change. For example, 10-dBA yields a sound level 10 times more intense than 1-dBA, while a 20-dBA level equates to 100 times more intense than 1-dBA, and a 30-dBA level is 1,000 times more intense than 1-dBA. To the average ear, the apparent increase "loudness" doubles for every 10-dBA increase in noise (Bell 1982). Human speech is normally around 60 dBA.

3.2.1 Regulatory Setting

The Amy has supplemented the original DoD planning 1978 guidelines to develop a more comprehensive Environmental Noise Management Program (ENMP) that uses average day-night levels (Ldn) to categorize noise conditions on military installations. . Components of the ENMP include programs for handling noise complaints and undertaking supplemental noise evaluations when warranted by the nature of the discrete noise events. New revisions of Army Regulation 200-1 reflect changes in the discussion of noise as environmental vs. operational. The revised Army Regulation 200–1 notes that military noise is very much an operational issue. The AR200-1 noise limits are defined in Table 3-3

Table 3-3 Noise Limits for Noise Zones (AR 200-1)

Noise Zone	Noise limits (dB)	Noise limits (dB)	Noise limits (dB)
	Aviation ADNL	Impulsive CDNL	Small arms – PK 15 (met)
LUPZ	60 - 65	57 - 62	N/A
I	< 65	< 62	<87
II	65 - 75	62 - 70	87 - 104
III	>75	>70	>104

dB=decibel; LUPZ=land use planning zone ADNL=A-weighted day-night levels CDNL=C-weighted day-night levels; PK 15(met)=Single event peak level exceeded by 15 percent of events. <=less than >=greater than

JBLM has an Installation Operational Noise Management Plan (IONMP) that provides a strategy for noise management. The IONMP includes noise education, annoyance complaint management, noise mitigation, and noise abatement procedures. The IONMP program provides a methodology for analyzing exposure to noise associated with military operations and provides land use guidelines for achieving compatibility between the Army and the surrounding communities. The Washington Administrative Code (WAC) Chapter 173–60–040 establishes maximum permissible environmental noise levels based on the land use of an area or zone. WAC Chapter 173-60-050 lists exemptions to WAC Chapter 173-60-040. Sounds originating from temporary construction sites as a result of construction activity are exempted from the maximum permissible noise levels as long as the construction activity occurs between the hours of 7:00 AM and 10:00 PM.

Maximum permissible environmental noise levels for affected environment fall into one of three (3) categories as shown in Table 3–4.

Table 3-4 Maximum Permissible Noise Levels

EDNA of Noise Source	**EDNA of Receiving Property (dBA)**		
	Class A	**Class B**	**Class C**
Class A	55	57	60
Class B	57	60	65
Class C	60	65	70
Where Class A = Residential; Class B = Commercial; Class C = Industrial "EDNA" means the environmental designation for noise abatement, being an area or zone (environment) within which maximum permissible noise levels are established.			

Source: WAC 173-60-030, WAC 173-60-040

3.2.2 Affected Environment

The main sources of noise from JBLM to surrounding communities include aircraft (fixed-wing and rotary), munitions, detonations, and live-fire ranges. Small cities near the Installation experience short-term noise level increases from training activities. Existing sources of noise on JBLM include military aviation activities, small arms ranges, large caliber weapons training, and vehicle traffic. Noise from vehicle traffic is primarily located in the cantonment area. Noise contours have been developed for JBLM by the U.S. Army Center for Health Promotion and Preventative Medicine (USACHPPM) as recent as 2009 (USACHPPM 2009).

The IONMP and updated Army land use guidelines identify three noise zones for the Fort Lewis portion of JBLM (Fort Lewis 2005, USACHPPM 2009):

- Noise Zone I (NZ I) is compatible for most noise-sensitive land uses,
- Noise Zone II (NZ II) is normally incompatible for noise-sensitive land uses,
- Noise Zone III (NZ III) is incompatible for noise – sensitive land usage

Additionally, the Land Use Planning Zone (LUPZ) is utilized to represent an annual average that separates Noise Zone II from Noise Zone I. The LUPZ contour can be utilized as a planning tool to account for days of higher than average operations and possible annoyance. The 2009 USACHPPM noise study indicates impacts from large arm range operations and training extend beyond the majority of the installation boundary and affect the cities of DuPont, Rowley, Yelm, North Yelm, McKenna, and Nisqually.

LUPZ noise contours for JBLM include the portions of DuPont, which could be affected by Alternative A. The annual average noise level as modeled by USACHPPM for the affected area of the city of DuPont is approximately 57-dBC day-night level (Ldn) (CDNL) (U.S. Army 2010).

3.3 SOIL/GEOLOGY

3.3.1 Regulatory Setting

The CWA, section 404 covers fill in the waters of the U.S. and associated hydric soils. The permit review includes evaluating erosion and dust abatement for impacts. Grading and fill permits may be required by Pierce County or the city of DuPont due to a projected portion of the pipeline project traversing through a utility corridor in an off-base residential community. For on-base activities, JBLM would follow all its current NPDES permit requirements.

3.3.2 Affected Environment

GEOLOGY

Geological features within Pierce County result primarily from several glaciations that have occurred throughout the past 2.5 million years. Approximately 2,000 feet of interglacial soil and glacial deposits overlay bedrock throughout major portions of Pierce County. Glacial deposits consist of four (4) major types: advance outwash, till, recessional outwash, and lake sediments. Advance outwash is deposited in front of the glacier from melt water as the glacier retreats. These deposits typically consist of very dense-, medium- to coarse-grained sand and gravel with cobbles and boulders. Till is deposited at the base of advancing glaciers, and usually consists of very dense clay and boulder-sized elements. Recessional outwash is deposited by melt water from receding glaciers and consists of discontinuous layers of unconsolidated sand and gravel with variable factors of silt, cobble, and boulders. Lake sediments are deposited on or adjacent to glaciers. Lake deposits usually consist of silt and clay, resulting in low permeability characteristics (Pierce County 2005).

SOILS

There are four (4) different soils found within the project area: Alderwood gravelly sandy loam (0 to 6 percent (0-6%) slopes), Alderwood gravelly sandy loam (6 to 15 percent (6-15%) slopes), Spanaway gravelly sandy loam, and DuPont muck. Selected characteristics of each soil type are summarized in Table 3-5.

Alderwood series soils are found on the embankment between the existing WWTP and the Puget Sound shoreline, it's also the predominant soil type found at the existing and proposed WWTP areas. This series consists of moderately deep, moderately well drained soils that formed in glacial drift and glacial till from a basal till parent material and are typically found on till plains, moraines, and glacially modified foothills and valleys at elevations ranging between 0- to 800-feet above sea level (ASL). Within the project areas, gradients range from 0 to 15 percent (0-15%), but Alderwood soils in general can range up to 65 percent (65%). The available water capacity and the ability to transmit water for these soils are low. Alderwood soils have low susceptibilities to water erosion and moderate susceptibilities to wind erosion (USDA 2011; NRCS 2011).

Spanaway series soils comprise approximately 70 percent (70%) of JBLM soils. This series consists of deep, somewhat excessively drained soils that formed from a parent material of volcanic ash over gravelly outwash. Spanaway soils are typically found on glacial outwash terraces and plains at elevations ranging from 100- to 500-feet ASL. Within the project areas, gradients range from 0 to 6 percent (0-6%), but

Spanaway soils in general can range up to 15 percent (15%). The soil ability to transmit water is high and the available water capacity is low. Spanaway soils have low susceptibilities to water erosion and are moderately susceptible to wind erosion (USDA 2011; NRCS 2011).

DuPont series soils are limited to regions of creeks, streams, and wetlands within the project areas. This series consists of very deep, very poorly drained soils that formed from parent materials of organic deposits and diatomaceous earth. They are found in depressions or basins of glaciated uplands at elevations ranging from 150- to 1000-feet ASL. Slope gradients range from 0 to 1 percent (0-1%), thus surface runoff is usually ponded. The soil ability to transmit water is very low to moderately low and the available water capacity is also very low. DuPont soils have a low susceptibility to both water and wind erosion (USDA 2011; NRCS 2011).

Table 3-5 Soil Types							
Map Unit Name & Symbol	**Slope (percent) (%)**	**Hydrologic Group[1]**	**Soil Ability to Transmit Water (Ksat) (inches/hour)**	**Drainage Class**	**Available Water Capacity (inches)**	**Water Erodibility[2] (Kw)**	**Wind Erodibility[3] (group)**
Alderwood gravelly sandy loam (1B)	0 – 6	C	Very Low or Moderately Low (0.00 to 0.06)	Moderately Well Drained	Low (3.2)	0.15	4
Alderwood gravelly sandy loam (1C)	6 – 15	C	Very Low or Moderately Low (0.00 to 0.06)	Moderately Well Drained	Low (3.2)	0.15	4
Spanaway gravelly sandy loam (41A)	0 – 6	A	High (1.98 to 5.95)	Excessively Drained	Low (3.7)	0.15	4
DuPont Muck (12A)	0 – 1	D	Very Low or Moderately Low (0.00 to 0.06)	Very Poorly Drained	Very Low (0.0)	0.02	2

Notes:
[1] Four hydrologic groups are used for estimating the runoff potential of soils. Group A has the lowest and Group D has the highest runoff potential.
Group A: Mainly deep, well-drained to excessively drained sand, gravel, or both. Rate of water transmission is high, thus low runoff potential.
Group B: Mainly soils that are moderately deep to deep, moderately well drained to well drained, and moderately coarse textured.
Group C: Mainly soils that have a layer impeding the downward movement of water, or moderately fine to fine textured soils that have a slow infiltration rate. Rate of water transmission is slow.
Group D: Mainly clays that have high shrink-swell potential, soils that have a high permanent water table, soils that have a clay pan or clay layer at or near the surface, or soils that are shallow over nearly impervious materials. Rate of water transmission is very slow.
[2] Erosion categories – Water: Value 0.02 is low susceptibility to sheet and rill erosion, value of 0.69 is high susceptibility to sheet and rill erosion.
[3] Erosion categories – Wind: Category 1 is high susceptibility; category 8 is low susceptibility.

Source: USDA 2011.

3.4 VEGETATION

Vegetation is described in detail in the GTA EIS (U.S. Army 2010). The following summary of vegetation occurring within the project area is based on that previous document.

3.4.1 Regulatory Setting

Vegetation management on military installations is regulated by the Sikes Act. Roadside restoration or landscaping standards in the city of DuPont would be applicable for vegetation that may be impacted during construction along the pipeline corridors.

3.4.2 Affected Environment

There are four (4) habitat types of plant communities that occur on JBLM property and on the western side of the property boundary. These include (1) coniferous forests, (2) grasslands/prairies, (3) oak/oak-mixed woodlands, and (4) wetlands/riparian zones. These plant communities are summarized as follows.

CONIFEROUS FORESTS

Of the 90,600 acres of JBLM property (approximately 86,000 acres constitute former Fort Lewis and approximately 4,600 acres are former McChord Air Force Base property), nearly 75 percent (75%) of land cover is dominated by conifer forest. The most abundant forest type is prairie colonization forest that is dominated by Douglas fir (*Pseudotsuga menziesii*), covering just over 30,000 acres of land. Prairie colonization by Douglas fir was the result of an absence of fires set by historical inhabitants. Ponderosa pine *(Pinus ponderosa*) exists as small pure stands or scattered in overstory and cover approximately 780 acres. Lastly, Oregon white oak (*Quercus garryana*) is the least abundant conifer but occurs within the overstory as well within the prairie colonization forest type. Historical dry forest type covers approximately 7,300 acres of land and is a similar combination of species to the prairie colonization forest type with the exception that they existed prior to European settlement. Moist coniferous forest type is primarily dominated by Douglas fir and Western Hemlock (*Tsuga heterophylla*), with understory and overstory represented by western red cedar (*Thuja plicata*). This forest type covers approximately 17,200 acres of land cover and contains smaller clusters of red alder (*Almus rubra*) and big leaf maple (*Acer macrophyllum*) dominated stands.

JBLM has the largest presence of native ponderosa pine west of the Cascade Mountains, including native pine savanna with native grassland understory. This plant community is unique to JBLM and has not been found anywhere else (U.S. Army 2010).

PRAIRIE/GRASSLANDS

Prairies provide habitat for numerous plant and wildlife species, including special-status species. Of the less than 10 percent (10%) of original prairie lands still existing in the south Puget Sound region, JBLM contains some of the largest intact prairie tracts.

Grassland habitat at JBLM accounts for approximately 16,500 acres of land cover. The highest quality intact prairie is composed of open grassland habitat of native vegetation with up to 70 percent (70%) bunchgrass Roemer's fescue and mixed with lesser amounts of long stolon sedge, California oat grass, and prairie june grass. Lower quality grasslands are primarily non-native and invasive vegetation such as Scotch broom.

OAK/OAK-MIXED WOODLANDS

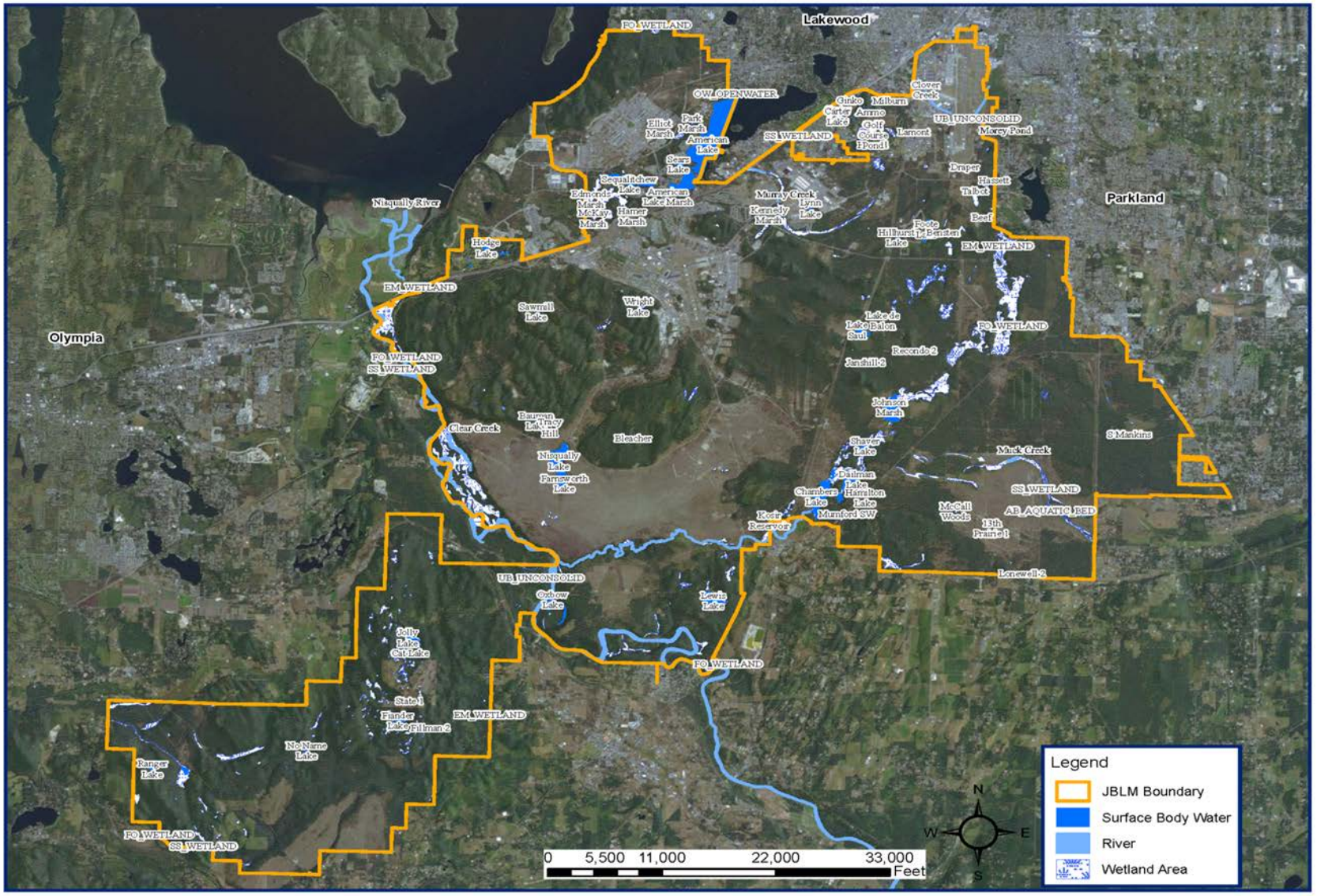
Approximately 4,700 acres of land cover at JBLM are composed of oak and oak-mixed woodlands. The woodlands range from Oregon white oak to a mix of oak, coniferous, and deciduous trees. Oregon white oak woodlands are declining in Washington and provide feeding, resting, and breeding habitat for Federally and State-listed or sensitive species (Larsen and Morgan 1998).

WETLANDS, WETLAND PLANTS, AND RIPARIAN ZONES

Approximately 4,100 acres or five (5) percent (5%) of the Installation is covered by wetlands (Figure 3-1). Specific types of wetlands present include aquatic beds, with emergent, scrub-shrub, and forested wetland plants. Aquatic beds are composed of aquatic vascular plants, such as duckweed, pondweed, and Eurasian water milfoil (*Myriophyllum spicatum*). Emergent wetlands include open, marshy habitats that are composed of multiple wetland plant species of sedge and cattail. Scrub-shrub habitats support low-growing woody species, such as spirea spp. and willows (*Saliz spp*.). Forested wetlands are composed of red alder and Oregon ash (*Fraximus latifolia*) overstory, salmonberry (*Rubus spectabilis*), vine maple (*Acer circinatum*), and stinging nettle understory. Further detail on wetland plants are provided in Section 3.6.3.

The major wetlands on JBLM are hydrologically connected to Muck Creek and the Nisqually River drainages. The tributaries of these systems support a diverse array of these wetland types (U.S. Army 2010).

Figure 3-1 Water Bodies on JBLM



3.5 WATER RESOURCES

The Federal jurisdiction for implementing the Clean Water Act is the USEPA. Within Washington State, USEPA grants permitting authority to the Washington Department of Ecology (WDOE), and Washington Department of Fish and Wildlife (WDFW) for designated and managed Water Resource Areas to facilitate watershed planning. Three (3) Water Resource Inventory Areas (WRIAs) lie within the JBLM boundary and include the Nisqually River (WRIA 11), Chambers-Clover (WRIA 12), and Deschutes River Basin (WRIA 13).

3.5.1 Regulatory Setting

Construction activities that may potentially impact surface waters require agency coordination through the following statutes listed in Table 3-6.

Table 3-6 Applicable Surface and Ground Water Regulations

Statute	Lead Agency	Regulated Activities
Section 10 of the Rivers & Harbors Act (33 USC 403)/	US Army Corps of Engineers (USACE)	Any work in or affecting navigable waters of the U.S. (i.e., outfalls). Navigable waters are those subject to the ebb and flow of the tide and/or are currently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
CWA Section 404 (33 USC §1251),	USEPA (Region 10-USEPA)	Regulates discharges of pollutants into waters of the United States. The CWA contains the requirements to set water quality standards (WQS) for all contaminants in surface waters.
Clean Water Act (CWA) Section 402	USEPA (Region 10-USEPA)	The Construction General Permit program oversees the discharge of pollutants and waste materials to surface waters of the United States.
401 – Water Quality Certification	Ecology	Water Quality Certification (Construction Activity)

3.5.2 Affected Environment

SURFACE WATER

Puget Sound borders JBLM property on the west. Four (4) major source water drainage basins occur on JBLM: the Nisqually River basin, the Sequalitchew Creek basin (including American Lake), the Deschutes River basin, and the Chambers-Clover Creek basin. The installation has six lakes or marshes that are over 100 acres in size. The main bodies of water in the JBLM area include American Lake, American Lake Marsh, Bell Marsh, Elliot Marsh, Hamer Marsh, Kennedy Marsh, Lynn Lake, McKay Marsh, Murray Creek, Muck Creek, Sears Lake, Sequalitchew Creek, Sequalitchew Lake (historical linkage to drainage to Puget Sound and historic tribal activities), Carter Lake, Morey Pond, Morey Creek and Clover Creek. The largest surface water body crossing through JBLM is the Nisqually River. It crosses the Installation in the southeast to northeast direction, discharging into the Nisqually Reach of Puget Sound (Figure 3-1).

Surface Water Quality

The CWA requires that all states restore their waters to be "fishable and swimmable." The WDOE's water quality program is in place to prevent and clean up water pollution. They assess waters bodies in the state as required for an integrated report under Section 303(d) of the CWA. The assessed waters are

grouped into categories that describe the status of water quality. The 303(d) list comprises those waters that are in the polluted water category, for which beneficial uses (i.e., drinking, recreation, aquatic habitat, and industrial use) are impaired (WDOE 2011). Waters placed on the 303(d) list require the preparation of a water cleanup plan, or Total Maximum Daily Load (TMDL). The TMDL identifies how much pollution needs to be reduced or eliminated to achieve clean waters. Further, it identifies the maximum amount of pollutant allowed to be released into a water body so that the beneficial uses of the water are not impaired. Marine and fresh water quality assessment categories are described below in Table 3-7.

Table 3-7 Marine and Fresh Water Quality Assessment Categories

Water Quality Classification/Category	Classification/Category Description
MARINE	
AA	Extraordinary
A	Excellent
B	Good
C	Fair
FRESHWATER	
1	Cleanest waters
2	Waters of concern
3	Insufficient data to meet minimum requirements
4	Waters that have pollution problems that are being solved in one of three ways: 4a-has a TMDL, 4b-has a pollution control program, or 4c-is impaired by a non-pollutant.
5	Polluted waters that require a TMDL.

Source: WDOE 2011

Marine waters receiving surface water from streams on JBLM are classified as AA water quality. Of the fresh water bodies, two (2) are classified as Class 5 - Clover Creek and American Lake. Clover Creek for degradation due to elevated fecal coliform levels, reduced dissolved oxygen concentrations, and elevated summer temperature levels. The American Lake (Category 5) is listed due to impairment from total phosphorus loading in the water body. No other water bodies or stream segments on the Installation are listed as impaired (WDOE 2009).

STORMWATER

On JBLM, stormwater is discharged to waters of the United States in accordance with the National Pollutant Discharge Elimination System (NPDES). Current permit coverage includes the Multi-Sector General Permit for Industrial Processes and the Construction General Permit. A JBLM Municipal Separate Storm Sewer System Permit is pending (2012). The drainage systems in the JBLM Main Cantonment area around Gray Army Airfield drain to treatment facilities, which include solids and oil removal and infiltration. These facilities overflow to a system of marshes. The marshes overflow to the JBLM stormwater canal on JBLM North, which conveys stormwater from JBLM North and Main into Puget Sound near Solo Point. Two (2) drainage systems on JBLM-North drain to treatment facilities. One facility includes an infiltration process. Both facilities have solids and oil removal and discharge to the JBLM stormwater canal. The drainage on JBLM-Main in the Madigan Army Medical Center and Logistics Center includes stormwater infrastructure, which discharges to Murray Creek. The major drainage infrastructure on JBLM-McChord Field discharges to Clover Creek. The JBLM stormwater

collection and conveyance system is currently at or near capacity for most of the cantonment area. Onsite infiltration is required for most new construction on JBLM. Significant areas of development within the cantonment have incorporated onsite-infiltration. The remaining cantonment areas, mostly encompassing residential communities, drain to surface waters through a number of small stormwater systems. (Burris, 2011)

WASTEWATER

Wastewater at JBLM is treated and discharged from the existing Solo Point WWTP to Puget Sound under an existing NPDES Permit. As summarized in Section 1.4.1, the Army has reported six (6) exceedances of permit thresholds during the 2004-2009 permitting period (USEPA 2009). After that reporting period and since January 2009, a total of 18 other permit exceedances have occurred. The exceedances were for the following reasons: excessive chlorine residual, out-of-range pH, and elevated Biological Oxygen Demand (BOD) or failure to achieve stipulated BOD removal percentages (JBLM 2011).

GROUNDWATER

Alternating aquifers and aquitards occur within the region. Aquifers are water-bearing strata composed of sand and gravel and aquitards are strata composed of silts and clays not capable of producing significant quantities of groundwater. The Vashon Drift Aquifer is a continuous shallow aquifer at JBLM. It ranges from 10-feet (10') to 30-feet (30') throughout the Installation, with lesser depths near lakes and streams and greater depths beneath the higher hills. It generally flows in a west-to-northwest direction across the Installation with localized changes in flow direction near discharge areas (major lakes, creeks, and the Nisqually River) (U.S. Army 2010).

Five (5) public water systems are operated by JBLM that rely entirely on groundwater. The cantonment area system is the main water supply system at the Installation. This system supplies water to more than 14,000 people on JBLM. The other three public water systems are small and supply water to the golf course, the Ammo Supply Point, and Range 17 (U.S. Army 2010).

Groundwater Quality

In general, natural conditions related to iron and manganese, have attributed to groundwater problems in the region. Groundwater at JBLM is generally low in total dissolved solids with calcium and bicarbonate as major constituents. There are three of four areas are on the USEPA's National Priorities List of contaminated sites (as described in Section 3.9 – Hazardous Materials and Waste) onsite. The USEPA designates sole-source aquifers to protect drinking water supplies in areas where few or no alternative sources to the groundwater resources exist. A sole-source aquifer is defined by USEPA as an underground water source that supplies at least 50 percent (50%) of the drinking water consumed in the area overlying the aquifer. A majority of the Installation is underlain by the Central Pierce County Aquifer. In addition, Wellhead Protection Areas (WHPA) is established at the Installation to protect groundwater quality and supply. A WHPA is an area that is designated within the 10-year time of travel zone boundary of a Group-A public water system well, as delineated by the water system pursuant to WAC 246-290-135.

3.6 BIOLOGICAL RESOURCES INCLUDING THREATENED AND ENDANGERED SPECIES

This section describes the terrestrial and aquatic species that occur at JBLM and in the vicinity where potential direct or indirect impacts to biological resources may occur. For the purposes of this EA, biological resources are divided into three (3) major categories: terrestrial wildlife, fish resources, and special-status species. Special-status species include species listed as threatened or endangered by U.S.

Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS) under the Endangered Species Act (ESA) and species not Federally listed but afforded Federal protection under the MBTA, Bald and Golden Eagle Protection Act (BGEPA) or the Marine Mammal Protection Act (MMPA).

The following resources are described in detail in the GTA EIS (U.S. Army 2010). The following summary of biological resources is based on that previous document and augmented by updated Federal and state references.

3.6.1 Regulatory Setting

Activities that may potentially impact biological resources and may require agency coordination through the following statutes are listed in Table 3-8.

Table 3-8 Applicable Biological Resources Regulations

Statute	Lead Agency	Regulated Activities
Endangered Species Act (ESA) (16 USC § 1531 *et seq*)	NMFS/US FWS	The ESA of 1973, as amended, requires that an action authorized by a Federal agency shall not jeopardize the continued existence of an endangered or threatened species or result in the destruction or adverse modification of designated critical habitat of such species.
Magnuson-Stevens Fishery and Conservation and Management Act (MSA) (16 USC 1801-1882)	NMFS	Federal agencies are to consult with NMFS on activities that may adversely affect Essential Fish Habitat (EFH) previously designated by the regional Fishery Management Councils for specific managed fish species.
Marine Mammal Protection Act of 1972 (MMPA) (16 USC 1361 *et seq.*)	NMFS	Federal agencies are to consult with NMFS on activities that may cause the "take" of a marine mammal. "Take" is defined as "to hunt, harass, capture, or kill".
Migratory Bird Treaty Act (MBTA) (16 USC §§703-712)	USFWS	The act prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests except as authorized under a valid permit (50 CFR 21.11)
Bald and Golden Eagle Protection Act (BGEPA) (16 USC 668(a); 50 CFR 22).	USFWS	Continues the protection of the bald eagle though it has been delisted under the ESA. This law provides protection of the bald and golden eagle (as amended in 1962) by prohibiting the take, possession, sale, purchase, barter, offer to sell, purchase or barter, transport, export or import, of any bald or golden eagle, alive or dead, including any party, nest, or egg, unless allowed by permit (16 USC 668(a); 50 CFR 22).

3.6.2 Affected Environment

TERRESTRIAL WILDLIFE

Vegetation and land cover at JBLM determines what species of terrestrial wildlife reside in the area. Although the Installation is substantially developed, fragmented habitat exists in the form of low-elevation wetlands, prairie grasslands, and forest stands. The shoreline area that borders the Installation on the west also serves as highly utilized habitat at JBLM. Approximately 20 species of reptiles and amphibians, 200 species of birds, 50 species of butterflies, and 50 species of mammals utilize these diverse habitats (U.S. Army 2010).

Wetland habitat at JBLM supports multiple species including salamanders and reptiles such as, rough-skinned newt (*Taricha granulosa*), Pacific giant salamander (*Dicamptodon tenebrosus*), western toad (*Bufo boreas*), and three (3) species of garter snake (western terrestrial [*Thanmophis elegans*], northwestern [*Thamnophis ordinoides*], and common [*Taricha sirtalis*]). River otter (*Lutra Canadensis*), mink (*Mustela vison*), muskrat (*Ondatra zibethicus*), and beaver (*Castor Canadensis*) utilize wetlands for foraging and as a riparian corridor. Waterfowl and a variety of water-dependent birds can be found year around within the wetland habitat at JBLM. Migratory birds such as robins, blackbirds, and several species of waterfowl breed or winter within the wetland habitat (U.S. Army 2010).

Prairie habitat is utilized by species such as pocket gopher (*Thomomys talpoides*), western bluebird (*Sialia Mexicana*), and streaked horned lark (*Eremophila alpestris strigata*). Hawks, common nighthawks, swallows, and sparrows forage and/or nest within the prairie habitat (U.S. Army 2010).

Common forest-dwelling amphibians and reptiles include northwestern salamander (*Ambystoma gracile*), long-toed salamander (*Ambystoma macrodactylum*), western toad, common garter snake, and rubber boa (*Charina bottae*). Bird species such as black-capped chickadees (*Poecile atricapillus*), red-breasted nuthatches (*Sitta canadensis*), and brown creepers (*Certhia familiaris*) can be found inhabiting the coniferous forest areas. Rapter species such as red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), and sharp-shinned hawk (*Accipiter striatus*) are known to nest within the coniferous forest habitat. Warblers, kinglets, and ruffed grouse (*Bonasa umbellus*) utilize the mixed coniferous-deciduous forest habitat. Bald eagle (*Haliaeetus leucocephalus*), great blue heron (*Ardea herodias*), osprey (*Pandion haliaetus*), and a variety of woodpeckers and owls use larger trees and snags for foraging, nesting, and perching. Mammal species such as Columbia black-tailed deer (*Odeocoileus hemionus columbianus*), raccoon (*Procyon lotor*), coyote (*Canis latrans*), black bear (*Ursus americanus*), townsend chipmunk (*Tamias townsendii*), northern flying squirrel (*Glaucomys sabrinius*), and various bat species occur on JBLM property, typically within the forest habitat.

Salamanders, birds, reptiles, and mammals utilize Oregon white oak and mixed oak habitat. In addition, many invertebrates such as various moth species, butterflies, gall wasps, and spiders live exclusively in association with Oregon white oaks (U.S. Army 2010).

The shoreline area at JBLM is utilized by many species of seabirds such as alcids, gulls, and shearwaters. Pigeon guillemot (*Cepphus collumba*) is the most common seabird found along the shoreline area with potential nesting habitat along the steep slopes near Solo Point. Shorebirds such as sandpipers, herons, and plovers also utilize the shoreline area of the Installation (U.S. Army 2010).

FISH AND INVERTEBRATE RESOURCES

Approximately 25 fish species occur within the lakes, ponds, rivers, and streams at JBLM. The Nisqually River watershed encompasses over half of JBLM property. Four (4) major surface water resources include the Nisqually River, Sequalitchew Creek (including American Lake), Deschutes River, and Chambers Creek basins. Species occurring within the Nisqually River include pink (*Oncorhynchus gorbusca*) and coho salmon (*O. kisutch*), coastal cutthroat (*O. clarki clarki*), winter steelhead (*O. mykiss*), and Federally threatened fall Chinook salmon (*O. tshawytscha*) and bull trout (*salvelinus confluentus*). Chinook salmon mainly spawn within the deeper and wider main stem of the Nisqually River and therefore have a very small presence within the small creeks occurring on the Installation (Shared Strategy for Puget Sound 2011). The Nisqually River drainage basin supports a high abundance of chum salmon where Muck Creek is the primary production area for this species. Muck Creek also supports populations of sea-run cutthroat trout, steelhead trout, and coho salmon. Johnson Creek is a tributary of

Muck Creek and supports small runs of coho and chum salmon (*O. keta*) and steelhead trout (U.S. Army 2010).

Warm water species include rock bass (*Ambloplites rupestris*), largemouth bass (*Micropterus salmoides*), brown bullhead (*Ictalurus nebulosus*), bluegill sunfish (*Lepomis macrochirus*), pumpkinseed sunfish (*Lepomis gibbosus*), black crappie (*Pomoxis nigromaculatus*), and yellow perch (*Perca flavescens*) (U.S. Army 2010).

Marine fish and invertebrate species that occur in south Puget Sound and may be present near Solo Point are summarized in Table 3-9. Shellfish and crustaceans are typically found within the nearshore and shallow areas to depths greater than 300-feet (300'); however, small abundances of these species occur near Solo Point (U.S. Army 2010).

Forage fish species such as Pacific herring (*Lampetra tridentate*), surf smelt (*Hypomesus pretiosus*), and Pacific sand lance (*Ammodytes hexapterus*) are critical prey species for ESA listed salmonids, marbled murrelet (*brachyramphus marmoratus*), and steller sea lions (*Eumetopias jubatus*). They are small schooling fishes that occur in marine waters of Washington and feed primarily on zooplankton. These three (3) species and their critical spawning habitats commonly occur within the nearshore zone of Pacific Northwest beaches. Within Puget Sound, each species uses approximately 10 percent (10%) of the shoreline spawning habitat during the year. Adjacent nearshore habitats are used as nursery grounds by all three (3) species (Penttila 2007). A surf smelt breeding area is located approximately 350 feet (350') west of the proposed new outfall location (WDFW 2011).

Table 3-9 Marine Species Likely to Occur Near Proposed Outfall

Common Name	Scientific Name
MARINE FISH	
Pacific herring	Clupea harengus pallasi
Surf smelt	Hypomesus pretiosus
Hake	Merluccius productus
Pacific cod	Gadus macrocephalus
Walleye pollock	Theragra chalcogramma
Rockfish	Sebastes sp.
Pile surfperch	Rhacochilus vacca
Flounder	Pseudopleuronectes americanus
Rock Sole	Psettichthys melanostictus
Spiny dogfish	Squalus acanthias
Chinook salmon	Oncoryhynchus tshawytscha
Chum salmon	O. keta
Coho salmon	O. kisutch
Pink salmon	O. gorbuscha
Sockeye salmon	O. nerka
Sea-run cutthroat trout	O. clarki
Pacific Octopus	Enteroctopus dofleini

Table 3-9 Marine Species Likely to Occur Near Proposed Outfall	
Common Name	**Scientific Name**
INVERTEBRATES	
Dungeness crab	Cancer magister
Red rock crab	Cancer productus
Spot prawn	Pandalus sp.
Geoduck	Panopea generosa
Pacific oyster	Crassostrea gigas
Olympia oyster	Ostreola conchaphila
Horse clam	Tresus nuttallii
Butter clam	Saxidomus gigantean
Manila clam	Venerupis philippinarum
Native littleneck clam	Leukoma staminea
Soft-shell clam	Mya arenaria
Spiny scallop	Chlamys hastate
Pink scallop	Chamys rabida
Pinto abalone	Haliotis kamtschatkana
Star fish	Asteroidea
Sea urchin	Echinoidea
Sea cucumber	Parastichopus californicus

Source: Army 2010

Essential Fish Habitat

The Magnuson-Stevens Fishery and Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires that the regional Fishery Management Councils (FMCs), through Federal fishery management plans (FMPs), describe and identify essential fish habitat (EFH) for each Federally managed species, minimize, to the extent practicable, adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitats. Congress defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 United States Code [USC] 1802[10]). The term "fish" is defined in the MSA as "finfish, mollusks, crustaceans, and all other forms of marine animals and plant life other than marine mammals and birds." The regulations for implementing EFH clarify that "waters" include all aquatic areas and their biological, chemical, and physical properties, while "substrate" includes the associated biological communities that make these areas suitable fish habitats (50 CFR 600.10). Habitats used at any time during a species' life cycle (i.e., during at least one of its life stages) must be accounted for when describing and identifying EFH (NMFS 2002).

Potential impacts from the construction of the new outfall were not discussed in-depth within this EA, but were evaluated at a programmatic level. Subsequent analysis will occur for all Phase II construction when it is designed. Construction of the new outfall would require trenching or directional boring within the sediment of the Puget Sound shoreline, in-water work that would alter EFH will be minimized or

eliminated. It is anticipated that the proposed action will have little effect on EFH in the action area. Therefore, the proposed action may affect, but is not likely to affect EFH in the action.

3.6.3 Special-Status Species

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. Species considered in this discussion will be those listed as "endangered," "threatened," "candidate", or "proposed" by the USFWS or NOAA NMFS.

The ESA also requires the federal government to designate "critical habitat" for any species it lists under the ESA. The ESA, however, was subsequently amended by the National Defense Authorization Act for Fiscal Year 2004 (Pub. L. 108–136) to exclude lands controlled or owned by the Department of Defense (DoD) from being designated as critical habitat regardless of presences of primary constituent elements (PCEs). ESA section 4(a)(3)(B)(i) states: ''The Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation.''. The action area includes both DoD-owned property and non-DoD-owned property. All portions of the action area located on JBLM are excluded as critical habitat while portions of the action area located outside of JBLM, primarily the marine environment, are open for critical habitat designation.

Table 3-10, on the following page lists thirty (23) endangered, threatened, and candidate species with the potential to occur in Pierce County; however, only seven of these species has the potential to occur in the action area. A Biological Evaluation (Appendix F) was prepared for Phase I of the Proposed Action and found No Effect to federally listed endangered, threatened, or proposed species. When planned, Phase II activities, including the construction of the proposed outfall and RWDS, will require subsequent Section 7 consultation.

Bald Eagle

Bald eagles are protected by Federal law. In July 2007, the bald eagle was removed from the protection under the ESA, but is still protected under the MBTA (16 USC 703 et seq.) and the BGEPA (16 USC § 668-668c). These laws prohibit the taking of bald eagles, which is defined as pursuit, shooting, poison, killing, trapping, collecting, disturbance, or transportation, and provides protection to prevent harassment and provide buffer zones around nesting and roosting sites. Due to their presence on JBLM and those federal protections the bald eagle is discussed to provide the appropriate environmental baseline; however, it is not listed in Table 3-10.

Bald eagles are year-round residents at JBLM with over 250 bald eagles wintering on the Installation. Ten (10) nesting territories have been identified within the following locations: Nisqually River, Nisqually Bluff, Collard Woods, American Lake north, American Lake south, American Lake west, Spanaway marsh, Johnson Marsh, Halverson Marsh, and the golf course at the Installation (U.S. Army 2010).

Table 3-10 Endangered, threatened, and candidate species present in and around the proposed JBLM WWTP project area. Listing status and likelihood of occurrence in the action area is provided.			
Common Name (*Scientific name*)	**Listing Status (Federal)**	**Critical Habitat**	**Likelihood of Occurrence**
PLANTS			
Golden paintbrush (*Castilleja levisecta*) [1]	Threatened	Not designated	Not present
Marsh sandwort (*Arenaria paludicola*) [1]	Endangered	Not designated	Not present
Water howellia (*Howellia aquatilis*) [1]	Threatened	Not designated	Not present
Whitebark pine (*Pinus albicaulis*) [1]	Candidate	Not designated	Not present
INSECTS			
Taylor's checkerspot (*Euphydryas editha taylori*) [1/6]	Proposed	Not designated	Not present
Mardon skipper (*Polites mardon*) [1/6]	Proposed	Not designated	Not present
FISHES			
Bull trout (*Salvelinus confluentus*); Coastal-Puget Sound DPS [1/6]	Threatened	Designated	Likely present
Chinook salmon (*Oncorhynchus tshawytscha*); Puget Sound ESU [2/6]	Threatened	Designated	Likely present
Steelhead (*Oncorhynchus mykiss*); Puget Sound DPS [2/6]	Threatened	Under review	Likely present
Pacific eulachon/smelt (*Thaleichthys pacificus*); Southern DPS [5/6]	Threatened	Designated [7]	Potentially present
Canary rockfish (*Sebastes pinniger*); Puget Sound/Georgia Basin DPS [5/6]	Threatened	Not designated	Potentially present
Yelloweye rockfish (*Sebastes ruberrimus*); Puget Sound/Georgia Basin DPS [5/6]	Threatened	Not designated	Potentially present
Bocaccio (*Sebastes paucispinis*); Puget Sound/Georgia Basin DPS [5/6]	Endangered	Not designated	Potentially present
REPTILES AND AMPHIBIAN			
Oregon spotted frog (*Rana pretiosa*) [1/6]	Candidate	Not designated	Not present
BIRDS			
Marbled murrelet (*Brachyramphus marmoratus*) [1/6]	Threatened	Designated [7]	Potentially present
Northern spotted owl (*Strix occidentalis caurina*) [1/6]	Endangered	Designated [7]	Not present
Streaked horned lark (*Eremophila alpestris strigata*) [1/6]	Proposed	Not designated	Potentially present
Yellowbilled cuckoo (*Coccyzus americanus*) [1/6]	Candidate	Not designated	Not present
MAMMALS			
Southern resident killer whale (*Orcinus orca*) [4/6]	Endangered	Designated	Potentially present
Humpback whale (*Megaptera novaeangliae*) [4/6]	Endangered	Not designated	Unlikely present
Steller sea lion (*Eumetopias jubatus*); eastern population [4/6]	Threatened	Designated [7]	Unlikely present
Mazama pocket gopher (*Thomomys mazama* ssp. *glacialis* and *tacomensis*) (Roy Prairie and Tacoma) [1/6]	Candidate	Not designated	Unlikely present
Fisher (*Martes pennanti*); West Coast DPS [1/6]	Candidate/Endangered	Not designated	Not present
North American wolverine (*Gulo gulo*	Candidate/None	Not designated	Not present

Table 3-10 Endangered, threatened, and candidate species present in and around the proposed JBLM WWTP project area. Listing status and likelihood of occurrence in the action area is provided.			
Common Name (*Scientific name*)	**Listing Status (Federal)**	**Critical Habitat**	**Likelihood of Occurrence**
luteus); contiguous U.S. DPS [1]			

[1] USFWS 2011
[2] NOAA-NMFS 2011
[3] NOAA-NMFS 2011a
[4] NOAA-NMFS 2011b
[5] NOAA-NMFS 2011d
[6] WDFW 2008, 2011a
[7] Critical habitat does not occur within the action area.

Table 3-11 Listed species in Pierce County with a very low likelihood of occurrence in the action area. Habitat requirements and rationale for their likely absence is provided.			
Common Name (*Scientific name*)	**Listing Status**	**Habitat Requirements**	**Rationale for Absence**
PLANTS			
Golden paintbrush (*Castilleja levisecta*)	Threatened	Open native grasslands on glacially-derived soils (USFWS 2000; Dunwiddie 2009).	Extirpated from range by agricultural/urban development; several surveys of JBLM area found no individuals (see Army 1997; USFWS 2000; Dunwiddie 2009; WNHP 2011).
Marsh sandwort (*Arenaria paludicola*)	Endangered	Native wetlands and freshwater marshes in saturated acidic bog soils, predominantly sandy with a high organic content (see Army 1997; WNHP 2011).	Extirpated from range by elimination or degradation of habitat; 2 surveys on JBLM found no individuals (see Army 1997; Eco-logic 2009; WNHP 2011).
Water howellia (*Howellia aquatilis*)	Threatened	Grow on firm, consolidated clay and organic sediments in freshwater wetlands filled by spring precipitation runoff, and exhibit drying during growing and seed-set seasons (Gamon 1997, 1998; Kerschke 1997).	Decline due to competition with introduced plants and loss of supporting wetland habitat from human activities; extant population present on eastern edge of JBLM but no known individuals in or near action area (see Gamon 1997, 1998; Lynch 2005; WNHP 2011).
Whitebark pine (*Pinus albicaulis*)	Candidate	High-elevation forests and timberlines where it is either a climax alpine species or a seral species at or above tree line (USFWS 2011a).	Habitat supporting this species is not present in the action area; historical records indicate this species has never been present in the action area (see USFWS 2011a)
INSECTS			
Taylor's checkerspot (*Euphydryas editha taylori*)	Proposed	Open native grasslands on glacially-derived soils (USFWS 2010).	Only remaining population on JBLM is restricted to eastern edge and not in or near the action area (see U.S. Army 2010).
REPTILES AND AMPHIBIAN			
Oregon spotted frog (*Rana pretiosa*)	Candidate	Found in wetlands likely >4 hectares in size with shallow zones with abundant emergent or floating aquatic plants (McAllister et al. 1997; U.S. Army 2006).	Decline due to loss of habitat, non-native plant invasions, and the introduction of exotic predators such as bullfrogs. 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 (Brachyramphus marmoratus)	Threatened	Typical found foraging in shallow coastal waters, typically within typically 1-2km from shoreline (USFWS, 1997)..	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	Endangered	Found in mature, undisturbed coniferous forests (USFWS 2008a).	Decline due to habitat degradation and

Table 3-11 Listed species in Pierce County with a very low likelihood of occurrence in the action area. Habitat requirements and rationale for their likely absence is provided.			
Common Name (*Scientific name*)	**Listing Status**	**Habitat Requirements**	**Rationale for Absence**
(*Strix occidentalis caurina*)			fragmentation and competition with other species. Although habitat is present on JBLM, none are found in the action area. No records of this species in the action area exist (U.S. Army 2010).
Streaked horned lark (*Eremophila alpestris strigata*)	Proposed	Open prairie and riverine outwash area with minimal vegetation. Nests are typically on ground which is sparsely vegetated and dominated by grasses and forbs.	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 (*Coccyzus americanus*)	Candidate	Requires undisturbed, mature riparian corridors (USFWS 2000a).	Decline due to reduction of suitable habitat and habitat fragmentation. No habitat or known population is present in the action area (see USFWS 2000a).
MAMMALS			
Humpback whale (*Megaptera novaeangliae*)	Endangered	Feeding grounds are in cold, productive coastal waters. Calving occurs in the warmest waters available near equatorial latitudes (NOAA-NMFS 2011).	They are only infrequent visitors to waters near the Nisqually National Wildlife Refuge and are considered an accidental migrant to Puget Sound (U.S. Army 2010).
Steller sea lion (*Eumetopias jubatus*); eastern population	Threatened	Haulouts and rookeries usually at beaches with gravel, rocky, or sandy substrate, or ledges, rocky reefs, jetties, offshore rocks, or coastal islands (Jefferies et al. 2000).	Threats mainly from anthropomorphic sources and habitat degradation (NOAA-NMFS 2011e). No breeding rookeries are found in Washington; no haulout sites are found in or near the action area (Jefferies et al. 2000).
Mazama pocket gopher (*Thomomys mazama* ssp. *glacialis* and *tacomensis*) (Roy Prairie and Tacoma)	Proposed	Occurs in southern Puget Sound grasslands and alpine meadows including native prairies (Stinson 2005).	Decline due to reduction of native prairie habitat. They avoid areas with high densities of Scotch broom or Douglas-fir. Little if any habitat is present in the action area; no populations have been identified in action area (U.S. Army 2006).
Fisher (*Martes pennanti*); West Coast DPS	Candidate	Found in dense, mesic forests at low to mid-elevations (Hayes and Lewis 2006).	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 (see Hayes and Lewis 2006).
North American wolverine (*Gulo gulo luteus*); contiguous U.S. DPS	Candidate	Found in mountainous alpine areas (USFWS 2010a).	Decline due to habitat fragmentation and climate change. No habitat or known population is present in the action area (see USFWS 2010a).

1

FISH

Coastal-Puget Sound Bull Trout DPS

Currently, all populations of bull trout (Salvenlinus confluentus) in the lower 48 states are listed as threatened under the ESA. Bull trout are in the char subgroup of salmonids and have both resident and migratory life histories. The Coastal-Puget Sound bull trout DPS reportedly contains the only occurrence of anadromous bull trout in the contiguous United States (USFWS 1999). Critical habitat was originally designated for bull trout in 2005 (70 FR 56212) with a final revision to this habitat designation published in 2010 (75 FR 63898). Although critical habitat is designated in south Puget Sound, it is not designated at JBLM. The USFWS determined that conservation efforts identified in the Installation's INRMP would provide benefits to bull trout (USFWS 2010a).

Bull trout spawning areas are associated with colder water temperature than most salmonids, cleanest stream substrates, complex habitats (i.e., streams with riffles and deep pools, undercut banks and many large logs), and river, lake and ocean habitats that connect to headwater streams (USFWS 2010a). Bull trout spawn from August to November. They are opportunistic feeders, but are primarily piscivorous. Adults feed almost exclusively on other fish, including various trout and salmon species, minnows, suckers, whitefish, and sculpin. Juveniles feed on aquatic invertebrates, including mayflies, stoneflies, caddisflies, and beetles.

Bull trout have been documented using the Nisqually River system for feeding, overwintering, and migration (USFWS 2010a). They have not been observed within the tributaries on JBLM (U.S. Army 2010).

Puget Sound Chinook Salmon Evolutionary Significant Unit (ESU)

The Puget Sound ESU of Chinook salmon was listed as threatened on March 24, 1999, with the threatened listing reaffirmed in 2005 (NMFS 2005a).

Critical habitat was initially designated for Puget Sound Chinook on February 16, 2000, and was revised on September 2, 2005 (NMFS 2005b). Critical habitat consists of the water, substrate, and the adjacent riparian zone of accessible estuarine and riverine reaches and extends to a depth of 30 meters below Mean Lower Low Water (MLLW) mark. The Marine Nearshore Zone from extreme high tide to mean lower low tide has also been included in the final habitat designation. Critical habitat for Puget Sound Chinook has been excluded from DoD lands subject to an approved Integrated Natural Resources Management Plan (INRMP). Adult migration and juvenile outmigration occurs primarily through the Nisqually River to the south of the Installation and Chambers Creek to the north. Chinook use a variety of freshwater habitats but tend to restrict spawning habitat to large mainstream rivers. However, spawning has been documented in the lower Muck Creek during high water years (U.S. Army 2010). Surface waters on and near JBLM are used for spawning, rearing, and/or migration, including Nisqually River and Muck Creek.

Puget Sound Steelhead Salmon ESU

The Puget Sound Distinct Population Segment (DPS) of steelhead was listed as threatened on May 11, 2007 (NMFS 2007). Stocks of the Puget Sound steelhead DPS are mainly winter-run, although a few small stocks of summer-run steelhead also occur. No critical habitat for Puget Sound steelhead has been designated, but it is currently under development (NMFS 2007).

Steelheads exhibit the most complex life history of any species of Pacific salmonid. Steelhead can be anadromous (referred to as steelhead) or freshwater residents (referred to as rainbow trout), and, under some circumstances, can yield offspring of the alternate life history form (NMFS 2007). Anadromous

forms can spend up to seven (7) years in fresh water prior to smoltification and then spend up to three (3) years in salt water prior to migrating back to their natal streams to spawn (Busby et al. 1996). In addition, steelhead may spawn more than once during their life span, whereas other Pacific salmon species generally spawn once and die.

Steelhead that enters freshwater between May and October are considered summer-run while those that enter between November and April are considered winter-run. Spawning occurs from April through June.

The Nisqually River supports both winter- and summer-run steelhead. Steelhead use streams on and near JBLM for spawning, rearing, and/or migration, including Nisqually River and Muck Creek (U.S. Army 2010). Spawning mainly occurs in the Nisqually River while rearing occurs in Muck Creek.

Pacific Eulachon/Smelt; Southern DPS

Pacific eulachon/smelt (*Thaleichthys pacificus*); southern DPS was listed as threatened under the federal ESA on March 13, 2009 (74 FR 10857). Proposed critical habitat, designated on October 20, 2011 (76 FR 65324), includes the marine waters in the action area.

Eulachon (also commonly called smelt, candlefish, or hooligan) are a small, anadromous fish from the eastern Pacific Ocean (NOAA 1999; NOAA-NMFS 2011c). Eulachon are endemic to the eastern Pacific Ocean, ranging from northern California to southwest Alaska and into the southeastern Bering Sea (NOAA 1999; NOAA-NMFS 2011c). In the continental United States, most eulachon originate in the Columbia River Basin. Other areas in the United States where eulachon have been documented include the Sacramento River, Russian River, Humboldt Bay and several nearby smaller coastal rivers (e.g., Mad River), and the Klamath River in California; the Rogue River and Umpqua Rivers in Oregon; and infrequently in coastal rivers and tributaries to Puget Sound, Washington (Starr and Starks 1895; NOAA 1999; NOAA-NMFS 2011c; Gustafson et al. 2010).

Eulachon occur in nearshore ocean waters and to 1,000 feet (300 meters) in depth, except for the brief spawning runs into their natal (birth) streams (NOAA 1999; NOAA-NMFS 2011c). Spawning grounds are typically in the lower reaches of larger snowmelt-fed rivers with water temperatures ranging from 39 to 50° F (4 to 10°C). Spawning occurs over sand or coarse gravel substrates (NOAA 1999; NOAA-NMFS 2011c).

Eulachon typically spend 3 to 5 years in saltwater before returning to freshwater to spawn from late winter through mid-spring. During spawning, males have a distinctly raised ridge along the middle of their bodies (NOAA 1999; NOAA-NMFS 2011c). Eggs are fertilized in the water column. After fertilization, the eggs sink and adhere to the river bottom, typically in areas of gravel and coarse sand. Most eulachon adults die after spawning. Eulachon eggs hatch in 20 to 40 days. The larvae are then carried downstream and are dispersed by estuarine and ocean currents shortly after hatching. Juvenile eulachon move from shallow nearshore areas to mid-depth areas (NOAA 1999; NOAA-NMFS 2011c).

The nearest reported occurrence of eulachon to the action area is a historic transplant of individuals from the Columbia River to the Nisqually River in 1932 (see Gustafson 2010). Although the outcome of this planting is unknown and eulachon are thought to only ever have had rare relative abundance in Puget Sound (see NOAA 1999; NOAA-NMFS 2011c; Gustafson 2010), PCE habitat features in the form of freshwater and estuarine migration corridors and nearshore and offshore marine foraging habitat may occur in the action area.

Puget Sound/Georgia Basin Canary Rockfish DPS

The Puget Sound/Georgia Basin canary rockfish (*Sebastes pinniger*) DPS has been listed as threatened under the ESA (NMFS 2010) throughout all of their range. This designation encompasses the inland marine waters east of the central Strait of Juan de Fuca and south of the northern Strait of Georgia.

Much of the following information on canary rockfish life history and habitat use is derived from research in other areas where canary rockfish are more abundant. Canary rockfish range from Punta Blanca, Baja California, to the Shelikof Strait of Alaska, and are abundant from British Columbia to central California. Larvae and pelagic juveniles (1.3-2.0 cm) are found in the upper 330-feet of the water column from January until about March when they start to move into intertidal areas (tide pools, rocky reefs, kelp beds, cobble areas), although some juveniles remain pelagic in much deeper water until July (Love et al. 2002). Juveniles may occupy rock-sand interfaces near 50 feet to 65 feet during the day and then move to sandy areas at night. Adult canary rockfish typically inhabit waters from 160 feet to 820 feet but some may occur at 1,400 feet (i.e., greater than the project depth). Larger fish tend to occur in deeper water. Although canary rockfish are sedentary, some have been reported to migrate 700 km over several years. Adults release larvae (0.25-0.50 cm) between September and March with peaks in December and January off the Oregon and Washington coasts (Wyllie-Echeverria 1987; Barss 1989).

Diets of juvenile canary rockfish consist of open-water and benthic prey, including copepods, amphipods, and krill eggs and larvae. Adults and sub-adults feed on krill, gelatinous zooplankton, small lanternfishes, anchovies, sanddabs, and adult shortbelly rockfish (Phillips 1964). Some juvenile canary rockfish predators include marine birds and mammals, lingcod, other rockfish, Chinook salmon, and other fishes (Love et al. 2002).

Canary rockfish were once considered fairly common in the greater Puget Sound area (Kincaid 1919; Holmberg et al. 1967); however, little is known about their habitat requirements in these waters (Drake et al. 2009; Palsson et al. 2009). Palsson et al. (2009) reviewed historical data on Puget Sound fish species distributions and relative number of occurrences through the mid-1970s from literature, fish collections, unpublished log records, and other sources. In this historical records review, Palsson et al. (2009) noted 114 records of canary rockfish prior to the mid-1970s, with most records attributed to sport catch from the 1960s to 1970s in Tacoma Narrows, Hood Canal, San Juan Islands, Bellingham, and Appletree Cove. Drake et al. (2009) concluded that canary rockfish occur in low and decreasing abundances in Puget Sound.

Puget Sound/Georgia Basin Yelloweye Rockfish DPS

The Puget Sound/Georgia Basin yelloweye rockfish (*Sebastes ruberrimus*) DPS is listed as threatened under the ESA (NMFS 2010) throughout all of their range. The designation area of Puget Sound/Georgia Basin encompasses the inland marine waters east of the central Strait of Juan de Fuca and south of the northern Strait of Georgia.

Yelloweye rockfish occur from Ensenada, Baja California, to the Aleutian Islands in Alaska. They are abundant from southeast Alaska to central California. Juvenile yelloweye rockfish settle in shallow, high relief zones, crevices, and sponge gardens. They move deeper as they grow into adults, continuing to associate with caves and crevices and spending large amounts of time lying on the substratum, sometimes at the base of rocky pinnacles and boulder fields (Love et al. 2002). Adults typically inhabit waters 80-feet to 1,560-feet deep, and often occur in areas with high relief and complex rocky habitats. Yelloweye release larvae from April to September with a hiatus in June and July (Palsson et al. 2009). Larvae and

juveniles remain pelagic for up to two (2) months, settling to shallow, high relief zones, crevices, and sponge gardens (Love et al. 2002).

Yelloweye larvae and juveniles are opportunistic feeders, preying upon fish larvae, copepods, amphipods, krill eggs, and larvae. Adult diets consist of rockfishes, herring, sand lance, flatfishes, shrimps, crabs, and lingcod eggs (Love et al. 2002). In South Sound, yelloweye rockfish are known to feed on fish, especially walleye pollock (*Theragra chalcogramma*), cottids, poachers, and Pacific cod (*Gadus macrocephalus*) (Washington et al. 1978).

An approximate estimate of yelloweye rockfish abundance in Puget Sound Proper was only 1,200 individuals during the 1980s (Drake et al. 2009). Yelloweye rockfish are less frequent in southern Puget Sound compared to northern Puget Sound, presumably because less rocky habitat is available in southern Puget Sound. No more than 20 yelloweye rockfish have ever been observed in annual recreational fishery samples and harvest of them became prohibited in Puget Sound in 2002.

Puget Sound/Georgia Basin Bocaccio DPS

The Puget Sound/Georgia Basin bocaccio (*Sebastes paucispinus*) DPS has been listed as endangered throughout all of its range (NMFS 2010). The designation area of Puget Sound/Georgia Basin encompasses the inland marine waters east of the central Strait of Juan de Fuca and south of the northern Strait of Georgia.

Bocaccio range from the Punta Blanca, Baja California region to the Gulf of Alaska. They are believed to have commonly occurred along steep walls in most of Puget Sound prior to fishery exploitations, although they are currently very rare in these Puget Sound habitats (Love et al. 2002). Little is known about the habitat requirements of most rockfishes despite the years of research already performed. Even less is known about bocaccio in Puget Sound (Drake et al. 2009; Palsson et al. 2009).

Much of the following information on bocaccio life history and habitat use is derived from other areas where bocaccios are more abundant. The juvenile bocaccio settle in nearshore habitats at 3 to 4 months of age, where the species prefer shallow waters over algae-covered rocks, or in sandy areas where eelgrass beds or drift algae are present (Love et al. 1991, 2002). As bocaccios grow older, they move into deeper waters with adults found over high relief boulder fields and rocks. They can occur well off the bottom (over 100 feet above the substrata) or as deep as 900 feet (Love et al. 2002). Adult bocaccios inhabit waters approximately 40 feet to 1,570 feet in depth but are most common at depths of 160 feet to 820 feet. Although bocaccios are typically associated with hard substrate, they may occur over mud flats, where they can be located as much as 96 feet off the bottom (Palsson et al. 2009).

Bocaccios release larvae in January, continuing through April off the coast of Washington. Larval and pelagic juvenile bocaccios drift into nearshore surface waters associated with drifting kelp mats (Love et al. 2002). Larval bocaccio feed upon microplankton, but juveniles are more opportunistic feeders (e.g., fish larvae, copepods, krill) (Phillips 1964; Sumida and Moser 1984; Love et al. 2002). Adult bocaccios are piscivorous, whereas juveniles consume smaller fishes and zooplankton. Larger juveniles and adults feed upon other rockfishes, hake, sablefish, northern anchovies, lantern fish, and squid (Phillips 1964; Eschmeyer et al. 1983; Sumida and Moser 1984).

Historically in Puget Sound, most bocaccios were reportedly found near Point Defiance and Tacoma Narrows. Palsson et al. (2009) reviewed historical data on Puget Sound fish species distributions and relative number of occurrences through the mid-1970s from literature, fish collections, unpublished log records, and other sources. Palsson et al. (2009) noted bocaccios were only recorded 110 times; most records were associated with sport catch from the 1970s in Tacoma Narrows and Appletree Cove (near

Kingston). Bocaccios have never been observed during WDFW bottom trawl, video, or dive surveys in Puget Sound (Palsson et al 2009).

MARINE MAMMALS

Several marine mammals that occur within the nearshore areas of South Puget Sound and potentially within the project area include harbor seal, California sea lion, and river otter (U.S. Army 2010). Seals and sea lions rest or haul-out along Puget Sound shorelines and California sea lions are occasionally seen near the proposed new outfall project area.

Other mammals seen within the offshore areas of JBLM include minke whales and killer whales (transient and resident), as well as dall's porpoise. A long-beaked common dolphin was spotted 0.25 to 0.5 mile from shore in July, near Anderson Island (Orca Network 2011).

Federally listed marine mammals that may be present near the project area include Southern Resident Killer whale and Steller sea lion.

Southern Resident Killer Whale

The southern resident killer whale DPS was listed as endangered on November 18, 2005 (NMFS 2005c). A recovery plan was approved in 2008 (NMFS 2008b). The southern resident killer whale DPS consists of three (3) pods (J, K, and L pods) that occur in the inland waters of Washington State and British Columbia (Strait of Georgia, Strait of Juan de Fuca, and Puget Sound), principally during the late spring, summer, and fall (Heimlich-Boran 1988; Ford et al. 2000; Wiles 2004). J pod spends much of the winter and early spring in inland waters, while K and L pods tend to move to coastal areas during this period (Ford et al. 2000; Krahn et al. 2004). As of July 2011, the population was estimated at 88 individuals (J-pod=26, K-pod=20, and L-pod=42) (Center for Whale Research 2011).

Killer whales are highly social mammals and occur in pods, or groups of up to 40-50 animals. Resident killer whales primarily feed on salmonids including Chinook and chum salmon of which have been the preferred prey (Ford et al. 1998; Ford and Ellis, 2005).

Transient killer whales also occur in Washington inland waters and have been observed south of Solo Point in Olympia during the early fall months (Orca Network 2011). Genetic and morphological studies indicate that southern resident killer whales are a distinct population, and they appear not to associate or interbreed with the other North Pacific killer whale populations, including transient killer whales (Krahn et al. 2004). Although the transient population is not listed under ESA, it is protected under the MMPA.

Southern resident killer whales occasionally occur in Puget Sound near JBLM property. As many as five (5) members of J-pod were observed near Anderson Island in August of 2011 (Orca Network 2011). Critical Habitat is designated in most of Puget Sound, including along JBLM and the northern Washington coast.

Steller Sea Lion

The Steller sea lion was federally listed as threatened on November 26, 1990 (NMFS 1990). The NMFS reclassified the Steller sea lion into two (2) DPSs based on demographics and genetics (NMFS 1997). The population was divided into two (2) recognized management stocks (eastern and western) and separated at 144º W longitude (Loughlin 1997). The western stock was listed as endangered on May 4, 1997, and the eastern stock retained the threatened classification. The eastern DPS includes the species distribution in southeast Alaska, Canada, Washington (including inland waters), Oregon, and California (NMFS 1997).

Only the eastern DPS is discussed in the EA as the western DPS is outside the geographic area. No critical habitat has been designated for the eastern DPS in Washington.

The eastern DPS Steller sea lions are born primarily at 13 major rookeries in southeastern Alaska, northern British Columbia, and southern Oregon (Pitcher et al. 2007). No rookeries exist in Washington State. Both sexes are found in Washington waters. These animals are most likely immature or nonbreeding adults from rookeries located on the Oregon and British Columbia coasts (Jeffries et al. 2000; NMFS 2008a). Steller sea lions haul out to rest at a much larger number of coastal sites throughout their range year-round. In Washington, Steller sea lions primarily occur at haul-out sites along the outer coast from the Columbia River to Cape Flattery, as well as in British Columbia along the Vancouver Island coastline in the Strait of Juan de Fuca (Jeffries et al. 2000; Committee on the Status of Endangered Wildlife in Canada 2003; Olesiuk 2008).

Steller sea lions are occasionally present in Puget Sound at the Toliva Shoals haul-out site in south Puget Sound (Jeffries et al. 2000) and a rock near Marrowstone Island. They also use manmade structures such as jetties and navigation buoys, offshore rocks, and coastal islands. The closest steller sea lion haul-out location observed was on a navigation buoy located approximately five (5) miles north of the project area, near Fox Island. Steller sea lions are present in Puget Sound from late fall through May and are increasing in number (Steiger and Calambokidis 1986; Jeffries et al. 2000; Jeffries 2010 as cited in Navy 2011). Because Steller sea lions are often observed with California sea lions, and they have the ability to swim long distances, they may be present near the project area.

3.7 SOCIOECONOMICS

3.7.1 Regulatory Setting

Socioeconomics is the resource under which the economic and social impacts of an economic change are studied. Development can impact demographics, economic development, and quality of life. Environmental justice and the protection of children are also analyzed under socioeconomics.

Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations was established to focus attention on potential environmental and human health impacts on minority and low-income populations resulting from Federal actions, with the goal of environmental protection for all communities. It requires Federal agencies to identify and address the disproportionately high and adverse environmental or human health effects of an action on these populations, to the greatest extent practicable. The CEQ defines minorities as members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, and Black or African American (CEQ 1997). Low-income populations are identified using the Census Bureau's statistical poverty threshold, which varies by household size and number of children. In 2010, the poverty threshold for a family of four (4) with two (2) children was $22,113 (U.S. Census Bureau 2010a).

EO 13045, Protection of Children from Environmental Health Risks and Safety Risks was established to protect children from disproportionately being affected by environmental health and safety risks due to agency actions. It requires agencies to identify and address potential risks to this population, to the greatest extent practicable.

3.7.2 Affected Environment

This section describes various factors that are analyzed under Socioeconomics and Environmental Justice standards that are considered vital elements of a community. Those element areas are as follows:

- Demographics
- Economic development
- Quality of life
- Environmental justice in minority and low-income populations
- Protection of children from environmental health risks and safety risks.

The ROI for JBLM is comprised of Pierce and Thurston counties. The city of DuPont is located in Pierce County and may be impacted by Alternative A of the Proposed Action, as the Lewis Main Line portion of the reclaimed water system is planned to partially run through the city. Thus this affected environment section focuses at the county level, but provides some detail on the city of DuPont as well.

DEMOGRAPHICS

The 2010 Census population of the ROI totaled 2,419,312, increasing from the ROI's 2000 Census population of 908,175 (U.S. Census Bureau 2010b). The largest communities located in the ROI include Tacoma and Lakewood in Pierce County and Olympia and Lacey in Thurston County. Each community's 2010 Census population is as follows: 1) Tacoma 198,397, 2) Lakewood 58,163, 3) Olympia 46,478, and 4) Lacy, 42,393 (U.S. Census Bureau 2010b). The 2010 Census noted a population of 8,199 for the city of DuPont (U.S. Census Bureau 2010b).

As of January 2010, JBLM supports 34,480 active duty personnel; 53,444 military family members; 16,107 civilian personnel (including contractors); and 27,470 family members of civilian personnel. In total, this represents approximately 14 percent (14%) of the population in the ROI (City of Lakewood 2010).

ECONOMIC DEVELOPMENT

Economic development focuses on employment, income, and unemployment statistics. In 2010, almost 3.8 million jobs existed in Washington State. The 2010 per capita personal income in the state was $42,570, an increase of 1.9 percent from 2009, and 107 percent of the national average (Bureau of Economic Analysis 2010b). In 2009, Washington State's unemployment rate was 8.9 percent (8.9%), compared with the 2009 national average of 9.3 percent (9.3%) (Washington State Department of Transportation 2010).

Pierce County is located within the urban region designated as the Puget Sound Region. It has good access to key transportation facilities, including Interstate 5 (I-5), rail and airport. It is Washington State's second largest labor market behind King County. Economic development is concentrated around the urban port city of Tacoma, as the Port of Tacoma is the sixth largest container facility in North America (Washington Department of Employment Security 2010). In 2009, approximately 382,995 jobs existed in Pierce County (Bureau of Economic Analysis 2010a) and its per capita personal income was $40,577 (7th in the state), an increase of 0.3 percent (0.3%) from the prior year (Bureau of Economic Analysis 2010b). That same year, Pierce County's unemployment rate was 9.9 percent (9.9%) (Bureau of Labor Statistics Local Area Unemployment Statistics, 2010a). JBLM plays a strong economic role in the county as a regional employer, and as purchasing agent for local goods and services (Washington Department of Employment Security 2010). In 2009, 381,118 nonfarm jobs existed in Pierce County. Of that total, 95,057 were government jobs, 43,105 were health care/social assistance jobs and 25,755 were construction jobs. Of the government jobs in Pierce County, 36,606 were military (Bureau of Economic Analysis 2010a).

Thurston County is located in an area of Washington where the Nisqually and Squaxin Island tribes established themselves, and is currently the location of Olympia, the state capital. In 2009, approximately 130,574 jobs existed in the county (Bureau of Economic Analysis 2010a) and its per capita personal income was $40,801 (6th in the state), a decrease of 0.8 percent from 2008 (Bureau of Economic Analysis 2010b). Thurston County's 2009 unemployment rate was 7.5 percent (Washington State Department of Transportation 2010). In 2009, 128,760 non-agricultural jobs existed in Thurston County. Of that total 37,963 were government jobs, 14,207 were retail trade jobs, 14,065 were health care/social assistance jobs and 1,814 were agricultural. Of the government jobs in Thurston County, 801 were military (Bureau of Economic Analysis 2010a).

The city of DuPont is situated in an area adjacent to both the JBLM and the Puget Sound. The Burlington Northern Santa Fe railroad runs through the city. Historically, the area has been inhabited by the Sequalitchew-Nisqually people at the mouth of Sequalitchew Creek. Later, Hudson Bay Company developed a storehouse and permanent trading post in the area, and in 1906, the E.I. du Pont de Nemours and Company purchased an area of land and designed and built DuPont as a company town for the DuPont Powder Works plant. This company town lasted until a 1970s sale of the holdings to Weyerhaeuser, which eventually led to the redevelopment of the area into a planned residential development. The city continues to develop, grow, and expand (City of DuPont 2007).

QUALITY OF LIFE

Numerous facilities and services on JBLM in the civilian community contribute to quality of life on the Installation and the communities adjacent to JBLM. Key contributors to quality of life include health care, childcare and schooling, and recreation.

Health care on JBLM is provided through Madigan Army Medical Center (MAMC), and supplemented by medical and dental clinics, and other health services. MAMC is a Level II Trauma Center and has a total military beneficiary population that encompasses a six-state region. Residing within the hospital's 40-mile catchment area are approximately 160,000 Soldiers, Family members and Military retirees (MAMC 2010). It is the fifth (5th) largest employer in Pierce County, with more than 5,000 staff members including doctors, nurses, interns, and fellows (JBLM 2010). Approximately 200 volunteers monthly donate their time to an internal American Red Cross program. MAMC has 243 in-patient beds and 229 surgery beds, with the possibility of expansion to 318 during a disaster. It is a technically advanced medical center and a teaching institution, providing Graduate Medical and Nursing Education programs. MAMC's daily averages include 5,021 lab procedures, 3,830 prescriptions, 179 emergency room visits, 44 surgical procedures, seven (7) births, and 4,336 clinic visits (U.S. Army 2010).

JBLM's Exceptional Family Member Program (EFMP) is a program for active duty military with Family members that have a physical, emotional, developmental, or intellectual disability that requires specialized services. It provides for the development of a plan of support for that Family member that provides a multi-disciplinary, complementary, and comprehensive approach (JBLM 2010). MAMC facilitates the EFMP program, coordinating with military and state agency services to provide participating JBLM Families with appropriate care (MAMC 2010).

In addition to MAMC, Pierce County is the location of several other hospital and clinics throughout Lakewood, Tacoma, and south in Thurston County. Some of the larger ones are Allenmore Hospital, Good Samaritan Hospital, Mary Bridge Children's Hospital and Health Center, Puget Sound Behavioral Health Psychiatric Hospital, Riverside Infirmary, Saint Anthony Hospital, Saint Clare Hospital, Tacoma General Hospital, Veterans Affairs Medical Center American Lake, Western State Hospital, Capital Medical Center and Providence Saint Peter Hospital.

Childcare programs on base are provided at centers on JBLM and in Family Child Care Homes. These programs are available for children from ages six (6) weeks to 12 years. In 2010, JBLM provided five (5) on-base Child Development Centers, with the plans to construct seven (7) additional child and student care facilities and expand three (3) of the existing facilities (U.S. Army 2010).

Clover Park School District is the fourth (4^{th}) largest school district of 15 districts in Pierce County. It operates schools in 68 square miles encompassing the city of Lakewood (immediately adjacent to JBLM) and JBLM. The school district runs 17 elementary schools, four (4) middles schools, two (2) senior high schools, one (1) alternative school, and four (4) special programs. Thirty-one percent (31%) of the district's students live on military installations and a total of 43 percent (43%) of its students are federally connected (Clover Park School District 2011). The city of DuPont is located within Pierce County's Clover Park and Steilacoom school districts.

Within the ROI, there are 25 school districts (with two overlapping King and Lewis County boundaries), with a combined total enrollment of 167,328 in October 2011 (State of Washington Office of Superintendent of Public Instruction 2011a). Within the ROI there are approximately 71 private schools, with an enrollment of approximately 12,381 students (State of Washington Office of Superintendent of Public Instruction 2011b).

Other quality of life facilities offered on JBLM include a PX Exchange and Commissary, chapel, and mini-mall. Recreational programming provides a variety of activities and clubs for all ages. The JBLM Golf Course is open to the public, while the following recreational facilities are open to military personnel and family: Jensen Sport and Fitness Center, McVeigh Sports and Fitness Center, various sport fields, a roller-skating arena, and a bowling center.

The region as a whole has a wealth of recreational opportunities that both military and civilian community members can take part in, enhancing quality of life. The Pierce County Parks department maintains 30 park sites (2,000 acres), two (2) recreation centers, five (5) boat launch sites, trails, two (2) golf courses, and many other recreational facilities. The 340-acre Fort Steilacoom Park is utilized for soccer, baseball, and softball, and provides a playground and picnic area. The Nisqually National Wildlife Refuge is 2,925 acres with many recreational and environmental educational opportunities, as does the Mount Rainier National Park (City of DuPont 2007).

The city of DuPont is a planned community designed to promote a neighborhood-based character, where future development planning desires include maintaining a walkable and accessible recreational system for community members. The city of DuPont owns 53.1 acres of developed park space at 11 different sites, while 59 separate park sites of approximately 12.7 acres are privately-owned and maintained. Within DuPont, there are also 54.0 acres of public open space and 409.4 acres of natural area (e.g. lakes, wetlands, marshes etc.). Public sports facilities available in DuPont are limited to a softball field and gymnasium located at Chloe Clark Elementary School. Additional facilities are offered by private companies. A system of trails, both pave and unpaved, and several miles of designated bike lanes span 12.6 miles within many areas of DuPont (City of Dupont 2007).

ENVIRONMENTAL JUSTICE

Minority populations within the ROI comprise approximately 26 percent (26%) of the overall population in Pierce County and 18 percent (18%) of Thurston County. Minority populations within DuPont comprise approximately 31 percent (31%) of the city's total 2010 Census population. Data from 2000 indicates that the minority population on JBLM is larger than within the ROI, at 39.6 percent (39.6%) of

the population identifying as American Indian or Alaskan Native, Asian or Pacific Islander, Black or African American (Army and Air Force Exchange Center 2008)

The official U.S. poverty rate in 2010 was 15.1 percent (15.1%), an increase from 14.3 percent (14.3%) in 2009. Washington State's 2010 poverty rate was 13.4 percent (13.4%) overall, increasing from 12.3 percent (12.3%) in 2009. Pierce and Thurston counties had 2010 individual poverty rates of 12 percent (12%) and 10.1 percent (10.1%) respectively. DuPont's 2000 poverty level was 4.6 percent (4.6%) (U.S. Census Bureau 2010c) and its 2010 poverty rate was 4.5 percent (4.5%) (ref 2 American Fact finder). DuPont makes up a large portion of census tract 728. The Census Bureau defines a "poverty area" as a census tract where 20 percent or more of the residents have incomes below the poverty threshold. As of 2009, census tract 728 was not considered a poverty area, with a poverty rate of 6 percent (6%) (American Community Survey, 2009). In 2000, 8.2 percent (8.2%) of the Fort Lewis population was below the poverty level (Army and Air Force Exchange Center 2008).

PROTECTION OF CHILDREN

In 2010, 23.5 percent (23.5%) of Washington State's population was under 18 years of age (U.S. Census Bureau 2010d). Pierce County's percentage of population under 18 years of age was slightly more (24.9 percent (24.9%)), while Thurston County's was slightly less (23.0 percent (23.0%)) (U.S. Census Bureau 2010e). In DuPont, 33.4 percent (33.4%) of the population is under 18 years of age (U.S. Census Bureau 2010f).

Children are present in the ROI in many settings including neighborhoods, schools, day care centers, and recreational areas. JBLM has over 4,600 family quarters located within 14 housing neighborhoods. JBLM also supports four (4) community centers for use by residents of JBLM housing and provides a children's library (U.S. Army 2010).

3.8 PUBLIC SERVICES (UTILITIES/ENERGY DEMAND/GENERATION)

3.8.1 Affected Environment

This section describes various elements that are considered Public Services on the Installation. They are listed below.

- Fire and police services
- Electricity
- Natural gas, fuel oil and steam
- Telecommunications
- Water
- Wastewater

The ROI for JBLM is comprised of Pierce and Thurston counties, with the focus in the JBLM and the city of DuPont.

FIRE AND POLICE SERVICES

The JBLM Military police are located in Building 2007-C. The JBLM Fire Department is located in Building 4100 on West Way, this station and the satellite station on Lewis North provides fire protection

and emergency services for the WWTP site. The city of DuPont police station and fire station are located at the city campus located at 1780 Civic Drive.

ELECTRICITY

Electricity on JBLM is supplied by Tacoma Power. The electrical distribution system consists of substations located around JBLM. Substations are fed from a 115 kV pole line and contain 20-megavolt-ampere (mVA) transformers (U.S. Army, 2010). The distribution system uses a medium-voltage system: 13.8-kilovolt (kV), three-wire, single-point grounded system (U.S. Army Corps of Engineers, 2011).

NATURAL GAS, FUEL OIL, AND STEAM

Natural gas is used as a primary heat source on JBLM. It is provided by Puget Sound Energy, which owns the major gas lines on JBLM. Fuel oil serves as backup when gas supplies are not available and is purchased by contract. Building 3292 is a major steam plant and steam supplier on JBLM (U.S. Army, 2010).

TELECOMMUNICATIONS

The current WWTP's telecommunication requirements are serviced by a 12-strand, single-mode fiber-optic cable. The telephone system at JBLM is government owned and is maintained by Network Enterprise Center (NEC). Qwest provides outside telephone service to the JBLM system. Communications facilities are divided into four (4) major areas on the Installation: the Main Post, North Fort, the Training Areas (TAs), and the MAMC. There are approximately 160 miles (260 km) of aerial cable and 34 miles (55 km) of underground cable in the four (4) areas. (U.S. Army 2010)

WATER

JBLM water supplies rely entirely on groundwater. The JBLM cantonment area relies on 12 source wells, including one (1) drinking water source (Sequalitchew Spring) and eight (8) drinking water source wells located around JBLM. Three (3) other smaller public water systems supply the Golf Course, the Ammo Supply Point, and Range 17 (U.S. Army, 2010).

WASTEWATER

The sanitary sewer collection system at JBLM comprises 240 miles of gravity sewers ranging in size from four (4") to 30 inches (30") (10 centimeters [cm] to 76 cm) in diameter (JGA and AMEC 2007). The portions of the sewer system to the include lift stations and approximately 6,300 feet (1,900 m) of force mains that range in diameter from four (4") to 16 inches (16") (10 cm to 41 cm). During recent years, new construction on North Fort has replaced a significant amount of older sewer trunk lines in that area. The sewer system is divided into six (6) basins, A through F. Basins A through D are predominately on the Main Post and include the MAMC and the Logistics Center Area. Basins E and F are on North Fort and include the Beachwood Housing area. Historically, the system has been plagued with infiltration from groundwater and possibly some inflow from cross connections to the stormwater system. Flows fluctuate from approximately 2.2 MGD (8.3 million L per day) in the summer/dry season to six (6) MGD (22.7 million L per day) in the winter/wet season (JGA and AMEC 2007).

The Army discharges treated wastewater from the Solo Point WWTP to Puget Sound under its USEPA NPDES permit. Over the 2004 to 2009 period of the previous permit, the Army exceeded the permit treatment requirements six (6) times (USEPA 2009c). Within a new reporting period and since 2009, there have been 18 exceedances. The Solo Point treatment plant has sufficient hydraulic design capacity to handle demand. Given the past performance of the facility, however, it is expected that discharges will violate permit treatment requirements more frequently in the future as demand increases. Increased

demand combined with more stringent requirements that USEPA has identified for discharges under future NPDES permits will render the Solo Point WWTP insufficiently protective of Puget Sound water quality. Based on these findings, the objective of improving sustainability and the mitigation identification in the GTA EIS, the replacing of the WWTP and building a new RWDS was generated and resulted in the proposed project action (U.S. Army, 2010).

3.9 HAZARDOUS MATERIAL AND WASTES

Hazardous materials and wastes are substances that have the potential to pose a substantial threat to human health or the environment. Hazardous materials and wastes are identified and regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Resources Conservation and Recovery Act (RCRA), Occupational Safety and Health Act (OSHA), Toxic Substances Control Act (TSCA) and Emergency Planning and Community Right-to-Know Act (EPCRA). Waste may be classified due to characteristics (toxicity, reactivity, ignitability, or corrosivity). It may be "listed", or identified as hazardous in 40 CFR Part 261 Subpart C.

3.9.1 Regulatory Setting

Pursuant to Federal and state laws intended to protect people and the environment from potential harmful releases of hazardous materials, Executive Order (EO) 12088, Federal Compliance with Pollution Control Standards, and DoD Instruction 4715.6, Environmental Compliance, require that hazardous materials and hazardous waste management procedures be developed and implemented by all military departments. The Army, through AR 200-1, governs all aspects of managing hazardous materials and regulated waste by military or civilian personnel, tenants and contractors at all Army facilities. The JBLM Integrated Contingency Plan and Spill Prevention, Control, and Countermeasure Plan are implemented for all projects. That takes into account that JBLM operates as a State and Federally permitted large quantity hazardous waste generator (RCRA ID#WA92 14053465) with 418 individual hazardous waste accumulation points located throughout the installation (U.S. Army 2010).

3.9.2 Affected Environment

HAZARDOUS WASTE

Hazardous wastes generated at JBLM include medical and bio hazardous waste, asbestos, lead-based paint, and polychlorinated biphenyls. Additional materials used and managed accordingly on the installation are listed below.

- Petroleum, Oil
- Paints
- Cleaners, Sanitation Chemicals
- Solvents, Lubricants, Sealers, Adhesives
- Coolants, Refrigerants
- Compressed Gases
- Batteries
- Munitions
- Pesticides and Herbicides

JBLM has several plans in place to help manage hazardous materials and waste including a Pollution Prevention Plan, Installation Contingency Plan, Facility Response Plan, Hazardous Material Management Plan (HMMP), and Ozone Depleting Chemical Management Plan. The HMMP controls procurement through Authorized Use Lists (AULs), Restricted Use List (RUL), and signature cards (Army Form 1687), which limit and reduce hazardous materials use and substitute more environmentally preferable less toxic products. A centralized bar-coded system is used to track containers of waste that are generated on base to ensure the appropriate disposal measures (U.S. Army 2010).

SOLID WASTE

The solid waste management program has separate operations for collection and disposal of municipal solid waste, construction and demolition waste, and regulated medical waste. Nonhazardous solid waste is landfilled off the Installation only or recycled. However, JBLM solid waste management includes the mission of storage, use, and transport of hazardous materials and disposal of hazardous wastes at JBLM (U.S. Army 2010).

The Installation has a permanent recycling center that has been in operation since 2007. JBLM is developing a plan to further improve recycling activities Installation-wide by implementing a plan for a Qualified Recycling Program. This is anticipated to result in both environmental and cost saving improvements at JBLM (U.S. Army 2010).

The Installation currently composts 100 percent (100%) of the sewage sludge generated from the existing WWTP with the remainder sent to an offsite approved waste location (U.S. Army 2010).

FORMER WASTE DISPOSAL, SPILL, AND CONTAMINATED SITES AT JBLM

The Installation Restoration Program (IRP) is an ongoing program administered by the DoD used to identify, evaluate, and remediate contaminated sites on Federal lands that are under DoD control. The program was implemented in response to CERCLA requirements to remediate sites that pose a health threat. Section 211 of the Superfund Amendments Reauthorization Act (SARA) amended CERCLA and established the Defense Environmental Restoration Program (DERP), through which DoD funds and conducts its environmental restoration programs.

A RCRA Facility Assessment conducted on the Installation in 1996 identified 81 sites representing potential environmental hazards, most of which were located in the cantonment area. The identified contaminated sites include:

- active and former landfills;
- solid and biomedical waste incinerators;
- hazardous waste treatment, storage and disposal facilities;
- petroleum storage areas, maintenance areas;
- training areas, firing ranges; and
- areas containing unexploded ordnance.

In addition, potential contaminated sites include a former silver recovery unit, former refueling areas, weapons and tank ranges, pesticide rinse areas, and transformer storage areas.

3.10 AESTHETICS (LIGHT AND GLARE)

3.10.1 Regulatory Setting

There are no specific regulations that are applicable for visual effects to assess overall aesthetic effects. NEPA does not directly establish specific guidance for conducting visual impact assessments. Most Federal agencies have set forth their own NEPA regulations and guidance, which generally follow the CEQ procedures but are tailored to the specific mission and activities of each agency.

Similar to aesthetics, there are no specific regulations for light and glare, however, the Washington State Environmental Policy Act (SEPA) - WAC 197-11-960 (11) does require analysis of light and glare from construction and operation of a project. This EA does include light and glare as an impact within the context of aesthetics, and impact to adjacent land uses. In regards to regulations, JBLM strives to meet the general intent of designing outdoor industrial lighting to minimize light escapement beyond the property lines of the site.

3.10.2 Affected Environment

Aesthetics

The topography of JBLM is characterized by rolling hills to open flat terrain from the east, crossing Interstate 5 (I-5) and transitioning to ridges with slopes on the western boundary. The existing Solo Point WWTP (Figure 3.2) is located on a ridge (approximate 222-feet [222'] elevation) that is above Puget Sound, within a hilly area with elevations that range from 100 to 400 feet above mean sea level (MSL). There are steep slopes, ravines, and hillsides sloping downwards to the shoreline of Puget Sound. The hillsides are heavily forested with second (2nd) growth that surrounds the WWTP on four (4) sides.

The principal public viewpoints of JBLM available to the general public are from boats in Puget Sound and I-5 and State Route 507 which bisects JBLM. There are limited views through the forested areas of JBLM to the city of DuPont and town of Roy to the south and the town of Steilacoom and city of Lakewood to the North. The viewshed of JBLM in general consists of a mixture of coniferous and deciduous forested hillsides, residential/commercial and military facilities, and limited shoreline area at Solo Point. The visual character of the project site is forested and located on top of a ridge with limited public views of the site.

Light and Glare

Ambient light in the vicinity of the WWTP is limited to the stationary facility lights and limited mobile sources. Stationary sources include security lighting on the site and along the security fence. Mobile sources of light include light from headlights of vehicles operating at the facilities. There is the potential of some glare off of the road from the facility during rainy periods, however, most of the road use by the military or retired military is during daylight hours and the glare would not be present during daylight hours.

Figure 3-2 General Topography at Solo Point

3.11 TRAFFIC AND TRANSPORTATION SYSTEMS

The following section establishes the baseline and existing transportation system on JBLM and provides information on the type of road and transit systems.

3.11.1 Regulatory Setting

On military installations, several DoD directives apply to transportation planning and implementation at military installations, including:

- DoD Directive 4500.9 Transportation and Traffic Management
- DoD Directive 4510.11 Transportation Engineering
- DoD 4500.9-R Defense Transportation Regulation

3.11.2 Affected Environment

Primary roadways function as arterials, serving as the major through routes within the Installation and providing connections to I–5 and the surrounding major highways. The primary roadways on JBLM illustrated in Figure 3-3and listed below.

- 41st Division Drive
- Pendleton Avenue
- Jackson Avenue
- Stryker Avenue
- East Gate Road
- Railroad Avenue
- Rainier Avenue
- 2nd Division Drive
- 3rd Division Drive

The main entrance and thoroughfare on the Main Post and on North Fort is 41st Division Drive. On the Main Post, 41st Division Drive has five (5) lanes and a posted speed limit of 35 mph and provides access to the Town Center area of the Main Post. The Town Center area, which is generally bounded by 41st Division Drive, Nevada Avenue, North Division Street, and Liggett Avenue, contains the PX Exchange and Commissary, bowling alley, movie theater, and many other retail, office, recreational, and social support services. At the North Fort, 41st Division Drive south of A Street has four (4) lanes and a raised, planted median with concrete curb and gutter on both sides of the roadway. There is a concrete sidewalk on the east side of the road, separated from the roadway by a planter strip, and signed and marked 4-foot-wide (4') on-street bike lanes in both directions (JBLM 2011c).

Pendleton Avenue, the primary east-west arterial in the Town Center area, is a three (3) lane arterial with a center two-way left-turn lane and a posted speed limit of 25 mph. It is the only street in the Town Center with a continuous pedestrian walkway. Other nearby streets do not have continuous designated pedestrian facilities. Pendleton Avenue continues west under I–5, providing access to North Fort within the secured Lewis Main portion of JBLM boundaries. (JBLM 2011c)

Several streets in North Fort, including 41st Division Drive (north of A Street), have recently been improved and widened to 32-feet (32') (curb-to-curb) to provide 5-foot-wide (5') striped bike lanes on both sides. The streets also have new curbs, gutters, and sidewalks (JBLM 2011c).

OFF-JBLM

Several roadways the Installation provide access to and from JBLM to the surrounding area. I–5, a six-lane freeway with a posted speed limit of 60 mph, is the main highway that provides access to and from JBLM from the communities to the north, south, and west of the Installation.

DuPont Steilacoom Road, on the west side of North Fort, is a two-lane arterial road with a posted speed limit of 45 mph. This roadway provides access to the cities of DuPont (Center Drive) and Steilacoom, and to North Fort via East Drive. East Drive connects North Fort to North Gate Road, providing access to the city of Lakewood. North Gate Road is a two-lane arterial road with a posted speed limit of 35 mph (JBLM 2011c).

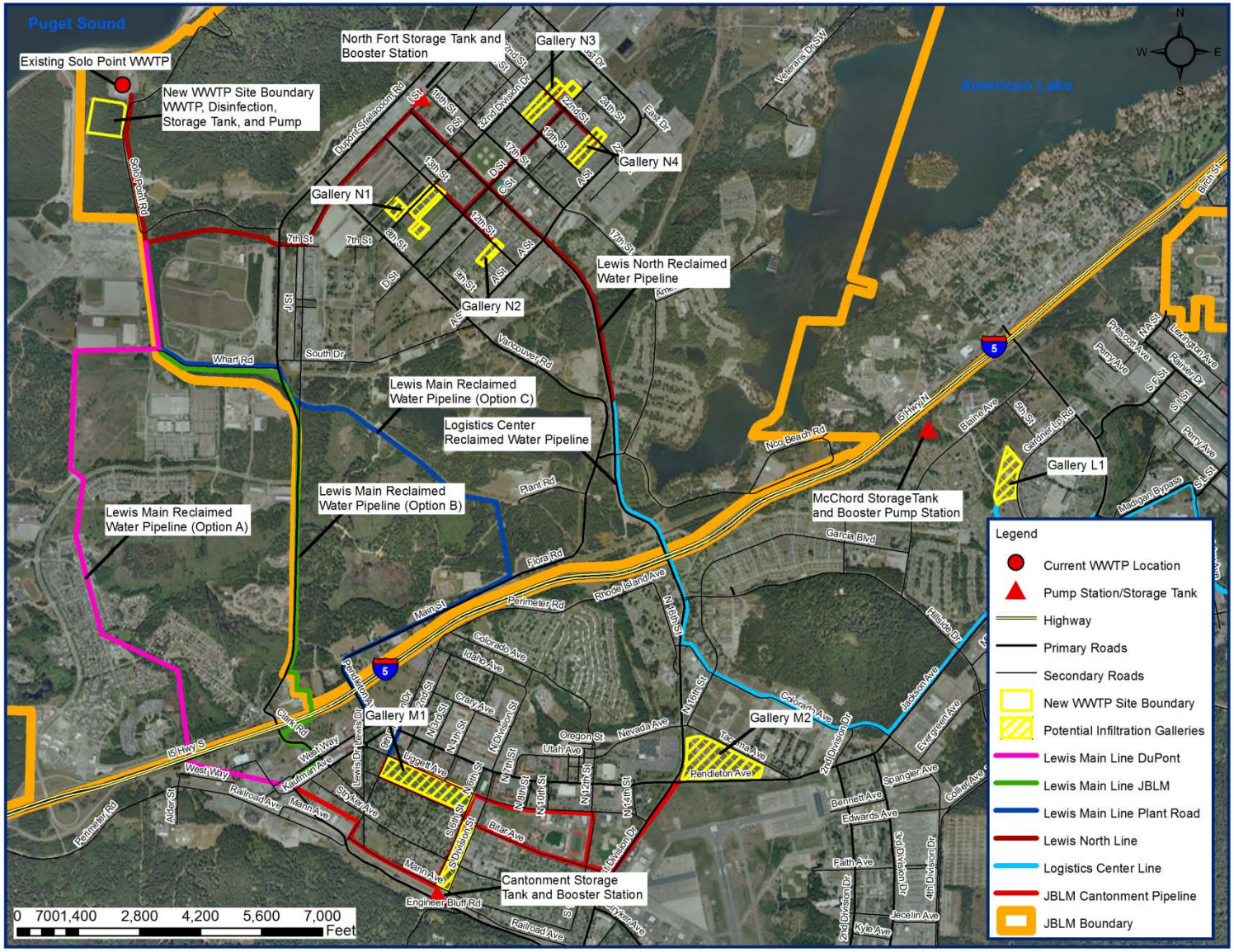
ACCESS CONTROL POINTS AND OPERATIONS

Access onto the Installation is restricted to authorized personnel only and controlled via 10 Access Control Points (ACPs) or gates. The primary ACPs are the Liberty (Main) Gate, the Madigan Gate, the 41st Street (North Fort) Gate, and the DuPont Gate. The secondary gates serving JBLM are D Street Gate, East Gate, Logistics Center Gate, Transmission Line Gate, Rainier Gate, and the Scouts Out gate. Visitors to JBLM are directed to use the Liberty Gate, where the Visitor's Center issues temporary passes for limited access onto the Post. The McChord primary gates are McChord Field Main Gate, (Bridgeport Way); McChord Field Barnes Gate (Perimeter Road); McChord Field Woodbrook Housing Gate (Gravelly Lake); and McChord Field North Gate (112th Street & South Tacoma Way) (JBLM 2011c).

TRANSIT SERVICE

Transit services accessible by JBLM personnel are provided by Intercity Transit and Sound Transit/ Pierce Transit provides bus service on the Installation and to the surrounding communities. Transit route #207 provides service from the JBLM Bus Depot, located at Building 2166 on 12th Street and Liggett Avenue in the Town Center of the Main Post, to Madigan Hospital. Route #207 buses run once per hour on weekdays (JBLM 2011c).

Figure 3-3 JBLM Roads and Pipeline Distribution System



3.12 CULTURAL RESOURCES

The following section establishes the existing regulatory requirements for cultural resources, the existing resources on the Installation and what studies have been conducted in the project area.

3.12.1 Regulatory Setting

Cultural resources are remnants of past human activity that as a general rule are greater than 50 years of age. Cultural resources can be present within landscapes as districts, sites, or isolated finds. Districts are groups of buildings, structures, and sites that are linked historically by function, theme, or physical development (Little et al. 2000). The individual buildings, structures, and sites are most often contiguous but they can also be noncontiguous. Sites are the locations of a significant event, or of historical human occupation or activity (Little et al. 2000). They are identified by the presence of artifacts and/or features within a given space. Sites may have the capacity to yield important information about aspects of human history and cultures. Isolated finds are characterized by solitary artifacts or sparse groupings of a few artifacts within a given space. They generally lack potential to yield information on human history and culture but can be significant for other reasons.

Cultural resources also include Traditional Cultural Properties (TCPs), locations with enduring significance to the beliefs, customs, and/or practices of living communities. In particular, a TCP is a place defined by its historical association with the beliefs, customs, and/or practices of an existing community and its continuing, contemporary importance in maintaining that community's cultural identity. TCPs can include places used for or in association with religious, spiritual, ceremonial, medicinal, or subsistence practices, customs, or beliefs. Archaeological and historic cultural resource sites and/or features including (but not limited to) rock imagery, rock alignments, stone circles, and cairns may comprise TCPs, as can natural topographic features or areas, material source areas, or areas with no particular physical characteristics at all. TCPs are considered eligible for nomination to the NRHP if they are associated with cultural practices or beliefs of a living community that are (a) rooted in the community's history and (b) important in maintaining the continuing cultural identity of the community (Parker and King 1998). Culturally sensitive locations called Areas of Native American Concern, which may not be considered eligible for nomination to the NRHP, may still be protected under the American Indian Religious Freedom Act of 1978 (AIRFA).

Cultural resources that are currently listed in, that have been determined eligible for listing in, or that are considered potentially eligible for listing in the NRHP are termed "historic properties". Historic properties can include both prehistoric (prior to European contact) and historic (post-European contact) objects, sites, buildings, structures, and districts, as well as TCP's. All historic properties within a project area constitute the affected environment for cultural resources.

The ROI for cultural resources is all areas that may potentially be impacted by a project, both directly and indirectly. Federal and state regulations governing the management of cultural resources refer to the ROI as an Area of Potential Effect (APE). Direct impacts include physical disturbances to cultural resources as well as visual impacts to the setting. Indirect impacts include increased access to otherwise restricted areas that can lead to greater instances of artifact removal and vandalism. APEs are set by Federal agencies and the State Historic Preservation Office (SHPOs). Construction APEs consists generally of the footprint of the project element. The APE for a pipeline right-of-way (ROW) depends upon the size (diameter) of the pipeline being constructed. APEs for pipelines are commonly 100 feet wide for pipelines with ROWs of less than 75 feet. Visual APEs vary from state to state, but most commonly follow Federal

Communications Commission standards for cell towers. The visual APE for structures less than 200 feet in height is 0.5 miles.

Historic properties on Federal or tribal lands are protected by many laws, regulations, and agreements. Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires, for any Federal, Federally assisted, or Federally licensed undertaking, that the Federal agency take into account the effect of that undertaking on any district, site, building, structure, or object that is included in the NRHP before the expenditure of any Federal funds or the issuance of any Federal license. Eligibility criteria (36 CFR 60.6) include association with important events or people in our history, distinctive construction or artistic characteristics, and either a record of yielding or a potential to yield information important in prehistory or history. In practice, properties are generally not eligible for listing on the NRHP if they lack diagnostic artifacts, subsurface remains, or structural features, but those considered eligible are treated as though they were listed on the NRHP, even when no formal nomination has been filed. This process of taking into account an undertaking's effect on historic properties is known as "Section 106 review," or more commonly as a cultural resource inventory.

The Archaeological and Historic Preservation Act of 1974 (AHPA) provides for the survey, recovery, and preservation of significant scientific, prehistoric, archaeological, or paleontological data when such data may be destroyed or irreparably lost due to a Federal, Federally licensed, or Federally funded project. The Archaeological Resources Protection Act of 1979 (ARPA) prohibits unauthorized excavation on Federal and Indian lands, establishes standards for permissible excavation, prescribes civil and criminal penalties, requires agencies to identify archaeological sites, and encourages cooperation between Federal agencies and private individuals.

The APE of any Federal undertaking must also be evaluated for significance to Native Americans from a cultural and religious standpoint. Sites and practices may be eligible for protection under the American Indian Religious Freedom Act of 1978 (AIRFA). Sacred sites may be identified by a tribe or an authoritative individual (Executive Order 13007). Special protections are afforded to human remains, funerary objects, and sacred objects of cultural patrimony under the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA).

The NAGPRA of 1990 is triggered by the possession of human remains or cultural items by a Federally funded repository or by the discovery of human remains or cultural items on Federal or tribal lands, and provides for the inventory, protection, and return of cultural items to affiliated Native American groups. Permits are required for intentional excavation and removal of Native American cultural items from Federal or tribal lands.

The American Indian Religious Freedom Act of 1978 requires consultation with Native American groups concerning Proposed Actions on sacred sites on Federal land or affecting access to sacred sites. It establishes Federal policy to protect and preserve for American Indians, Eskimos, Aleuts, and Native Hawaiians the right to free exercise of their religion in the form of site access, use, and possession of sacred objects, as well as the freedom to worship through ceremonial and traditional rites. The Act requires Federal agencies to consider the impacts of their actions on the religious sites and objects important to these peoples, regardless of eligibility for listing on the NRHP.

Other regulations governing the management of cultural resources include Executive orders (EOs), U.S. Army Regulations, JBLM Regulations, and Memorandum of Agreements between the U.S. Army, Washington State Historic Preservation Office (SHPO), and Advisory Council on Historic Preservation (ACHP). The EOs include the Protection and Enhancement of the Cultural Environment of 1971 (EO #11593) and the Indian Sacred Sites of 1996 (EO #13007). Army regulations include Army Regulation

JBLM Regulation AR 200-1: Environmental Protection and Enhancement. This guidance prescribes policies for conservation, protection and enhancement of the environment (including cultural resources) at JBLM, its sub-installations, and supported facilities (ICRMP 2012). Specifically the controlling document is the JBLM Integrated Cultural Resource Management Plan (ICRMP) –2012 edition. Finally, the Army entered into the First Amended Memorandum of Agreement with the Washington SHPO and the ACHP in December of 2000 due to the potential adverse effects to family housing in the Greenwood and Broadmoor neighborhoods of the JBLM Garrison Historic District caused by privatization of the management of the housing units. Under the agreement, the Army is responsible for ensuring that activities conducted at the historic housing units comply with Section 106 of the NHPA unless they are listed in under the "Exempt Activities" stipulation of the agreement (ICRMP 2005).

3.12.2 Affected Environment

The archaeological record of the Southern Puget Sound is poorly documented and not well understood. Sites in the Fort Lewis area occur in nondepositional environments that have little or no potential to contain stratigraphically separable occupations, and they are not conducive to the preservation of organic remains. Archaeological materials are restricted to surface contexts and represent occupations from multiple ages that cannot be separated chronologically (ICRMP 2005, Appendix A). Shoreline archaeological sites are scarce due to natural erosional processes related to steep slopes and storm water runoff that have destroyed them over time. Archaeological sites are more numerous in the surrounding lowland prairies and interior uplands (ICRMP 2005, Appendix A).

The oldest archaeological remains from the area date to 11,000 years Before Present (BP) and include Clovis style projectile points indicative of big game hunting activities (ICRMP 2005, Appendix A). Subsequent occupations show an increased reliance on the gathering and processing of plant resources and later on marine resources (salmon and shellfish). Archaeological resources associated with plant processing include large earth ovens and fire-cracked rock. Archaeological resources associated with procurement of marine resources include nets and fish traps (ICRMP 2005, Appendix A). The first European exploration of the shoreline of North Fort Lewis was in 1792 by British explorers Puget, Whidbey, and Menzies. Archaeological sites within the boundaries of Fort Lewis dating between 1770 and 1830 would include Native American village sites and special activity sites with historic artifacts from early trade (ICRMP 2005, Appendix A). The archival record does not indicate any Europeans were on Fort Lewis prior to the late 1820s. The Hudson Bay Company established a physical presence in and near Fort Lewis with trade and travel along the Nisqually Reach and subsequent construction of Fort Nisqually in 1833 (ICRMP 2005, Appendix A). From 1830 to 1860, the Hudson Bay Company's (HBC) fur trade and the Puget Sound Agricultural Company's (PSAC) livestock and agricultural enterprises had a significant impact on the development of the region. Between 1846 and 1917, rural agriculture developed across what is now Fort Lewis. A system of roads, farms, herding stations, and pastures were constructed by the PSAC on what is now Fort Lewis (ICRMP 2005, Appendix A). Camp Lewis was established in 1917 following the outbreak of World War I. As of 2005, five (5) structures from the original Camp Lewis construction remained at Fort Lewis including two (2) warehouses (Buildings 1210 and 4170) and the main gate (Liberty Gate) (ICRMP 2005, Appendix A). The Army acquired the Red Shield Inn (Building 4320) at Fort Lewis from the Salvation Army in 1921. This building is currently listed on the National Register. Between 1927 and 1939, approximately 250 buildings were constructed at Fort Lewis with landscaping incorporated into the site plan. Many of these structures and the incorporated landscaping currently compose the core area of Fort Lewis Garrison Historic District (ICRMP 2005, Appendix A).

Archaeological sites at JBLM include artifact assemblages, shell middens, burials, cemeteries, rock piles, rock shelters, chimney falls, brick falls, piers, shipwrecks, earthworks, trash pits and piles, and building remains (ICRMP 2005). As of 2005, there were 248 known archaeological sites at JBLM, most which are from the historic period. Of these, 230 are historic, 12 were prehistoric, and six (6) have both historic and prehistoric components. Three (3) of the sites have been determined to be eligible for the National Register, four (4) have been determined to be not eligible for the National Register, and 241 are unevaluated for National Register eligibility. The most important sites are related to the early Hudson's Bay Company occupations, prehistoric and historic Native American occupations, and pioneer Euro-American settlements (ICRMP 2005).

Historically, the Nisqually tribe occupied the lands on which JBLM is situated. The lands were ceded to United States in 1854 in the Treaty of Medicine Creek. Other tribes signing the treaty include the Puyallup Tribe and Squaxin Island Tribe (ICRMP 2005). The Puyallup Tribe has documented interests in the northern portion of JBLM in Pierce County. The Squaxin Island Tribe has documented interests in the southern portion of the JBLM Rainer Training Area in Thurston County. The Steilacoom and Yakama tribes also claim interests on and around JBLM (ICRMP 2005). Pierce County condemned more than two-thirds of the original Nisqually Indian Reservation in 1917 and donated the land to the United States Government for the purposes of establishing Camp Lewis. These lands currently lie in an artillery impact area. The remaining reservation lands are surrounded on three (3) sides by JBLM (ICRMP 2005). In 1996, three (3) specific areas at JBLM were identified by Nisqually tribal elders as traditional cultural properties potentially eligible for listing in the National Register. Other specific areas could not be specifically identified, but the Nisqually Tribe attaches traditional and cultural significance to much of the JBLM landscape (ICRMP 2005). As of 2005, the Puyallup Tribe had not identified any specific locations of traditional cultural properties, but they are known to have fished in Chambers, Steilacoom, and Sequalitchew Creeks and gathered plants on the open prairies that JBLM now occupies (ICRMP 2005).

As of 2005, a total of 15 cemeteries were known on JBLM that are managed and protected as archaeological sites. They primarily date to the Nisqually Reservation and early pioneer periods (ca. 1854-1917), and most are unmarked. The JBLM Military Cemetery and a pet cemetery are also present on the base and were still in use as late as 2005 (ICRMP 2005).

Historic structures at JBLM include shelters, roads, walkways, railroad tracks, recreational facilities, and monuments to commemorate people, places, and events. As of 2005, all buildings, structures, and monuments built before 1948 in the Main Post and North Fort Cantonment areas had been formally evaluated for eligibility to the National Register in consultation with the Washington State Historic Preservation Office (ICRMP 2005). JBLM contains three (3) National Register eligible historic districts (Fort Lewis Garrison Historic District, Old Madigan General Hospital Historic District, and American Lake Veteran's Administration Hospital Historic District). The Fort Lewis Garrison Historic District was listed on the Washington Heritage Register in 2004, but is not formally listed on the National Register (Washington Department of Archaeology and Historic Preservation Historic Register Report, Nov. 22, 2011). The American Lake Veterans Administration Hospital was listed on the Washington Heritage Register and National Register in 2009 (Washington Department of Archaeology and Historic Preservation Historic Register Report, Nov. 22, 2011). JBLM also contains one (1) individually listed National Register property (Salvation Army Red Shield Inn), and three (3) structures which have been determined to be individually eligible for listing on the National Register (Liberty Gate, Mount Rainier Ordinance Depot Gate, Casey Memorial Theater), one (1) individually listed commemorative property (Captain Wilkes July 4, 1841 Celebration Site) on the Washington Heritage Register, and one (1) National Register eligible commemorative property (91st Division Monument) (ICRMP 2005).

According to the Washington Department of Archaeology and Historic Preservation online records, the McChord Air Force Base is also a National Register eligible historic district. It was listed on the Washington Heritage Register and the National Register in 2008. Two (2) other historic properties (Adjutant General's Residence, Thornewood Estate) listed on the Washington Heritage Register and the National Register are located outside the boundaries of JBLM in the adjacent city of Lakewood.

The area around the JBLM Garrison Historic District has been designated a historic landscape. A historic landscape is defined as a geographic area associated with a historic event, activity, or person or exhibiting other cultural or aesthetic values. The area around the JBLM Garrison Historic District is recognized as contributing to those characteristics that qualify the District for the National Register (ICRMP 2005). The historic landscape is a holistic collection of character defining features, which include, but are not limited to, views, open space, vegetation, site furnishings, circulation systems, and water features (ICRMP 2005).

As of 2005, a total of 28 archaeological investigations and plans, one (1) traditional cultural property investigation and plan, 14 historic building investigations and plans, six (6) historic landscape investigations and plans, and one (1) monument and memorial investigation and had been completed at JBLM (ICRMP 2005-Appendix H). Since 2005, it is unknown how many investigations have been conducted at JBLM and how many cultural resources have been recorded as the records for inventories and sites recorded are not currently available. The APE of the Proposed Action has been inventoried, but the results of that investigation are currently unavailable.

CHAPTER 4.0
VALUED ENVIRONMENTAL COMPONENTS (VEC) - ENVIRONMENTAL CONSEQUENCES

4.1 IMPACT ANALYSIS

This chapter section identifies the potential direct, indirect, and cumulative effects of implementing the Proposed Action under the *Preferred Alternative, Alternative B* and the *No Action Alternative*. These Alternatives are described in **Section 2.0**. Specifically, potential effects on each of the VECs are 36) analyzed in this EA. In addition, potential effects for the considered alternatives on each VEC are compared and contrasted.

Where a potential significant adverse impact is identified, mitigation measures are identified that, if implemented, would reduce the level of identified impacts to acceptable, less-than-significant levels. This section also identifies environmental protection measures routinely implemented by JBLM to minimize adverse soil erosion and sedimentation effects associated with construction activities (see **Section 2.5**).

4.1.1 Significance Criteria

Impacts are identified as either significant, less than significant (i.e., common impacts that would not be of the context or intensity to be considered significant under the NEPA or CEQ Regulations), or no impact. As used in this EA, the terms "effects" and "impacts" are synonymous. Where appropriate and clearly discernible, each impact is identified as either adverse or positive.

The CEQ Regulations specify that, in determining the significance of effects, consideration must be given to both "*context*" and "*intensity*" of the effect (40 CFR 1508.27):

- **Context**
  Refers to the significance of an effect to society as a whole (human and national), to an affected region, to affected interests, or to just the locality. In other words, the context measures how far the effect would be "felt." For this Proposed Action, this is the ROI described in **Section 4.1.2**.
- **Intensity**
  Refers to the magnitude or severity of the effect, whether it is positive or adverse. In other words, intensity refers to the "punch strength" of the effect within the ROI.

The significance of potential direct, indirect, and cumulative effects has been determined through a systematic evaluation of each considered alternative in terms of its effects on each individual VEC. Direct effects are those that occur at the same time and space as the action; indirect effects are those that occur further removed in time or space from the action. Potential cumulative effects of the Proposed Action are discussed in Section 4.1.4.

The Army developed a set of criteria for use in assessing whether possible alternatives meet the purpose of and need for the Proposed Action. Any alternative considered for further analysis needed to meet the following requirements:

SUSTAINABILITY

Each alternative should enhance or support the JBLM sustainability program. Alternatives that degrade the natural environment or require significantly greater resources than the Proposed Action and other alternatives without corresponding increased benefit should be eliminated from detailed evaluation. The alternatives should lend themselves toward sustainable design prior to the start of construction.

MISSION SUPPORT

Each alternative must promote, support, and be consistent with the Army's mission requirements, which include (1) BRAC, (2) GDPR, (3) GTA, (4) Modularity, (5) Transformation, (6) Training, and (7) Functional Efficiency.

TECHNICAL VIABILITY

Each alternative must be practicable to an extent that once completed will satisfy the Purpose and Need.

ECONOMIC FEASIBILITY

Each alternative must be achievable within a reasonable cost. Alternatives whose implementation is significantly more expensive without increased benefit appropriate with the additional cost should be eliminated from detailed evaluation.

PUBLIC RELATIONS

To the extent feasible, each alternative should reflect positively on the Army and enhance the relationship between JBLM and the surrounding community. Alternatives that encroach on the adjacent civilian population can often be met with public resistance and erode relationships between the JBLM and the local community. Alternatives with the potential to have substantial impacts to the surrounding community without additional benefits should be eliminated.

RANGE OF IMPACTS

Significance criteria for VECs analyzed in this EA are as follows:

- ***Soils***
  If an alternative would result in an increased soils hazard, substantial reduction in the availability of prime farmland soils, or impacts to human health and safety or property due to increased soils instability, it would have a significant effect. Such soil hazards would include, but not be limited to, land subsidence, substantial increased erosion, and slope instability.

- ***Water Resources and Wetlands***
  If an alternative would result in a reduction in the quantity or quality of water resources for existing or potential future use, it would have a significant effect. An alternative also would have a significant effect on water resources if it would cause substantial flooding or erosion, if it would subject people or property to flooding or erosion, or if it would adversely affect a significant water body, such as a stream, lake, or coastal zone. The measurable degradation of wetlands would also be significant.

- ***Biological Resources***
  The effect of an alternative on biological resources and ecosystems would be significant if it would disrupt or remove any endangered or threatened species or its designated critical habitat. The loss of a substantial number of individuals of any plant or animal species (sensitive or non-sensitive species) that could affect the abundance or diversity of that species beyond normal variability would also be considered significant. The measurable degradation of sensitive habitats, particularly wetlands, would also be significant.

- ***Cultural Resources***
  An alternative would have a significant effect on cultural resources if it would: result in damage, destruction, or demolition to an archaeological site or building that is eligible or listed on the

NRHP (i.e., an historic property); promote neglect of such a resource, resulting in resource deterioration or destruction; introduce audio or visual intrusion to such a resource; or decrease access to resources of value to Federally recognized Native American Tribes. The impact analysis for cultural resources focuses on properties that are listed in or considered eligible for the NRHP, as well as resources that are considered sensitive by federally recognized Native American Tribes.

Table 4-1 Affected Environment and Consequences of Alternatives

VEC	No Action Alternative	Alternative A (Phase I &II)	Alternative B (Phase I Only)
Air Quality	No Effect	Short-term, less-than significant adverse effect during construction. Improvement in long-term air quality with reduced methane burn-off.	Short-term, less than significant adverse effect during construction. Improvement in long-term air quality with reduced methane burn-off. The level of construction impacts without the RWDS would be substantially less on air quality with reduced fugitive dust.
Noise	No Effect	Short-term, less-than significant adverse effect during construction. There would be short term construction noise on the school and children along the DuPont RWDS alignment. No long-term noise effects.	Short-term, less-than significant adverse effect during construction. No long-term noise effects. The level of construction impacts without the RWDS would be substantially less on sensitive noise receptors along the RWDS alignments.
Soil/Geology	No Effect	Short-term, less-than significant adverse effect during construction. No long-term soil effects.	Short-term, less-than significant adverse effect during construction. No long-term soil effects. The level of construction impacts without the RWDS would be substantially less on soils.
Vegetation	No Effect	Short-term, less-than significant adverse effect during construction. Retention of existing tree buffer at WWTP site and landscape restoration will off-set any long term effects.	Short-term, less-than significant adverse effect during construction. The level of construction impacts without the RWDS would be substantially less on the vegetation. Retention of existing tree buffer at WWTP site will off-set any long term effects around the WWTP site.
Water Resources	Continued degradation of water quality and potential failure of meeting USEPA requirements	Short-term, less-than significant adverse effect during construction with implementation of JBLM environmental protection measures and the proposed mitigation. The water resource would not be directly impacted with directional boring. The impacts are avoided by constructing in existing utility corridors and road prisms. The long term operational effects of reclaimed waste water would be beneficial to the base and regional water quality.	Short-term, less-than significant adverse effect during construction. Retention of existing tree buffer at WWTP site will off-set any long term effects. The level of construction impacts without the RWDS would be less on adjacent water resources.
Biological Resources	Near shore adverse impacts from degrading water quality discharge from existing WWTP	Short-term, less-than significant adverse effect during construction with implementation of JBLM environmental protection measures and the proposed mitigation. There are some fish, birds, and mammal species designated under the Endangered Species Act (ESA) that may have short-term effects. Specifically, it is likely that Bull Trout, Chinook Salmon, Steelhead, Coho Salmon, Chum Salmon, Pacific Eulachon/Smelt, Marbled Murrelet, Streaked Horned Lark, and Southern Resident Killer Whale would have a construction determination of May Affect, Not Likely to Adversely Affect. Informal consultation would be required for the construction of the outfall and RWDS. The long term operational effects of reclaimed waste water would be beneficial to biological resources upland and in the fresh/marine water habitats.	Short-term, less-than significant adverse effect during construction with implementation of JBLM environmental protection measures and the proposed mitigation. No Effect to Endangered Species Act (ESA) listed species.

Table 4-1 Affected Environment and Consequences of Alternatives			
VEC	**No Action Alternative**	**Alternative A (Phase I &II)**	**Alternative B (Phase I Only)**
Socioeconomics	No Effect	The construction and operations of the new WWTP, new outfall, and demolition of the existing WWTP would not create disproportionate impacts to minority, low income, schools, or children. There are no Environmental Justice impacts from the Proposed Action. An adverse impact would be realized with the RWDS, specifically the Lewis Main Line – City of DuPont alignment would create adverse impacts to the 35% minority school child population during construction. However, those impacts can be avoided with the other on base alignment alternatives proposed.	The construction and operations of the new WWTP would have no disproportionate impacts to minority, low income, schools, or children. There are no Environmental Justice impacts from the proposed action.
Public Services	Increasing need for continual maintenance and improvements; emergency responses to adverse water quality discharges and permit violations.	Limited effects with Short-term construction activities that may require temporary shut-off of utilities in localized areas.	Limited effects with Short-term construction activities that may require temporary shut-off of utilities in localized areas
Hazardous Material & Waste	Increase in adverse water quality discharges, permit violations, and failure at meeting sustainability goals.	Limited effects that would be focused on the demolition of the existing WWTP which may contain lead/asbestos. This will be mitigated by appropriate application of abatement standards and operating procedures in addition to environmental protection measures and the proposed mitigation.	No Effect.
Aesthetics & Visual Quality	No Effect	Short term effects during construction activity, but not substantial adverse impacts.	No Effect
Transportation	No Effect	Short term construction activities will require detours and partial lane closures.	No Effect
Cultural Resources	No Effect	The new WWTP and RWDS system could have an impact on existing historical resources in the vicinity of the Logistics Center Line at the Main Gate of JBLM. An archaeological survey is being conducted to define the extent of the resource and directional bore methods are proposed to avoid the resources.	No Effect
Land Use	No Effect	No Effect	No Effect
Air Space	No Effect	No Effect	No Effect

4.1.2 Region of Influence

The ROI for the Proposed Action is primarily contained within the boundaries of JBLM; however, some impacts such as air, noise, light and glare may extend to adjacent jurisdictions of DuPont and Steilacoom to the southwest, west, and east and Pierce County to southeast and east. Therefore the ROI is JBLM and a half-mile from the boundaries of JBLM.

4.1.3 Impact Assessment Methodology

The Proposed Action, under the Preferred Action Alternative, would involve installing, operating, and maintaining a new WWTP and RWDS with approximately 25 miles of underground water reclaimed "purple pipe" and installing aboveground water tanks on JBLM.

Given the large spatial coverage (i.e., in terms of linear distance) of this Proposed Action, and its general potential to adversely affect multiple sensitive resources over its length, JBLM undertook a comprehensive, proactive alternatives screening analysis to ensure potential adverse effects would be minimized or avoided. This also was accomplished by incorporating into the Proposed Action the numerous environmental protection measures identified in Section 2.5. Under either Action Alternative, these measures would be implemented, thereby avoiding adverse effects.

At present, only the general locations of the proposed underground "purple pipe" system are known. These locations are shown on Figure 2-5. While the Proposed Action would follow these alignments, the specific locations of direct bury, boring, and Case Bore/Jack-and-Bore would be based on existing sensitive environmental resources, as identified throughout Chapter 4.0.

The proponent will be preparing a detailed engineering design of the Preferred Action Alternative that will clearly show the specific proposed locations of "purple pipe" direct bury, "purple pipe" directional bores, Case Bore/Jack-and-Bore, and the placement of water tanks. This design, will be prepared at a sub-meter level of accuracy (i.e., within three (3) feet) and will incorporate JBLM's current and extensive GIS-based data that identify the locations of sensitive environmental resources and training operations. In addition, and to the extent possible per the environmental protection measures, the design would be coordinated with utility providers to share existing utility ROWs, would be located within existing disturbed road ROWs, and would be co-located within previously designed and approved construction areas. The final, AutoCAD/GIS-based design, as reviewed and approved by the ED via the JBLM environmental review process, would ensure that the environmental protection measures are fully implemented.

As the Preferred Alternative would be implemented over a period of time, each project component, prior to construction authorization, would be subjected to the JBLM's review process. This would include submission of each proposed facility and each segment of "purple pipe" location, including proposed water tanks, maintenance holes and pump stations. This would provide a second, current review of the project component to ensure that the environmental protection measures are followed; that any future changes in the locations of environmental resources, utilities, or other elements are addressed with the most current information available; and that significant adverse impacts are avoided. This process would take advantage of the location flexibility of the Preferred Alternative Action. In other words, a segment of "purple pipe" could be relocated to the other side of a road or to within a road to avoid a resource impact at the time its installation is proposed.

Based on the above, the impact analysis presented herein is more programmatic in nature than site-specific, recognizing the flexibility of the Preferred Alternative, its ability to avoid resources through sensitive design and placement, and changes that may occur over time in the location of resources. Rather than identifying every location where an impact to a sensitive resource might occur (e.g., the location of every NRHP-eligible cultural resource in the vicinity of the Action's alignment), the analysis relies on implementation of the environmental protection measures to avoid the resource and the conduct of validation reviews through the JBLM process. These elements, coupled with implementation of additional, programmatic mitigation measures presented in this EA's analysis, would ensure significant adverse effects are avoided.

4.2 AIR QUALITY

Air quality impacts are calculated based on estimated activities associated with the alternatives including construction of the RWDS. Dust would be produced during soil disturbing activities and demolition at construction sites. Operation of heavy equipment and increased vehicular traffic associated with personnel would result in an increase in pollutants associated with vehicle exhaust.

Impacts to air quality would be considered significant if the proposed activities were to:

- Increase ambient air pollutant concentrations at the Installation boundary above any NAAQS
- Contribute to an existing violation of any NAAQS (by exceeding *de minimis* levels for General Conformity)
- Interfere with or delay timely attainment of NAAQS
- Impair visibility within any Federally mandated PSD Class I area (mainly from particulate matter)
- Produce emissions of hazardous air pollutants (toxic air pollutants) exceeding State or Federal emission levels at the installation boundary

The action area is within portions of Pierce County, WA that area designated as maintenance areas for CO. Therefore, a general conformity review was completed and the detailed calculations are included in Appendix A for estimated CO emissions. Table 4-2 summarizes the impact thresholds.

Table 4-2 Air Quality Impact Thresholds

Pollutant	CO	HAP (VOC)	NOx	SO2	PM
Threshold	100 tpy	25 tpy total, 10 tpy individual HAP	250 tpy	250 tpy	250 tpy

Assumptions and methods utilized in the calculation of air emissions for the general conformity review and impact analysis are available in Appendix A.

4.2.1 Alternative A – Phase I and Phase II (Preferred Alternative)

PHASE I

Construction of the new WWTP would result in short-term minor impacts to air quality associated with mobile sources and creation of dust during clearing activities. Operation of heavy equipment during construction, as well as vehicular traffic from construction workers, engineers, and deliveries of equipment and components would contribute to the impact on air quality. These mobile sources would emit criteria pollutants. Emissions are calculated on an estimated annual basis. See Table 4-3 for the resultant estimated emissions.

Daily operations at the new facilities would not differ from the existing Solo Point WWTP facility. Increased production of VOCs due to increased population at JBLM is included in the impact analysis for the GTA EIS; therefore, impacts will not be discussed in this document. It was determined in the EIS that there was no significant impact to air quality based on the increased population (US Army 2010).

Table 4-3 Estimated Emissions from Alternative A						
Action	**VOC**	**CO**	**NOx**	**SO_2**	**PM**	
	(tons/yr)	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	**(tons/yr)**	
2013						
Construction of WWTP (12% of total construction)	0.62	2.98	5.23	0.62	8.37	
Significant Impact Threshold	25	100	250	250	250	
Exceed Threshold (Significant Impact)	No	No	No	No	No	
2014						
Construction of WWTP (50% of total construction)		2.59	12.42	21.80	2.57	34.88
Significant Impact Threshold		25	100	250	250	250
Exceed Threshold (Significant Impact)		No	No	No	No	No
2015						
Construction of WWTP (38% of total construction)		1.97	9.44	16.57	1.95	26.51
Significant Impact Threshold		25	100	250	250	250
Exceed Threshold (Significant Impact)		No	No	No	No	No
2016						
Demolition of WWTP		0.71	3.91	5.52	0.65	18.88
Significant Impact Threshold		25	100	250	250	250
Exceed Threshold (Significant Impact)		No	No	No	No	No
2018						
Construct RWDS and Outfall		12.60	54.88	142.14	15.71	175.27
Significant Impact Threshold		25	100	250	250	250
Exceed Threshold (Significant Impact)		No	No	No	No	No

PHASE II

Demolition of the existing WWTP on JBLM would result in short-term minor impacts to air quality associated with heavy-duty construction equipment utilized to remove components of the existing WWTP and heavy-duty vehicles utilized to transport materials to an approved disposal site or recycle facility on JBLM.

Construction of the facilities associated with the RWDS would have minor impacts to air quality associated with mobile sources operating during the construction period.

Each pipeline route of the RWDS would have slightly varying air quality impacts related to particulate matter emissions during trenching and drilling operations.

LEWIS NORTH LINE

Approximately 27,751 lf of pipeline would be installed as part of the Lewis North Line. This would result in an estimated 41 acres of disturbance within the utility corridors, plus the acreage associated with its projected pump stations and several infiltration galleries. Minor short-term air quality impacts from construction of these elements are expected. The main source of air pollutants will be the construction equipment and delivery trucks utilized during the construction.

LOGISTICS CENTER LINE

Approximately 31,899 lf of pipeline would be installed as part of the Logistics Center Line. This would result in an estimated 47 acres of disturbance within the utility corridors, plus the acreage associated with projected pump stations and one (1) infiltration gallery. Impacts from these construction activities would be minimal and similar to those described in the Lewis North Line.

LEWIS MAIN LINE

Approximately 21,758 lf of pipeline would be installed as primary corridor on the Lewis Cantonment area and the northern linkage to the WWTP has three optional alignments. The main cantonment corridor would result in an estimated 41 acres of disturbance within the utility corridors, plus the acreage associated with its projected pump stations and two (2) infiltration galleries. Impacts from these construction activities would be minimal and similar to those described in the Lewis North Line.

Option A-City of DuPont Alignment (17, 664 lf), a portion of this line would traverse through a residential community in the city of DuPont, and it is estimated that minor local impacts to air quality during construction are to be expected. There is minor temporary creation of particulate matter (dust) during drilling. Impacts will be dependent on the underlying soils and recent rain events prior to construction. Mitigation of dust is possible by the use of water trucks.

Option B-JBLM DuPont/Steilacoom Road Alignment (16,800 lf), the line would predominately be in the roadway prism and through existing JBLM training areas along the western boundary of the area referred to as Lewis North. There is minor temporary creation of particulate matter (dust) during drilling. Impacts will be dependent on the underlying soils and recent rain events. Mitigation of dust is possible by the use of water trucks.

Option C- JBLM Plant Road Alignment (20,371 lf) would be in the roadway, with some impacts to gravel road areas through the Stequlichaw Creek basin. Similar to Option B, the line would predominately be in the roadway prism and through existing JBLM training areas on the Lewis North base and when it crosses I-5 into the cantonment area, would be in the roadway to minimize impacts. There would be minor temporary creation of particulate matter (dust) during drilling. Impacts would be dependent on the underlying soils and recent rain events. Mitigation of dust is possible by the use of water trucks.

4.2.2 Alternative B – Phase I only (Construction of WWTP)

Construction of the new WWTP would result in short-term minor impacts to air quality associated with mobile sources and creation of dust during clearing activities. The level of impacts would be less for this alternative without the installation of the RWDS pipeline corridor and just the construction of the WWTP. Operation of heavy equipment for construction, as well as vehicular traffic from construction workers, engineers, and deliveries of equipment and components would contribute to air quality impacts. The construction impacts would be less for Alternative B without the RWDS construction corridors throughout JBLM North, the city of DuPont and Main base. These mobile sources would emit criteria pollutants and CO_2. Emissions are calculated on an estimated annual basis. See Table 4-4- for the resultant estimated emissions.

Table 4-4 Estimated Emissions from Alternative B					
Action	VOC (tons/yr)	CO (tons/yr)	NOx (tons/yr)	SO_2 (tons/yr)	PM (tons/yr)
2013					
Construction of WWTP (12% of total construction)	0.62	2.98	5.23	0.62	8.37
Significant Impact Threshold	25	100	250	250	250
Exceed Threshold (Significant Impact)	No	No	No	No	No
2014					
Construction of WWTP (50% of total construction)	2.59	12.42	21.80	2.57	34.88
Significant Impact Threshold	25	100	250	250	250
Exceed Threshold (Significant Impact)	No	No	No	No	No
2015					
Construction of WWTP (38% of total construction)	1.97	9.44	16.57	1.95	26.51
Significant Impact Threshold	25	100	250	250	250
Exceed Threshold (Significant Impact)	No	No	No	No	No

4.2.3 No Action Alternative

Under the No Action Alternative, no construction or demolition activities would occur. There would be no changes to existing air emissions as a result of this action and there would be no impacts to air quality.

4.2.4 Mitigation Measures

Air quality impacts can be further mitigated by the use of efficient construction techniques and effective job site management. Reduction in vehicle idling on the job site can reduce emissions of all NAAQS pollutants. In addition to management of idling equipment, newer construction equipment can be utilized to reduce emissions. The air emissions for the Proposed Action are calculated utilizing an older fleet of construction vehicles (known as Tier 0 – 2, See Appendix A for more information); however, newer construction equipment outfitted with the newest pollutant control equipment can reduce air quality impacts. Construction site fugitive emissions (particulate matter) can be mitigated by utilizing dust management practices including, but not limited to, water trucks and control of job site vehicle speed.

4.2.5 Cumulative Effects

Air emission impacts from the Proposed Action are short-term and are not significant. However, the construction of the Proposed Action in combination with the cumulative projects listed in Appendix B could present a temporary impact in varying degrees if construction time periods overlap, but these activities will be monitored to maintain compliance with NAAQS. This temporary impact would be due to large amounts of construction equipment, workers driving to site, and deliveries of construction materials during overlapping time periods. Temporary impacts could occur related to PM and CO emissions during construction. Mitigation measures including construction dust control and utilization of newer and cleaner construction equipment can be utilized to reduce any potential impacts.

4.3 NOISE

4.3.1 Alternative A – Phase I and Phase II (Preferred Alternative)

PHASE I

Construction activities associated with the new WWTP would include site clearing, excavation, grading, paving, and building construction on a short term, temporary basis. Noise generated from construction activities may cause temporary noise disturbances based on the types of equipment and the amount equipment in operation that exceed the maximum permissible environmental noise levels. The noise levels associated with various construction activities are summarized in Table 4-5. However, construction of the new WWTP would occur between the hours of 7:00 AM and 10:00 PM and is therefore exempt from maximum permissible environmental noise levels.

Table 4-5 Maximum Noise Levels at 50 feet from Common Construction Equipment

Equipment Type	Maximum Noise Level (dBA)*
Jackhammer/Rock drill	89
Grader	89
Crane	89
Chain saw	89
Compactor (ground)	83
Dozer	82
Excavator	81
Backhoe	78
Dump truck	76
Boring Jack Power Unit (directional boring)	83

Note: *Maximum sound pressure levels in dBA reference 20 microPascals (20 µPa).

Source: WSDOT 2011

Overall, construction noise levels are governed by the noisiest pieces of equipment (i.e., jackhammers, back hoes, trucks). Sensitive receptors on JBLM include occupied facilities in Lewis North. The closest off-base sensitive noise receptors (residential land use areas) to the proposed construction of the WWTP are located over two (2) miles southwest (city of DuPont) and over two (2) miles northeast (city of Steilacoom). Noise from equipment is expected to be short-term and due to the existing heavy forest would not adversely impact JBLM personnel residential areas or off-base sensitive noise receptors.

Operation of the new WWTP is anticipated to produce very similar noise to the current Solo Point WWTP. Therefore, operation of the new WWTP is not anticipated to impact sensitive noise receptors.

PHASE II

As discussed above for Phase I, noise generated from the demolition of the existing Solo Point WWTP would include noise generated as a result of equipment operation during the short-term demolition time period. Demolition of the existing Solo Point WWTP is planned to occur between the hours of 7:00 AM and 10:00 PM and therefore are exempt from maximum permissible environmental noise levels. The area of potential impact is similar to Phase 1 for the demolition of the existing Solo Point WWTP, noise generated from equipment is expected to be short-term and due to the existing heavy forest, will not adversely impact JBLM personnel residential areas or off-base sensitive noise receptors.

Construction of the facilities associated with the RWDS would not generate disturbing noise levels outside of the exempted hours of 7:00AM and 10:00PM for construction activity, and thus noise impacts to sensitive noise receptors are not expected from construction of these facilities.

LEWIS NORTH LINE

Noise associated with construction of the Lewis North Line may cause some temporary noise disturbance during directional boring and any roadside clearing that is necessary. However, noise levels are not anticipated to exceed baseline for more than a temporary period (less than one day) nor would they directly impact sensitive noise receptors based on duration of the noise and proximity to the receptors.

LOGISTICS CENTER LINE

As described under the Lewis North Line, no direct impacts to sensitive noise receptors are expected.

LEWIS MAIN LINE – (Option A DuPont; Option B – JBLM/DuPont; Option C-JBLM)

Noise generated during construction of the Lewis Main Line will likely cause some temporary disturbance to the residential neighborhoods or the training area this proposed pipeline would pass through. Directional boring activities could cause some underground vibrations, but would be temporary in nature. Ground vibrations from the directional boring activities are not expected to reach levels that could damage structures, but maybe audible (US Department of Transportation-FTA 2006) during daylight hours only. The anticipated duration of the activity is not expected to have direct impacts to sensitive noise receptors due to the temporary nature.

4.3.2 Alternative B – Phase I only (Construction of WWTP)

Noise impacts with implementation of Alternative B would be less with construction limited to just the WWTP. There would not be short-term/day light hour noise impacts to facilities or residences in the RWDS pipeline corridors. Therefore, no direct impacts to sensitive noise receptors are anticipated with implementation of Alternative B.

4.3.3 No Action Alternative

Under the No Action Alternative, the construction and operation of a new WWTP would not occur. The existing WWTP would continue to operate and baseline noise levels would remain unchanged.

4.3.4 Mitigation

Construction and demolition noise could be reduced by using quieter equipment, utilizing demolition/construction practices that minimize noise, turning off equipment not in use, and requiring mufflers on construction machinery. Work hours can also be restricted to avoid undue disruption. Temporary shielding could be installed during periods of high noise neighborhoods. All construction-related noise issues will be short-term and will cease when construction activities are complete.

4.3.5 Cumulative Effects

Cumulative effects for Alternative A and B, combined with other ongoing projects, would be less than significant. Construction-related noise impacts from the alternatives A or B could combine with construction-related noise increases associated with other planned and ongoing projects. This combination of construction project could cause temporary impacts to sensitive noise receptors during active construction. Therefore, implementation of the Proposed Action, when combined with other actions, would not result in significant cumulative impacts that are long term (lasting longer than the period of construction).

4.4 SOIL/GEOLOGY

4.4.1 Alternative A – Phase I and Phase II (Preferred Alternative)

PHASE I

Constructing the new WWTP would impact approximately 10 acres adjacent to the current WWTP facility. Erosion and compaction is the primary concern with soil disturbing activities associated with Alternative A. These activities would result in exposed soils leading to increased potential of erosion. Compaction leads to impervious soils resulting in increased surface runoff, which contributes to erosion. Because most soils in the proposed footprint for the new WWTP have low to moderate erosion potential, proper implementation of construction best management practices (BMPs) and incorporation of standard erosion control measures would result in no significant impacts to soil resources. Due to limited changes of existing geology, there would be no significant impacts to geological resources.

Daily operations at the new facilities would not differ from the existing Solo Point WWTP facility. The proposed project and associated facilities would incorporate standard erosion control measures to minimize erosion potential during post-construction activities (e.g. planting native vegetation, installing stormwater drainage infrastructure). Potential impacts associated with the operation of the new WWTP would not be significant.

PHASE II

Impacts to soils from demolition activities would be similar to construction activities. Demolishing the existing WWTP on JBLM would result in minimal impacts to geological and soil resources, thus no significant impacts to geological and soil resources are anticipated.

Construction of the facilities and "purple pipe" system associated with the RWDS could impact up to approximately 139 acres. The reclaimed water facility would be built at the existing/demolished WWTP location, therefore additional impacts to geological and soil resources from construction activities would be minimal, thus no significant impacts to geological and soil resources are expected from constructing the reclaimed water facility. The pump stations and infiltration galleries would be constructed on previously disturbed areas and thus impacts would be minimal. Impacts from infiltration galleries are negligible as they are primarily irrigation areas for dispersing reclaimed water. No adverse impacts to geological resources are anticipated with construction of these facilities.

Figure 4-1
Example of Direct *Bury* of utility run after preliminary soil restoration.
Source: Benning 2010.

The construction approach for the RWDS pipeline corridors would require direct bury (trenching), directional boring, or case/jack and bore. In most cases, the "purple pipe" system would be directly buried.

- In **direct bury** areas; a maximum 30-foot-wide construction corridor would be required. The corridor would be cleared of vegetation, appropriate erosion control measures installed, the "purple pipe" laid, required revegetation measures implemented, and the corridor allowed to return to prior conditions.

- In areas with existing streams, wetlands, National Register of Historic Places (NRHP)-eligible cultural resources sites, or other environmental resources of concern, the "purple pipe" system would be **directionally bored** under these areas using specialized equipment. Bores would be burrowed perpendicular to the resource to minimize bore length, to the extent possible and as site-specific conditions warrant. This equipment is able to bore to virtually any depth to an approximate maximum length of 2,500 feet (i.e., about 0.5 mile). The depth of the bore would depend upon the resource being avoided; NRHP-eligible cultural resource sites would be bored under at a minimum depth of six (6') feet, surface water areas would be bored under at a depth sufficient so as to not affect the resource. At each end of the bore location, an approximately 0.1-acre entrance and exit working area would be established to allow the boring equipment to operate, including appropriate erosion control measures (see Figure 4-2). As the bore is completed, the "purple pipe" would be run through the bore hole. Upon completion of the bore, the area would be restored to pre-project conditions.

Figure 4-2
Typical Directional Bore in operation.
Source: Benning 2010.

- In the cases where the "purple pipe" system would cross a railroad ROW or a highway ROW, a Case Bore/Jack-and-Bore may be required. This is where a steel casing (conduit) is placed in the pathway under the railroad bed or road surface (see Figure 4-3). A casing may be made up of one or more sections, but must be continuous. This type of bore requires more room to work, including typically a trench or pit at both ends to keep the case at a shallow angle as it is passed along the bore to the other side.

Figure 4-3
Typical Case Bore in operation.
Source: Benning 2010

Along each "purple pipe" run, "maintenance manholes" and "pump stations" would be installed on an as-needed basis. These holes provide access to the underground infrastructure for potential future maintenance requirements. Maintenance and pump station spacing varies widely, with distances between holes and will be finalized once the design for the system has been completed. Maintenance and pump stations are generally determined by their proximity to the areas and buildings requiring connectivity under the Preferred Alternative, as well as based on the "purple pipe" types proposed. Each hole would be dug with a standard backhoe, with appropriate erosion control measures in place.

- A typical maintenance hole is typically made of pre-cast concrete, in two pieces. In some cases, the maintenance hole would be poured in place. Typical installation would include installing erosion control measures, digging the hole, laying a gravel base, and emplacing the precast pieces

or pouring the walls of the maintenance hole. Upon completion, the area would be restored to pre-project conditions, except for a standard access lid or cover.

- A typical pump station is typically made of pre-cast concrete. In some cases, the pump station would be poured in place. Installation would include installing erosion control measures, digging the hole, laying a gravel base, and emplacing the precast pieces or pouring the walls of the pump station. Upon completion, the area would be restored to pre-project conditions, except for a standard access lid or cover.

LEWIS NORTH LINE

Approximately 27,751 lf of pipeline would be installed as part of the Lewis North Line. This would result in an estimated 41 acres of disturbance within the row/utility corridors. With implementation of mitigation measures described in Section 4.3.4, impacts to geological resources would be temporary and short-term.

LOGISTICS CENTER LINE

Approximately 33,899 lf of pipeline would be installed as part of the Logistics Center Line. This would result in an estimated 47 acres of disturbance within the row/utility corridors. Impacts from these construction activities would be similar to those described under the Lewis North Line with implementation of mitigation measures.

LEWIS MAIN LINE

Approximately 21,785 lf overall, with this corridor starting at the WWTP and heading south to Wharf Drive with a divergent point of three optional southern legs for this corridor connecting to the main base:

Option A - This line segment (17, 664 lf) would traverse through a residential community in the city of DuPont and have limited soil erosion impacts. The nature of the urban environment and implementation of BMPs will avoid soil impacts to the adjacent properties. This is the only portion of the proposed project that would be constructed off-base.

Option B – This line segment (16,800 lf) would predominantly be in previously disturbed soil areas (road ROWs and training areas). The area is a previously disturbed training area with some wetlands and bog areas that can be avoided.

Option C- JBLM Plant Road Alignment (20,371 lf) would be in previously disturbed soil areas (road ROWs and training areas); however there would be some directional boring or jack-and-bore to avoid impacts to wetlands and the Sequalitchew basin.

4.4.2 Alternative B – Phase I only (Construction of WWTP)

Alternative B only includes the construction and operation of the new WWTP. Impacts associated with Alternative B are similar, but less than those described for Alternative A. There would be no construction/trenching for the RWDS system and therefore less overall impacts. No significant impacts to geological and soil resources would occur.

4.4.3 No Action Alternative

Under the No-Action Alternative, the proposed project and its associated facilities and pipeline systems would not be constructed. Thus, baseline conditions (as described in Section 3.3.2) for geology and soils would remain unchanged. No significant impacts to geological or soil resources would occur as a result of implementing the No-Action Alternative.

4.4.4 Mitigation Measures

The proposed project will incorporate all practicable measures necessary to minimize impacts on soil and geology. By implementing the environmental protection measures (as described in section 2.5) and construction BMPs erosion control measures would be employed consistent with JBLM regulations for on-base activities and in-accordance-with Pierce County and city of DuPont regulations for off-base activities. JBLM would follow all its current NPDES permit requirements. The BMP measures would be developed as part of the required temporary erosion and sediment control (TESC) plan. At a minimum, the TESC plan would include the following measures:

- Maintain vegetation in areas outside designated construction clearing areas.
- Place straw, mulch, or other commercially available erosion control products on slopes that require protection.
- Use straw bales or silt fences to reduce runoff velocity in conjunction with collection, transport, and disposal of surface runoff generated from the construction area.
- Use only clean fill material.
- Provide dust control.

As a BMP, JBLM would utilize the above referenced appropriate BMPs and adhere to the terms of the NPDES General Permit for Stormwater Discharges for Construction Activity for Federal Facilities in Washington (CGP) to minimize erosion and sedimentation (and consequent surface water quality) impacts during construction-phase activities.

To the maximum extent possible, construction would occur within existing, disturbed road or utility ROWs. This includes existing roads and trails, as well as existing electric, natural gas, and water utility corridors. When located within a utility ROW, JBLM would coordinate with the utility owner and would ensure the infrastructure is installed at least 10 feet (10') from the existing utility.

CGP permit standards would be adhered to during all construction activities. The USEPA Region 10 would be responsible for reviewing and approving the JBLM's CGP Notice of Intent (NOI) application prior to construction. Stormwater runoff and erosion would be managed using BMPs, including but not limited to silt fencing, hay bales, vegetative buffers and filter strips, and spill prevention and management techniques, as detailed in the SWPPP. All disturbed areas would be re-vegetated and monitored to ensure success after construction is complete.

4.4.5 Cumulative Effects

Implementation of the Proposed Action would have the potential for increasing soil compaction and erosion during construction. Proposed pipeline corridor routes were selected on the basis of minimizing environmental impacts to the greatest extent practicable by using existing pipelines for wastewater transport to the new WWTP, and locating proposed new pipelines within existing roadways and utility corridors. While each phase of the project may have localized erosion, overall cumulative effects would be negligible because impacts would predominantly involve areas with existing development. In addition, BMPs for soil disturbing activities would be implemented during construction.

In review of the direct and indirect impacts to soils from ongoing projects (Appendix B) proposed under the GTA EIS (U.S. Army 2010), which include construction and training, the cumulative effects on soil erosion are not expected to increase substantially beyond current levels. At JBLM, the low slope gradients, climatic conditions, and soil textures have produced an environment that is limited in excessive

sedimentation or erosion impacts. Therefore, implementation of the Proposed Action, when combined with other actions, would not result in significant cumulative impacts to geological and soil resources.

4.5 VEGETATION

4.5.1 Alternative A – Phase I and Phase II (Preferred Alternative)

PHASE I

Approximately 10 acres of vegetation south of the existing WWTP would need to be cleared in order to provide space for the new WWTP. This area is primarily composed of historic dry forest type vegetation, which would result in a loss of approximately 0.13 percent (0.13%) of historic forest type vegetation and approximately 0.011 percent (0.011%) of total coniferous forest vegetation existing overall on JBLM property. Potential indirect effects of clearing would create the potential for adjacent areas surrounding the new facility to establish invasive or noxious plants, such as scotch broom.

Operations of all new facilities constructed under this alternative are not anticipated to directly impact vegetation. However, indirect impacts associated with potential establishment of invasive or noxious plants would be mitigated with BMPs as described in Section 4.5.4. With implementation of mitigation measures, no long-term adverse impact to vegetation would result from construction or operation of the new WWTP.

PHASE II

There would be no impacts to vegetation from demolition of the existing WWTP.

Construction of the facilities associated with the RWDS would have no adverse impacts to vegetation. The reclaimed water facility would be constructed within the same footprint as the existing WWTP. No additional vegetation would need to be removed to support this facility. The pump stations would be constructed within previously disturbed areas and would not directly impact adjacent vegetation.

LEWIS NORTH LINE

In order to reduce impacts to existing vegetation, the proposed RWDS would be installed via trenching methods along the road corridors and directional bore methods when located under streams and wetlands. It is anticipated that there would be a minor amount of clearing along the roadside corridors. There would be road and landscape restoration following construction. Therefore, no adverse impacts to vegetation are anticipated.

LOGISTICS CENTER LINE

Construction of the Logistics Center Line would be installed in the same methods as described above for the Lewis North Line and mitigated as described in Section 4.5.4. Therefore, no adverse impacts to vegetation are anticipated.

LEWIS MAIN LINE

Option A – DuPont- This line construction would be in the same methods as described above. However, approximately 17,664 lf of pipeline would need to be constructed through the city of DuPont, resulting in potential removal of established landscaping. The area for this proposed line is within previously disturbed or developed landscape areas. The landscaping areas would be avoided if possible by directional boring and restoration when open ditching is required. There may be some limited tree removal with restoration/mitigation following construction and implemented as described under in Section 4.5.4.

Option B – JBLM – This line would cross through JBLM training areas and an area with second (2^{nd}) growth conifer forest and some wetland areas. The wetlands and associated buffers would be avoided by using directional boring outside of the buffer edges.

Option C- JBLM Plant Road Alignment – Same range of impacts as Option B, this line would cross through JBLM training areas and an area with second (2^{nd}) growth conifer forest and some wetland areas. The wetlands and associated buffers would be avoided by using directional bore methods outside of the buffer edges

4.5.2 Alternative B – Phase I only (Construction of WWTP)

Construction impacts to vegetation would be restricted to the 10-acre footprint proposed for the new WWTP as described under Alternative A. The level of impacts would be less for this alternative without the installation of the RWDS pipeline corridor and just the construction of the WWTP. Additionally, implementation of BMPs/mitigation measures described under 4.5.4, and the small overall percentage of vegetation clearing overall, no long-term impacts to vegetation are expected with construction or operation of the new WWTP.

4.5.3 No Action Alternative

There would be no construction- or operations-related activities that would directly or indirectly affect native vegetation in the project area under the No-Action Alternative. Therefore, this alternative would have no impacts to vegetation.

4.5.4 Mitigation Measures

Through the implementation of the environmental protection measures (as described in Section 2.5), the laydown areas for new facilities would be actively managed. During construction and post-construction BMP's will be implemented to avoid establishment of invasive or noxious plants, which may spread into adjacent intact historical forest area from the proposed disturbed areas. Roadside restoration would be implemented following construction of the RWDS. Regular landscaping and grounds maintenance, including planting and seeding desirable native plant species, mowing, weeding, and erosion control would help minimize the establishment or spread of invasive plants to exposed soils on the site or on into adjacent undisturbed vegetation areas.

4.5.5 Cumulative Effects

Cumulative effects for Alternative A and B, combined with other ongoing projects, would be less than significant. Moderate, adverse cumulative impacts to vegetation in the South Puget Sound region or on JBLM would be expected from these alternatives. Various areas of vegetation on JBLM have been degraded by past and present construction and military training activities. The JBLM INRMP implemented new BMPs and training area restrictions to reduce further impacts on vegetation. This implementation of sustainability and regional efforts to protect remaining prairie, forest, and vegetation will help ensure that vegetation on JBLM and other suitable habitat off the installation would be protected for future generations. Therefore, implementation of the Proposed Action when combined with other actions would not result in significant cumulative impacts to vegetation resources.

4.6 WATER RESOURCES

4.6.1 Alternative A – Phase I and II (Preferred Alternative)

PHASE I

All construction for the facility and associated structures are upland and would have no adverse impacts to surface freshwater resources on the Installation, with implementation of the environmental protection measures (as described in Section 2.5) to avoid contaminants from equipment or general construction activities from entering any of the streams or lakes at JBLM. The Installation's SWPPP would be followed to avoid stormwater contamination from construction activities and no impacts to groundwater are expected from construction of the WWTP.

PHASE II

Demolition of the existing WWTP would have no adverse impacts to surface or ground water quality. The Installation's SWPPP would be followed to avoid stormwater contamination from demolition activities.

Construction of the outfall would temporarily impact water quality by way of bottom disturbance from outfall placement and associated in-water work equipment required for construction of the outfall. All appropriate BMPs and conservation measures to avoid inadvertent spills or leaks of contaminants from equipment into the Puget Sound would be implemented.

Construction of the facilities associated with the RWDS (i.e., reclaimed water facility, pump stations, and infiltration galleries) would have no adverse impacts to surface or ground water with implementation of environmental protection measures (as described in Section 2.5) and mitigation measures.

LEWIS NORTH LINE

In order to reduce impacts to surface water bodies, the proposed RWDS would be installed via trenching methods along the road prism and directional bore methods for under bridges, streams, and wetlands. All appropriate BMPs would be implemented to avoid impacts to surface and groundwater resources at JBLM. Therefore, no adverse impacts to water resources are anticipated for the proposed Lewis North Line.

LOGISTICS CENTER LINE

Construction of the Logistics Center Line pipeline would be installed in the same methods as described above for the Lewis North Line. Therefore, no adverse impacts to water resources are anticipated.

LEWIS MAIN LINE

Option A – DuPont – This line would be installed in the same methods as described above. There is the Sequalitchew Creek that currently is crossed by a bridge and the existing sewer line is located on the bridge, the new pipeline would be on the bridge and avoid impacts to that creek. Under Lewis Main Line – Option A there are no direct impacts to water resources with implementation of Alternative A.

Option B – JBLM – This line would be installed in the same method as described above. The impacts can be avoided by staying in the existing ROW. Additionally, directional boring will be utilized to stay outside of the buffer area. Under Lewis Main Line – Option B, there would be no significant adverse impacts to water resources.

Option C- JBLM Plant Road Alignment This line would be installed in the same method as described above. There is a portion of the line that would be near a wetlands buffer and can be avoided by

directional boring outside of the buffer area. Under Lewis Main Line – Option C, there would be no significant adverse impacts to water resources.

Upon completion and follow-on operation of the RWDS, water quality would likely improve overall as use of the outfall would no longer be required and the goal of moving to no further WWTP discharges into Puget Sound and retaining the reclaimed water on-base or also known as "zero discharge.

4.6.2 Alternative B – Phase I only (Construction of WWTP)

As described under Alternative A, appropriate environmental protection measures would be implemented and adherence to the Installation's SWPPP would be followed during construction of the WWTP. Therefore, no direct impacts to freshwater resources are anticipated.

4.6.3 No Action Alternative

Under the No Action Alternative, Puget Sound water quality could be at risk of impairment in the long-term due to the inefficiency of the existing WWTP. There would be no construction or operations related activities that would directly affect freshwater or groundwater resources on the Installation. Therefore, the No-Action Alternative would adversely impact nearshore marine water quality with discharge of treated water that would not meet permit conditions at all times.

4.6.4 Mitigation Measures

The laydown areas for new facilities would be actively managed during construction and post-construction to avoid any disturbance to nearby water resources.

During the preparation of the final AutoCAD / Geographic Information System (GIS)-based WWTP and RWDS engineering design, the proponent shall:

- Avoid surface waters and wetlands by locating the proposed "purple piping" alignment within previously disturbed areas, existing road or utility rights-of-way (ROWs), or other existing crossings to the maximum extent possible.
- Field determine, at appropriate intervals, the depths of all surface water features to be crossed by the proposed RWDS "purple piping" to establish the appropriate boring depths. Depths shall be marked on the design drawings.
- Field delineate and flag the boundaries of all jurisdictional wetlands and waters of the US in portions of the alignment that have not yet been delineated. Boundaries shall be marked on the design drawings.
- Field flag the boundaries of all jurisdictional wetlands and waters of the US in portions of the alignment that have been delineated. Boundaries shall be marked on the design drawings.
- Using the above data, locate all project construction components at a minimum distance of 50-feet (50') from the edge of the wetland boundary (i.e., the edge of wrested vegetation).

This final WWTP and RWDS design shall be reviewed and approved by the Environmental Division (ED) via the JBLM environmental review process. Any changes required by the ED shall be made by the proponent.

Prior to and during construction (i.e., the proposed construction would occur over a period of time) the proponent shall:

- Insure that appropriate BMPs would be in place and the Installations SWPPP would be adhered to by contractor.
- In-water construction of the outfall would comply with spill containment requirements.
- In the unlikely event that a construction accident or spill releases contaminants into waterways or the surrounding environment, construction BMPs (such as oil booms and absorbent pillows) would be employed to contain and minimize the spill. This would be followed by cleanup activities consistent with applicable Federal and state standards. By constructing the new WWTP, the Army will reduce the negative impacts of effluent discharges that exceed NPDES Standards. The Army will comply with 42 USC § 17094, which requires planning and design to maintain the hydrology of the site.
- Re-validate each proposed project component, immediately prior to construction, via the JBLM Garrison de-confliction proposal review process to ensure that conditions have not changed. Implement any changes required by the ED.
- Clearly field flag all wetlands and surface waters within and in the vicinity of the construction ROW, as well as the limits of the construction area. Comply with the limits of construction in accordance with the final design and any adjustments made during the immediately pre-project environmental review. All unavoidable wetlands and surface waters shall be bored under at a sufficient depth, as determined during the pre-construction analysis; boring entry and exit work locations shall be a minimum of 50 feet from the edge of the field-marked resource boundary.

Following completion of construction, the proponent shall:

Restore and re-vegetate disturbed construction areas to pre-project conditions, in compliance with the NPDES permit and the SWPPP. Native species of vegetation should be used to the extent possible or on the approved list of acceptable species. By constructing the new WWTP, the Army will reduce the negative impacts of effluent discharges that exceed NPDES Standards. The Army will comply with 42 USC § 17094, which requires planning and design to maintain the hydrology of the site.

4.6.5 Cumulative Effects

Cumulative effects to surface water could occur under Alternatives A, in conjunction with surface disturbances resulting from the construction of the pipelines. This disturbance, which would include vegetation removal and soil disturbance, would contribute to erosion and sedimentation. Cumulative effects on surface water resources would be highest shortly after construction begins and would decrease over time in response to site reclamation. Environmental protection measures (as described Section 2.5) to control erosion would be implemented to ensure that surface-disturbing activities have minimal effect on surface water resources and do not exceed significance criteria thresholds. Cumulative effects for Alternative B would be limited to the WWTP where there are no other current projects and no cumulative effects. Therefore, implementation of the Proposed Action, when combined with other actions, would not result in significant cumulative impacts to water resources.

4.7 BIOLOGICAL RESOURCES INCLUDING THREATENED AND ENDANGERED SPECIES

4.7.1 Alternative A – Phase I and Phase II (Preferred Alternative)

PHASE I

Terrestrial Wildlife

Less the one percent (1%) of total coniferous forest vegetation existing overall on JBLM property would be removed. This vegetation likely functions as roosting, nesting, or foraging habitat for various bird species, as well as nesting and foraging habitat for small mammals and various reptile species. Direct impacts to wildlife would be noise disturbance from tree clearing and construction activity. These disturbances would likely cause wildlife species to avoid the area temporarily. Some nesting activity by year-round resident bird species may be disturbed and some nests may inadvertently be destroyed during tree removal. Due to the small percentage of habitat removed overall at JBLM and the availability of habitat adjacent to the proposed WWTP location and within other areas of JBLM in general, construction of the new WWTP would have no long-term adverse impacts to wildlife species.

Operations of all new facilities constructed under this alternative are not anticipated to adversely impact terrestrial wildlife species.

Fish and Invertebrate Resources

There is no in-water work included with Phase I activities, and there is no impacts anticipated for fish and invertebrate species.

Operation of the new WWTP would have no adverse impacts to fish and invertebrates. In fact, the new WWTP is expected to more efficiently treat wastewater prior to discharge through the current outfall. All thresholds under the new NPDES permit are anticipated to be met resulting in improved water quality at the discharge point. Therefore, implementation of Phase I will have no adverse impacts to fish and invertebrates.

Special-Status Species

Water Howellia – Upland construction and operation of the WWTP with the associated building, pump stations, and infiltration gallery facilities would not impact Water howellia at JBLM because it is not found within the proposed project area.

Bald Eagles – Although no longer listed under ESA, due to the federal protection and presence at JBLM, the bald eagle is acknowledged in this analysis for environmental baseline purposes. JBLM has established primary (400 meters) and secondary (800 meters) buffer zones around bald eagle nest sites and communal night roosts, as well as protection zones along portions of foraging habitat along Muck Creek and the Nisqually River (Army 2007). The nearest bald eagle site is more than two (2) miles away from the proposed WWTP construction site (Army 2010). Implementation of Alternative A would not adversely impact bald eagles.

PHASE II

Terrestrial Wildlife

Only temporary noise disturbance is expected to wildlife species from demolition of the existing WWTP. No long-term adverse impacts are expected.

Construction of the facilities associated with the WWTP would be in previously disturbed areas where there is a small potential for wildlife presence in those areas and/or species present such as birds or smaller mammals have acclimated to typical noise and human activity in the area.

Construction activity associated with the new outfall may disturb shore birds and other wildlife species that may be present near the project area. Impacts are anticipated to be short-term and temporary and thus no long-term impacts to wildlife species are anticipated with the new outfall.

Construction of the facilities associated with the RWDS (i.e., reclaimed water facility, pump stations, and infiltration galleries) would be done in previously disturbed areas where there is a small potential for wildlife and/or species that have acclimated to typical noise and human activity in the area.

Therefore, no impacts to wildlife species are anticipated with construction of those facilities. Construction of the reclaimed water facility would be within the same footprint as the existing WWTP and thus temporary noise disturbance would be expected.

RWDS

The Lewis North Line, Logistics Center Line, and Lewis Main Line would be constructed by way of directional bore under creeks and streams; therefore, the construction activity would avoid any impacts to fish inhabiting these surface waters. No adverse impacts to fish and invertebrate resources are expected with construction of these three pipeline segments.

LEWIS NORTH LINE

In order to reduce impacts to existing vegetation habitat, the proposed RWDS would be installed via trenching methods along the road prism and directional bore methods for under bridges, streams, and wetlands. Noise generated from the tunneling and pipe placement would likely cause wildlife species to temporarily avoid the area. No direct impacts to habitat or species within the habitat are anticipated and overall disturbance to wildlife species from installation of the Lewis North Line would be short-term and temporary.

A minor amount of clearing of vegetation may be necessary along the sides of roads but restoration of native plant species, and thus replacing any removed habitat, would be included under mitigation following construction. Therefore, no adverse impacts to terrestrial wildlife species would result.

LOGISTIC CENTER LINE

Construction of the Logistic Center Line would be installed via the same methods as described above for the Lewis North Line. Therefore, no adverse impacts to terrestrial wildlife species are anticipated.

LEWIS MAIN LINE (Option A, B, and C)

Construction of the Lewis Main Line (Options A, B and C) would be installed in the same methods as described above for the Lewis North Line. This proposed pipeline location for Option A is within a previously disturbed and developed area where there is very little vegetation habitat other than some ornamental trees and general landscaping. Option B and C would be through potential habitat; however, there is limited second (2^{nd}) growth tree removal with the trenching activity limited to a small area. No adverse impacts to terrestrial wildlife species are anticipated.

Fish and Invertebrate Resources

No impacts to fish and invertebrate resources from upland demolition of the existing WWTP are anticipated.

Construction of the proposed outfall is not expected to adversely impact marine species. The presence of a local Pacific octopus near the outfall would not be adversely impacted due to the octopus due to the species ability to move away from the area during construction activity. Year round fish residents would likely be disturbed during outfall construction. Any noise or general in-water construction activity would cause fish to temporarily avoid the area during construction hours and return once activity ceases at the end of the day. More stationary species such as shellfish or smaller invertebrates may inadvertently be destroyed during construction. In addition, habitat would be lost with the displacement of approximately 20,000 to 25,000 SF of seafloor for the new outfall. Since in-water construction would be within approved work windows, disturbance from noise and general in-water construction activity would be minimal. Although some benthic habitat (defined in biological environment) would be lost, it is a small percentage of habitats that is still available to these species adjacent to the proposed new outfall location. Therefore, no long-term adverse impacts would result to fish and invertebrates with construction of the new outfall.

Construction of the facilities associated with the RWDS would be done in previously disturbed upland areas and would not directly impact marine or freshwater fish and invertebrates. Any construction of these facilities occurring near streams would be conducted using appropriate environmental protection measures (as described in Section 2.5) to reduce the potential for impact.

Special-Status Species

Water Howellia- Demolition of the existing WWTP would not occur near any wetland areas where this species occurs. Construction of the RWDS would require installing pipeline near wetland areas where this species occurs. With implementation of environmental protection measures (as described in Section 2.5) to reduce impacts (i.e., directional bore under wetlands), no adverse impacts are anticipated.

Bald Eagles - Demolition of the existing WWTP would take place adjacent to the WWTP site and is therefore greater than two (2) miles from bald eagle protection areas. Construction of the pump stations and infiltration galleries may temporarily disturb bald eagles due to noise, but construction of these facilities is not anticipated to last more than 60 days. Construction of the "purple pipe" system segments may disturb bald eagles from the noise; however, noise generated is not anticipated to exceed baseline noise levels that occur on a day-to-day basis at the Installation.

Marbled Murrelet - Demolition of the existing WWTP and construction of the RWDS is not anticipated to impact marbled murrelets as all activities would occur upland where marbled murrelets have not been observed. Because they have been observed within the nearshore areas of Solo Point, marbled murrelets may be present during the time of in-water construction. Noise generated and presence of human activity are likely to cause marbled murrelets to either move further offshore to forage or avoid the area altogether during outfall construction. Because construction will be temporary and short-term, no adverse impacts are expected to marbled murrelets during construction and no indirect long-term impacts would result from operations. Therefore, implementation of Phase II would have no adverse impacts to marbled murrelet.

Rockfish – There would be no impacts to rockfish from demolition of the existing WWTP and construction of the RWDS and associated upland facilities. In-water work (construction of the new outfall) would occur adjacent to the existing outfall which is approximately 70 feet below the water surface and within bottom sediment composed of sand and silt and a mix of some clay and trace gravel (Biological Assessment ADDENDUM II). Because adult rockfish prefer deeper water habitat with high rocky relief, they are not expected to be present in the project area. The absence of rocky substrate and aquatic vegetation (i.e., kelp beds, eelgrass) makes it unlikely that juvenile or larval rockfish would be

present within the project area. Therefore, proposed construction of the new outfall is not likely to adversely impact the federally listed bocaccio, canary, and yelloweye rockfish species. Implementation of Alternative A would have no adverse impacts to these species.

Puget Sound Chinook Salmon and Puget Sound Steelhead Trout – There would be no impacts to Puget Sound Chinook and Steelhead from demolition of the existing WWTP or upland construction of the facilities associated with the RWDS. Construction of the pipeline segments for the RWDS would be installed by directional bore under streams to reduce or avoid impacts to these species that may be present. Adult Chinook and steelhead may be present within the outfall construction area during migration and would likely move further offshore to avoid any noise or activity in the area. Because in-water work would occur during a time when juvenile salmonids are less likely to be present in the area (July 16 – February 15), no adverse impacts are anticipated. In addition, rearing and foraging habitat is scarce within the location of the new outfall as there is no aquatic vegetation present and is primarily a mix of sand and silt with some clay and trace gravel. No adverse impacts to Puget Sound Chinook or Puget Sound Steelhead would occur with implementation of Alternative A.

Coastal Puget Sound Bull Trout – There would be no impacts to bull trout from demolition of the existing WWTP or construction of the RWDS and associated facilities. Bull trout are not likely to be present within the proposed new outfall construction area. There are very few observations of bull trout south of the Tacoma Narrows Bridge (USFWS 2010bb). Bull trout that may be present within the project area would originate from the Puyallup core area of which the mouth of the Puyallup River is more than 20 miles from the project site. Lastly, there are fewer than 10 records of bull trout observed in or near the Nisqually River (USFWS 2010bb). Therefore, construction of the new outfall is not likely to adversely impact bull trout. Operations of the new WWTP would also have no negative impacts to bull trout. In fact, treated water discharged out the new outfall from the new WWTP is anticipated to be of improved quality (Class A) and thus would have no negative impacts to bull trout should they be in the area.

Marine Mammals - There would be no impacts to marine mammals from demolition of the existing WWTP or construction of the RWDS and associated facilities. The most likely occurrence of marine mammals in the area during outfall construction would be by seals and California sea lions. Noise and human activity in the water by way of construction of the outfall would likely cause sea lions and seals to avoid the area temporarily. In-water work would be conducted within the in-water work window of July 16 through February 15 and it is typical for construction phasing over a two-year (2-year) period working within these fish windows. Southern Resident Killer whales (SRKW) are rare visitors but may be present in the summer and fall months when in-water construction would be underway. Any in-water noise from construction equipment would be temporary and short-term. SRKW that may be present in the area at the time of construction would likely move further offshore without any significant alteration to foraging behavior that may be taking place at the time. Impacts to marine mammals would therefore be temporary and short-term with no long-term adverse impacts expected

4.7.2 Alternative B - Phase I only (Construction of WWTP)

Potential disturbance impacts to fish, invertebrates, and special-status species associated with construction of the new WWTP would not differ from those discussed under Alternative A, Phase I. Therefore, implementation of Alternative B would have no adverse impacts to biological resources.

4.7.3 No Action Alternative

Implementation of the No-Action Alternative would result in continued discharge of treated water that does not meet permitted thresholds under the NPDES permit. Water quality in the area of the existing

outfall would continue to be at risk of impairment and thus potentially affecting fish and invertebrates in the nearshore area.

4.7.4 ESA Conclusions and Determination of Effects

The proposed project would construct a new WWTP on JBLM. Construction would include upland areas on JBLM as well as noise impacts near the marine environment of South Puget Sound. Several species that potentially occur in the action area are listed by federal and/or state agencies as sensitive. An evaluation for Phase I of the project has been completed which found No Effect to ESA listed species. The effect determinations are detailed in the Biological Evaluation (APPENDIX F).

Critical habitat has been designated for some of these species and occurs in the action area for Phase II of the project. Phase II of the Proposed Action would require subsequent Section 7 consultation with the Services to determine impacts to ESA listed species. Because of the project plan to be revised and relocated to avoid sensitive species areas, it is believed that the effects determination for Phase II will be Not Likely to Adversely Affect ESA listed species within the action area.

4.7.5 Mitigation Measures

During the preparation of the final AutoCAD / GIS-based engineering design, the proponent shall:

- Avoid areas supporting natural vegetation communities by locating the proposed "purple piping" alignment within previously disturbed areas, or existing road or utility ROWs to the maximum extent possible.

This final design shall be reviewed and approved by the ED via the JBLM deconfliction review process. Any changes required by the ED shall be made.

- Clearly field flag and comply with the limits of construction, in accordance with the final design and any adjustments made during the immediately pre-project environmental review.
- Time construction to avoid nesting periods of migratory birds protected under the Migratory Bird Treaty Act (MBTA) during the migratory bird nesting season April through August so that nests are not disturbed. If it is not practical to conduct construction outside of this time frame, a qualified biologist shall survey the construction area in advance to ensure that no active nests are disturbed.
- Following completion of construction, the proponent would restore and re-vegetate disturbed construction areas to pre-project conditions, in compliance with the NPDES permit and the SWPPP. Native species of vegetation should be used to the extent possible and approved by JBLM Fish and Wildlife Staff.

4.7.6 Cumulative Effects

Cumulative effects would be less than significant under Alternative A or B. Under the No Action Alternative, increased effluents from the Solo Point WWTP with high BOD would continue to contribute to low oxygen levels in the Puget Sound, which could negatively impact marine species. This would be cumulative to increased effluent from other WWTPs in the region as a result of off-base population increases under the action alternatives. Nitrogen discharges from WWTPs and other point and nonpoint sources are thought to be the primary cause of low dissolved oxygen levels in the South Puget Sound (USEPA 2009a).

Short- and long-term minor adverse cumulative impacts to fish would be expected from past, present, and future actions on JBLM and within the South Puget Sound region. Stryker Brigade Combat Team (SBCT) and GTA unit training have the potential to degrade vegetation and soils and cause sedimentation of streams and rivers, although risks of habitat degradation would be low. Future training by other Army units, including SBCTs, would disturb soils and vegetation and could impact stream quality. Reduced water flows in Murray and Muck creeks in recent years have limited salmonid access to these creeks. Erosion, sedimentation, and pollution associated with construction and training can adversely impact fish habitat. Clearing of pipeline and transmission line ROWs, housing renovation and construction, and military training activities conducted by other units on JBLM would cumulatively impact water quality. The construction of the new WWTP would reduce the cumulative effects from the discharge at Solo Point. Therefore, implementation of the Proposed Action, when combined with other actions, would not result in significant cumulative impacts to biological resources.

4.8 SOCIOECONOMICS

4.8.1 Alternative A – Phase I and Phase II (Preferred Alternative)

PHASE I

During construction of the new WWTP there would be a short-term increase in construction jobs. In combination with other construction work included under Alternative A, there is potential for slight positive impact on regional employment.

Construction of the new WWTP would not occur on land currently used to provide quality of life resources or programming. No facilities would be directly affected by construction activities. The WWTP construction area is on JBLM and not accessible to the public. No childcare facilities, schools, health or recreational facilities are located nearby these locations. Adjacent to the WWTP is the area North Small Arms Impact Area used for training, which means the area is unlikely to be used for recreational purposes. Users of the road and undeveloped areas adjacent to the construction site could be subject to temporary indirect impacts during construction, including increased noise and dust. However, because of the localized and short-term nature of the construction and the fact that noise and dust effects would be primarily limited to the construction site, where workers would wear proper protective equipment, impacts are not expected to be significant.

Because construction areas for the new WWTP are undeveloped and no buildings or facilities are located nearby, low-income, minority or youth populations are not expected to be present in the immediate vicinity of the construction. No significant impacts to environmental justice or the protection of children would occur.

Operation of the new facility would not differ from existing day-to-day operation of the existing Solo Point WWTP facility. No impact is expected to regional population or economic indicators. With adoption of a Facilities Plan and use of environmental protection measures, no negative impacts to quality of life are expected. The plan would include the incorporation of odor and noise control equipment in all facility designs. Buffer areas and vegetative buffers will separate the WWTP from the surrounding area, screening views, buffering any sound, and designed to appear as natural landscape.

Operation of the new WWTP and system will provide the necessary sewage treatment capability for JBLM and improve the quality of wastewater leaving the installation. Effluent requirements will be met, and permit exceedances currently occurring will no long occur. Operations of the new WWTP will result in a cleaner environment in the region with the eventual use of infiltration and on-site storage of

greywater. Low-income, minority populations and children, as well as the regional population as a whole will benefit from a decrease in permit exceedances. Net positive impacts on quality of life are expected.

PHASE II

During demolition of the existing WWTP, there would be a small short-term increase in construction jobs. No WWTP jobs would be lost as the demolition work would not start until after the new WWTP has been put into service. In combination with other construction work included under Alternative A, there is potential for slight positive impact on regional employment.

Demolition of the existing WWTP would occur in an established industrial site, surrounded by forest, and not directly impacting any residential or recreational resources that create quality of life at JBLM. No quality of life facilities would be directly affected by demolition activities. Similar to potential impacts from the construction of the new WWTP, any increase in noise or dust would be localized, short-term in nature, and limited to the demolition site. Therefore impacts are not expected to be significant.

Because the demolition area is not used for purposes other than wastewater treatment and no buildings or facilities are located nearby, low-income, minority or youth populations are not expected to be present in the immediate vicinity of the demolition. No significant impacts to environmental justice or the protection of children would occur.

During construction of the reclaimed water facility, pump stations and infiltration galleries, as well as the distribution piping, there would be a short-term increase in construction jobs. In combination with other construction work included under Alternative A, there is potential for positive impact on regional employment.

LEWIS NORTH LINE

The Lewis North Line will run south from the WWTP site along a road leading through undeveloped land and then run east and northeast on JBLM to connect with four (4) potential infiltration galleries. The line would terminate at proposed infiltration galleries in landscaping areas that are within land use designations of developed administration, maintenance, troop facilities, and community services

LOGISTICS CENTER LINE

The Logistics Center Line will continue the Lewis North Line south, pass through additional JBLM family housing and community services areas, crossing I-5 and running northeast along I-5, then redirected to a proposed infiltration gallery and an industrial facility within land use designation of medical facilities on JBLM property.

LEWIS MAIN LINE

Option A-DuPont - is the only corridor that runs off of JBLM. The pipe would run south through an existing underground utility easement (approximately 25-feet wide) through the city of DuPont, passing under Center Drive, alongside public open space, and along Palisade Boulevard through the Palisade Village neighborhood. It would cross directly under Chloe Clark Elementary School, to again run alongside public open space, across I-5 and back onto JBLM. Chloe Clark Elementary had a 2009-2010 school year enrollment of 552 students between kindergarten and fifth grade. Thirty-five percent (35%) of the school's students are identified as a minority population (U.S. Department of Education, 2010). The pipe would also pass by the Mini-Skool Early Learning Center on Palisade Boulevard, north of the Elementary School. This center provides services for children ranging from six (6) weeks to five (5) years old as well as before and after school care.

Option B- JBLM would run through the JBLM training area on Lewis North and parallel to the DuPont-Steilacoom Road. This alignment would have no impacts on schools, residential populated areas, or quality of life.

Option C- JBLM Plant Road Alignment would run through JBLM training areas on Lewis North and then to I-5. The alignment would have no impacts on school, residential populated areas or quality of life, with construction in the roadways.

For Options A, B and C, they would generally connect to the Lewis Main Base in the same vicinity, crossing I-5 at or within Pendleton Avenue, at which point it would be referred to as simply the Lewis Main Line and would run through a variety of areas of JBLM, including training, open space, family housing, community services, and training areas.

There would be short-term adverse effects on quality of life because construction activities could temporarily impede access to the shops, facilities, and service in the areas where the distribution piping would be placed. For the duration of the construction, transit to and from the facilities adjacent to the construction locations would be obstructed, although it will likely still be possible to access these facilities. To minimize adverse effects as much as possible, pipelines will be installed by roadside trenching with roadside restoration, and within roadway easements when available. The preferred construction method of directional bore will minimize disruptions to residential and community access to quality of life resources.

There would be minor health risks associated with construction, related to noise and dust generation. Anyone accessing nearby areas, including children, would be exposed to noise, dust, and construction materials. Noise during school hours could be a minor distraction at schools. Project activities would comply with local noise and dust control regulations, and generation of noise and dust would cease with the completion of proposed construction activities. Disproportionate adverse effects to minority populations should not occur. However, there is the potential that the construction of the Lewis Main Line could adversely impact the protection of children since the Lewis Main Line construction area passes through a number of areas with a high density of children – namely the Palisade Village area, including related childcare centers and Chloe Clark Elementary.

4.8.2 Alternative B – Phase I only (Construction of WWTP)

During construction of the new WWTP, there would be a small short-term increase in construction jobs. However, with construction limited to the WWTP, there would be fewer jobs without the construction of the RWDS corridors.

Construction of the new WWTP would not occur on land currently used to provide quality of life resources or programming. No facilities would be directly affected by construction activities. The WWTP construction area is on JBLM and not accessible to the public. No childcare facilities, schools, health or recreational facilities are located nearby these locations. Adjacent to the WWTP is the area North Small Arms Impact Area used for training, which means the area is unlikely to be used for recreational purposes. Users of the road and undeveloped areas adjacent to the construction site could be subject to temporary indirect impacts during construction, including increased noise and dust. However, because of the localized and short-term nature of the construction and the fact that noise and dust effects would be primarily limited to the construction site, where workers would wear proper protective equipment, impacts are not expected to be significant.

Because construction areas for the new WWTP are undeveloped and no buildings or facilities are located nearby, low-income, minority or youth populations are not expected to be present in the immediate

vicinity of the construction. No significant impacts to environmental justice or the protection of children would occur.

4.8.3 No Action Alternative

Under the No Action Alternative, the proposed construction of the new WWTP, replacement outfall, and reclaimed water system would not occur. No changes to employment or population would occur. However, the existing WWTP is already inadequate to treat the increasing amount of sewage being generated at JBLM and the No Action Alternative would result in increased degradation of the site. Overall this would adversely impact environmental conditions in the region, and decrease quality of life for the region's population.

4.8.4 Mitigation Measures

Noise and traffic impacts due to construction activities that lend to impacts on quality of life and protection of children can be mitigated through a variety of environmental protection measures (as described in Section 2.5). In addition, the following mitigation measures could be implemented to minimize adverse effects to quality of life and children due to construction:

- Use of equipment that minimizes noise and dust.
- Publicize construction dates and routes.
- Notification of service providers on JBLM and within the city of DuPont, and appropriate school officials about the location and timing of construction activities.
- Coordinate construction activities with city of DuPont officials to avoid conflicts with public events.

4.8.5 Cumulative Effects

Construction-related employment from the Proposed Action could combine with construction-related employment increases associated with other planned and ongoing projects. Increased job opportunities in the short term could lead to a minor increase in population that would be additive to the potential expansion of population on JBLM and in the surrounding areas. Economic effects associated with increased population could include an increase in spending in the local economy, and an increase in demand for recreational resources and other quality of life facilities. Regional growth in the area is expected and long-term plans for the area allow for the accommodation of this growth. The increased capacity of the WWTP could allow regional growth plans to be more fully implemented, decreasing any potential for quality of life impacts or potential increases in environmental hazards due to increasing wastewater generation. Therefore it is not expected that cumulative population growth would have adverse impacts regional socioeconomics or on low-income populations or children in the long-term.

4.9 PUBLIC SERVICES (UTILITIES/ENERGY DEMAND/GENERATION)

4.9.1 Alternative A – Phase I and Phase II (Preferred Alternative)

PHASE I

Minimal impacts to utility services are anticipated during construction. Construction impacts to utilities typically relate to the need to relocate a utility line or temporarily disrupt utility service.

It is not anticipated that the construction or operation of the new WWTP would impact natural gas, fuel oil, or steam services on JBLM. No sewer services would be required during construction. These systems would not be impacted by the Proposed Action.

Depending on the type of construction activity, electrical energy may be needed to operate equipment. This miscellaneous power consumption by construction activities would not substantially impact local power supply. Construction operations would not have significant water, or sewer requirements. A construction stormwater management plan including temporary BMPs would be implemented to contain surface water flows within the project site and prevent increase in runoff.

Expanded plant operations could increase potential for future demand of JBLM fire protection or emergency services. However, this impact is not expected to be large, and can be met by the current level of service provided by JBLM fire and police services.

The new WWTP would require a 13.2 kVA electrical service, connection to a fiber optic cable system, and a water supply. A new eight-inch (8") water pipeline will be provided for fire protection at the WWTP. Fire protection for the site will be in accordance with National Fire Protection Association (NFPA) 820 Standard for Fire Protection in Wastewater Treatment and Collection Facilities. The standard requires fire hydrants for protection of most of the WWTP processes (U.S. Army Corps of Engineers, 2011).

These requirements do not represent a significant change in the amount of electricity, water supply, or telecommunications ability than is currently necessary to operate the existing WWTP. The existing electrical, water, and telecommunications systems on JBLM have adequate capacity to support the new WWTP and no adverse impacts are expected. Local utilities would be contacted to ensure their individual transmission lines and other facilities are able to accommodate the treatment plant when services are needed.

Stormwater management at the site will meet the Department of Ecology's stormwater management requirements and the latest version of the Stormwater Management Manual for Western Washington. All stormwater runoff from the facilities will remain onsite, runoff from impervious surfaces will be routed to rain gardens and infiltration galleries to manage and retain stormwater (U.S. Army Corps of Engineers, 2011).

An overflow connection from each storage tank to the sewer is required. Final locations of storage tanks have not been identified. The locations of the storage tanks will include consideration of ease of connection to sewer infrastructure to reduce future construction and linkages (U.S. Army Corps of Engineers, 2011). Overall the operations of the new WWTP would allow JBLM to meet the requirements outlined in the wastewater feasibility study (CH2M Hill 2009) and treated wastewater from the new WWTP would meet USEPA permit requirements. This would result in a positive impact to the JBLM sewer system.

PHASE II

Minimal impacts to utility services are anticipated during demolition of the existing WWTP. It is not anticipated that the demolition would impact natural gas, fuel oil, or steam services on JBLM. No sewer services would be required during demolition. These systems would not be impacted by the Proposed Action.

Depending on the type of demolition activity, electrical energy may be needed to operate equipment. This miscellaneous power consumption by construction activities would not substantially impact local power

supply. Demolition operations would not have significant water or sewer requirements. A stormwater management plan including temporary BMPs would be implemented to contain surface water flows within the project site and prevent increase in runoff.

LEWIS NORTH LINE

There is the potential for accidents to occur during construction activity; however, this is not anticipated to increase the need for police and fire services at the site.

Minimal impacts to utility services are anticipated during construction of the Lewis North Line. The Lewis North Line will run south from the WWTP site along a road leading through undeveloped land and then run east and northeast on JBLM to connect with four (4) potential infiltration galleries (U.S. Army, 2010, Figure 3-13).

The area where the Lewis North Line will run is developed in character and contains under and over-ground utility services. Any temporary disruptions will be coordinated with the appropriate utility service so that disturbance is minimized. Depending on the type of construction activity, electrical energy may be needed to operate equipment but this energy requirement would not substantially impact local power supply.

LOGISTICS CENTER LINE

There is the potential for accidents to occur during construction activity; however, this is not anticipated to increase the need for police and fire services at the site.

Minimal impacts to utility services are anticipated during construction of the Logistics Center Line. The Logistics Center Line will continue the Lewis North Line south, pass through additional JBLM family housing and community services areas, cross I-5 and run northeast along the interstate, breaking away to connect to a potential infiltration gallery and an industrial facility, all on JBLM property (U.S. Army, 2010, Figure 3-13).

The areas through which the Logistics Center Line passes are developed in character and contain under and over-ground utility services. Any temporary disruptions will be coordinated with the appropriate utility service so that disturbance is minimized. Depending on the type of construction activity, electrical energy may be needed to operate equipment but this energy requirement would not substantially impact local power supply.

LEWIS MAIN LINE

Option A would have minimal impacts to utility services as anticipated during construction of the Lewis Main Line. The Lewis Main Line Option crosses into the city of DuPont and would be within an existing utility corridor. Specifically, the line would be passing under Center Drive, alongside public open space, and along Palisade Boulevard through the Palisade Village neighborhood. It would cross directly under Chloe Clark Elementary School, to again run alongside public open space, across I-5 and back onto JBLM. Once it crosses I-5, the Lewis Main Line would run through a variety of areas of JBLM, including training, open space, family housing, community services, and training areas (U.S. Army, 2010).

Because of the developed nature of the area through which the Lewis Main Line will run, it will contain under and over-ground utility services. Any temporary disruptions will be coordinated with the appropriate utility service so that disturbance is minimized. Depending on the type of construction activity, electrical energy may be needed to operate equipment but this energy requirement would not substantially impact local power supply.

Option B would have minimal impacts to utility as the alignment would be between two easements: a Pierce County Road easement granted by JBLM and a Puget Sound Energy Easement granted by JBLM. This optional alignment would be trenching between the two easements and is not anticipated to have any adverse impacts in a previously disturbed and easily accessible area.

Option C would have minimal impacts to utilities with the pipeline alignment shifted within the roadway to avoid utility conflicts.

4.9.2 Alternative B – Phase I only (Construction of WWTP)

Impacts discussed under Phase I of Alternative A would be the same for Alternative B, minus the impact associated with Phase II, and will be less than significant.

4.9.3 No Action Alternative

Under the No Action Alternative, the proposed construction of the new WWTP, replacement outfall, and reclaimed water system would not occur. No changes to existing utility services would occur. However, the existing WWTP is already inadequate to treat the increasing amount of sewage being generated at JBLM and the No Action Alternative would result in increased degradation of the site. Overall this would adversely impact sewer services on JBLM and its surrounding communities.

4.9.4 Mitigation Measures

The following mitigation measures would be applied during design to minimize construction-related impacts to public services and utilities:

- Conduct a sustainability review during WWTP system design to maximize energy usage and meet all applicable energy code requirements.
- Implement energy conservation measures at the WWTP.

4.9.5 Cumulative Effects

The Proposed Action is not expected to significantly impact public services or utilities in the area. Increased wastewater flows in the area due to planned regional growth would be mitigated through the implementation of the Proposed Action. Therefore, implementation of the Proposed Action, when combined with other actions, would not result in significant cumulative impacts to public services resources.

4.10 HAZARDOUS MATERIAL AND WASTES

Impacts involving hazardous materials and wastes are considered significant if the storage, use, transportation, or disposal of these substances significantly increases human health or ecological risks. Federal, State, and local laws regulate storage, disposal, and transportation of hazardous materials and wastes to protect human health and the environment from potential impacts. Significance is based on toxicity, risk associated with transportation and storage, and the method of disposal.

4.10.1 Alternative A – Phase I and Phase II (Preferred Alternative)

PHASE I

Hazardous materials associated with operation of heavy equipment during construction activities include fuels, POL, and hydraulic fluid. Equipment spills or leaks would be managed per JBLM's Spill Prevention Control and Countermeasure Plan (SPCC) and HMMP in order to minimize potential impacts

to human health and the environment. Disposal of construction waste would follow the existing solid waste management program the Installation currently operates.

Operations of the WWTP are not anticipated to impact human health with implementation of Alternative A.

PHASE II

Similar to construction activities associated with Phase I, heavy equipment utilized for demolition activities would be managed under JBLM's SPCC and HMMP in order to minimize potential impacts to human health and the environment. Disposal of demolition material would follow the existing solid waste management requirements that are implemented at JBLM.

LEWIS NORTH LINE

A section of the proposed Lewis North Line would go through a former training area that has both groundwater and soil contamination issues as well as potential UXOs. Workers could be at risk of exposure to the contaminated media during directional boring activities on this section of pipeline. Preliminary investigations would need to be conducted of the drilling area and a buffer around it to ensure no risk to workers from UXOs. There would be adherence to the 3Rs Explosives Safety Guide and other direction given by JBLM, to reduce risk to human health during construction of this pipeline.

LOGISTICS CENTER LINE

As described above for the Logistics Center Line, a section of the pipeline would go through this same contaminated area. The same impacts to human health and recommendations apply.

LEWIS MAIN LINE

No direct impacts to human health are anticipated with construction of the Lewis Main Line (Option A, B, and C). Construction would be temporary and would not go through any identified contaminated sites.

4.10.2 Alternative B – Phase I only (Construction of WWTP)

Hazardous materials associated with operation of heavy equipment during construction of the WWTP include fuels, POL, and hydraulic fluid. As described under Alternative A, any equipment spills or leaks would be managed per JBLM's SPCC and HMMP. No demolition would occur under this alternative and hence generation of materials for disposal under this alternative would be low and not exceed baseline on the installation. Therefore, implementation of Alternative B would not adversely impact human health or the environment.

4.10.3 No Action Alternative

Under the No Action Alternative, construction and demolition activities would not occur and thus general hazardous materials and waste practices would not change from baseline. Therefore, no impacts to human health or the environment are anticipated with implementation of this alternative.

4.10.4 Mitigation Measures

Contractors would be made aware of existing buffers in place for former training areas where UXOs could be encountered. Standard environmental protection measures and construction permit related mitigations are listed in Section 2.5.

4.10.5 Cumulative Effects

Collectively taking into account construction projects on JBLM and the immediate vicinity of the WWTP and RWDS, the action alternatives would not substantively involve actions that would generate significant hazardous materials or require ongoing cleanup programs. Therefore, implementation of the Proposed Action, when combined with other actions, would not result in significant cumulative impacts to hazardous materials or solid waste resources.

4.11 AESTHETICS (LIGHT AND GLARE)

Visual resources have a social setting, which includes public expectations, values, goals, awareness, and concern regarding visual quality. This social setting is addressed as "visual sensitivity," the relative degree of public interest in visual resources and concern over adverse changes in the quality of that resource. The degree of visual sensitivity (detailed in Section 3.10) is treated as occurring at four (4) different levels, with the High Sensitivity considered the highest level of potential impact to No Sensitivity having no impact. The levels are as follows:

- High Sensitivity
- Moderate Sensitivity
- Low Sensitivity
- No Sensitivity

4.11.1 Alternative A – Phase I and Phase II (Preferred Alternative)

PHASE I

The limited views of and from the WWTP would be considered No Sensitivity to Low Sensitivity due to the isolated location of the project area and the screening effect of the forest and topography surrounding the site. There is a very limited area of the WWTP that is visible to passing vehicles, the access road and that is limited to military/retired military. The primary access road to the Solo Point WWTP is also used for access to a limited-use boat launch that is located below the WWTP site. That boat launch is restricted to military/retired military recreational use only. Those users of that access road to the boat launch briefly have a view of the WWTP front gate and a few of the buildings onsite.

The main structural element of the WWTP would be partially visible briefly to users of the access road. The cleared area would largely be screened from public viewshed by forested areas between the top of the ridge and Puget Sound shoreline. In addition, the fence structure, roads, and cleared areas would be consistent with existing structures, roads, and cleared areas at the existing WWTP.

The WWTP facility construction activity and related clearing of forested area would have temporary visual impact for the military/retired military users in vehicles that have access to the Solo Point boat launch, downslope on the beach and to the North. The limited view from the roadway is that of the existing treatment plant and albeit for a very brief moment in a vehicle. This is considered low sensitivity and would not have adverse impacts on aesthetics or scenic resource.

Therefore, the viewshed would remain similar and impacts would be not significant. There would be a relatively minor change in the overall visual characteristics of WWTP.

PHASE II

The construction of the RWDS lines will have temporary impacts to vehicular and pedestrians in the road corridors, on and off the base. The operations of the pipeline would not have aesthetic or light and glare impacts.

The construction and operations of the storage tanks at up to four (4) locations with associated pump stations could have potential visual impacts with the proposed location adjacent to nearby residential, commercial and industrial uses on JBLM. The tanks range in size from 500,000 gallons to one (1) million gallons and detailed in Table 4-7.

Table 4-7 Reclamation Storage Tank

Tank Location	Size	Approximate Size (Diameter x Height)
Cantonment Area Storage Tank (Lewis Main)	500,000 gallons	55 x 30
North Fort Storage Tank (Lewis North Line)	500,000 gallons	55 x 30
McChord Storage Tank (Logistics Center Line)	1 million gallons	80 x 30

Source: Tank Size estimates provided by JBLM

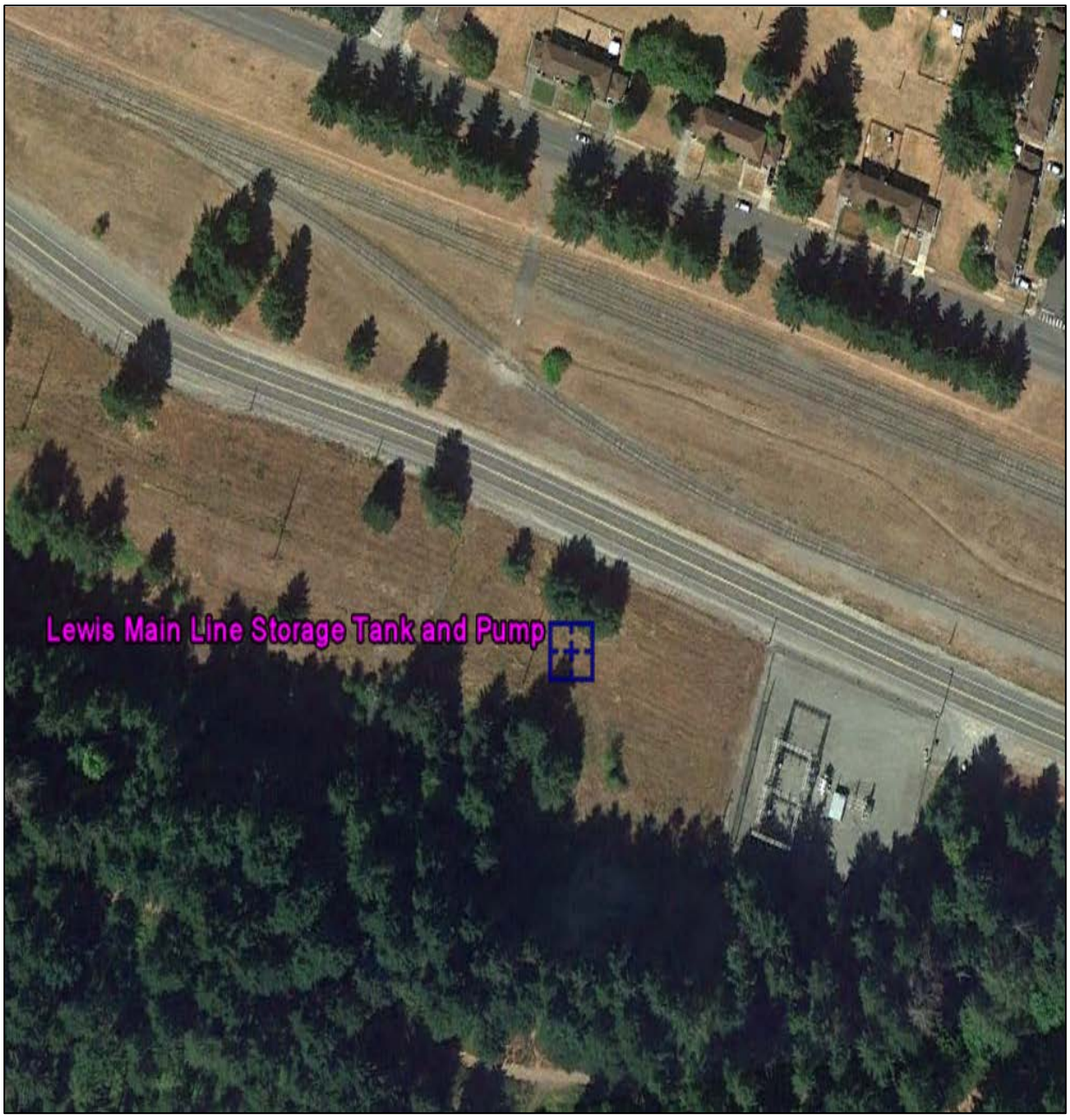
The North Fort Storage tank is proposed at the intersection of 41st Street and I Street (Figure 4-4), adjacent to the small arms impact area to the west, community services to the east, and troop facilities to the north and south. The views of the tanks will be in an industrial area currently used for storage and troop training and is considered a low sensitivity.

Figure 4-4 Proposed North Fort Storage Tank Location

Source: Google Earth 2012

The Cantonment Area Storage Tank is proposed in the general vicinity of Railroad Ave. and South 6th Street-Extended South (Figure 4-5). The tank would be adjacent to an electrical substation and on the fringe of training areas. There are views from residential areas to the north and across Railroad Ave. that would have a moderate sensitivity (views from urban residential subdivisions and segments of roads near them that serve as their primary access route.). There would be some level of visual impacts to those residents.

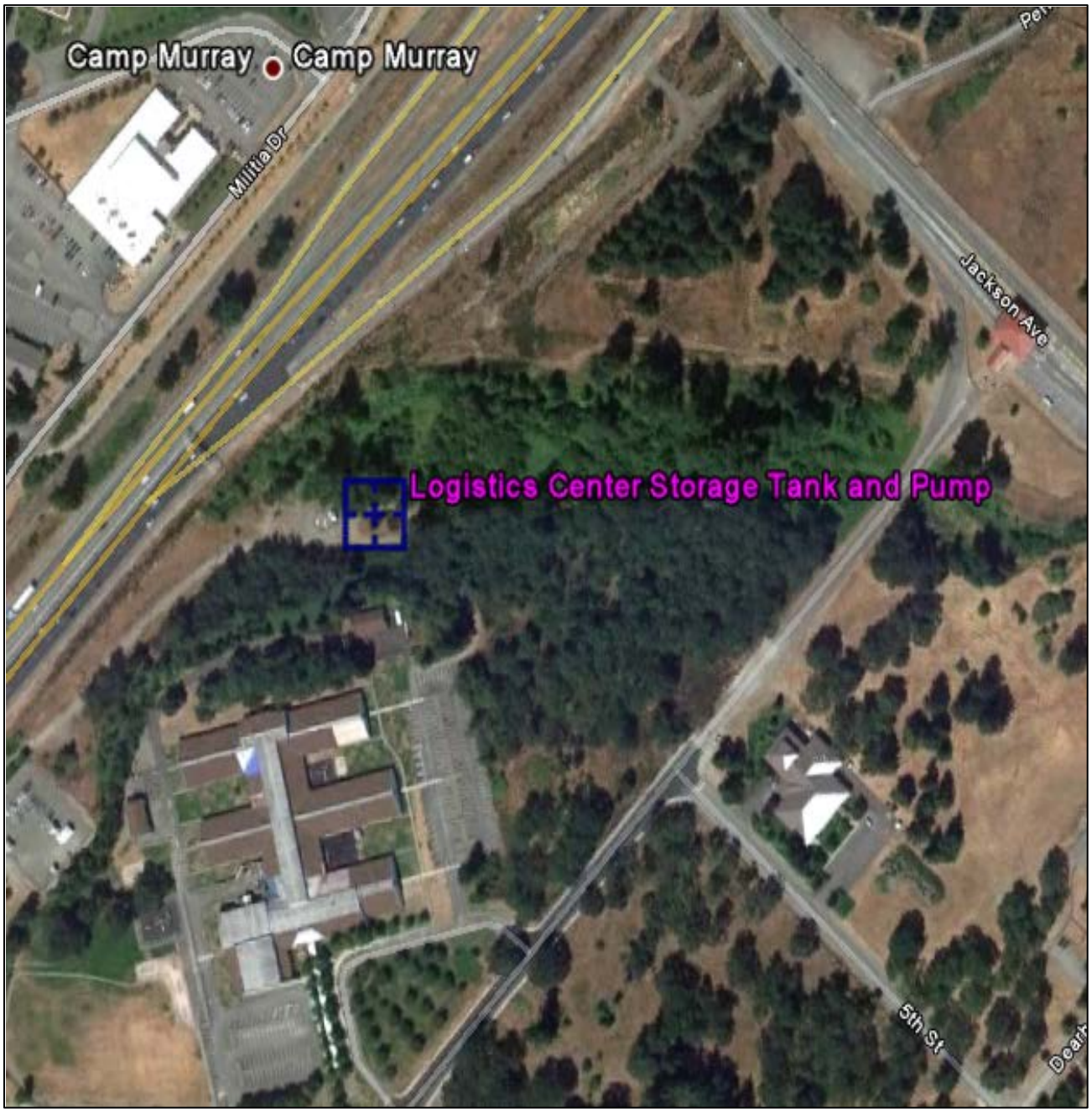
Figure 4-5 Proposed Cantonment Storage Tank



Source: Google Earth 2012

The McChord Storage Tank is proposed in a wooded area, along a north-south access road that runs parallel to I-5 on JBLM main base. This portion of I-5 is not considered a scenic route, the viewshed to the base is a wooded area and the tank would be located to take advantage of the trees screening the majority of the structure (Figure 4-6).

Figure 4-6 Proposed McChord Storage Tank



Source: Google Earth 2012

The construction activities in the vicinity of the storage tanks would be 60 to 90 days, within the general period of one (1) year for the total project construction. During this time, construction equipment, materials, and open trenches would be viewed from these roadways. However, due to the temporary nature of the activity, the impact is considered to be less than significant.

LEWIS NORTH LINE

There were would be no adverse visual or aesthetic impacts of the North Line, aside from temporary construction during installation of the pipe.

LOGISTICS CENTER LINE

There were would be no adverse visual or aesthetic impacts of the Center Line, aside from temporary construction during installation of the pipe.

LEWIS MAIN LINE

There were would be no adverse visual or aesthetic impacts of the Main Line, aside from temporary construction during installation of the pipe.

Light and Glare

The lighting provided by the Proposed Action would be consistent with the existing industrial nature of the WWTP site currently. The ambient light from the new WWTP would be limited to the stationary facility lights and limited mobile sources. Stationary sources include security lighting on the site and along the security fence. Mobile sources of light include light from headlights of vehicles operating at the facilities. There would be no adverse impact from light and glare.

4.11.2 Alternative B – Phase I only (Construction of WWTP)

The impacts of Alternative B would be similar to those described under Phase I of Alternative A, but with less impact due to not building the RWDS. The limited views of and from the WWTP would be considered low sensitivity due to the isolated location of the existing and proposed WWTP and the screening effect of the forest and topography surrounding the site. Alternative B would not have adverse impacts on aesthetics or scenic resource.

4.11.3 No Action Alternative

Under the No Action Alternative, the construction and operation of the proposed WWTP system would not occur. Baseline aesthetics resources and their conditions considered in this EA would remain unchanged. Therefore, there is no significant impact.

4.11.4 Mitigation Measures

Since there would be either no impacts or less than significant impacts with the alternatives, no mitigation is required.

4.11.5 Cumulative Effects

The Proposed Action is construction within an isolated area for the WWTP, the pipeline distribution systems would be within existing utility corridors and road ROWs, the storage tanks are 30 feet in height (estimated) and will be screened where possible. Impacts associated with construction, repair, and maintenance activities would be less than significant. The Proposed Action would therefore also not contribute to any cumulative impacts to aesthetics or light and glare. Therefore, implementation of the

Proposed Action, when combined with other actions, would not result in significant cumulative impacts to aesthetics or visual resources.

4.12 TRAFFIC AND TRANSPORTATION SYSTEMS

4.12.1 Alternative A – Phase I and Phase II (Preferred Alternative)

PHASE I

All signalized intersections in the transportation study area would likely experience some additional delay due to increases in background traffic by 2015. The overall growth at JBLM was considered and the GTA EIS showed that would not be a need for major roadway widening or new roads due to projected traffic volumes associated with the WWTP. The traffic volumes are not expected to result in a noticeable change in conditions or cause roadways to operate at unacceptable levels of service.

PHASE II

Pipeline installation would be within road ROWs. During construction, work in the ROWs would require the temporary closure of vehicle lanes intermittently throughout the construction period. However, for each roadway, at least one (1) lane would be open at any given time, and there would be no complete closure of roadways. JBLM proposes to prepare and implement a Traffic Control Plan detailing access and lane closures, as well as signage and other mechanisms to ensure the effective and safe operation of the roadway network, bicycle lanes and pedestrian facilities in the project area during construction and maintenance activities.

LEWIS NORTH LINE

For this corridor, the majority of construction will be underground through trenching along road ROWs within JBLM in a predominately industrial setting. Construction also has the potential to cause accidental damage to other ROW facilities, such as sidewalks, curbs, etc., and to interfere with plans for roadway paving in the area. However, proper precautions to protect all pavement, curb and gutter, sidewalks and drainage structures from damage are taken during construction. Any portion damaged by the project's operations will be replaced in accordance with current the JBLM standard construction details.

The crossings at I-5 and the railroad will be directional bore and coordinate directly with WSDOT and the BNSF railroad to avoid any disruptions.

LOGISTICS CENTER LINE

For this corridor, the majority of construction will be underground through trenching along road ROWs within JBLM in a predominately industrial setting. Similar to the Lewis North construction there could be some potential to cause accidental damage to other ROW facilities, such as sidewalks, curbs, etc. Portions damaged by the project's operations, shall be replaced in accordance with current the JBLM standard construction details.

The crossings at I-5 and the railroad will be directional bore and coordinate directly with WSDOT and the railroad to avoid any disruptions.

LEWIS MAIN LINE

Option A for this corridor, the majority of construction will be underground through directional bore within the existing 30-foot-wide utility corridor. There will be some limited trenching or above ground (attaching to bridge/water crossing) only when directional boring methods are not possible. The crossing of I-5 should have minimal impact on regional traffic with a directional bore approach, and if there were

to be any traffic detours, they would be coordinated with WSDOT and pursuant to their adopted maintenance of traffic and operations standards. There could be some potential to cause accidental damage to other ROW facilities, such as sidewalks, curbs, etc. Portions damaged by the project's operations, shall be replaced in accordance with current the JBLM standard construction details and city of Dupont (where applicable) standard construction details.

Option B for this alignment there would be minimal impacts with the work off to the shoulder of road prisms and not in the traffic lane. This alignment would have significantly less disruptions then Option A through an established urban neighborhood. The crossing of I-5 should have minimal impact on regional traffic with a directional bore approach, and if there were to be any traffic detours, they would be coordinated with WSDOT and pursuant to their adopted maintenance of traffic and operations standards.

Option C- JBLM Plant Road Alignment will generate the same level of impacts as Option B. This alignment would have minimal impacts with the work off to the shoulder of road prisms and not in the traffic lane. The crossing of I-5 should have minimal impact on regional traffic with a directional bore approach, and if there were to be any traffic detours, they would be coordinated with WSDOT and pursuant to their adopted maintenance of traffic and operations standards.

4.12.2 Alternative B – Phase I only (Construction of WWTP)

The impacts of Alternative B are less than A due to no construction impacts beyond the WWTP boundary at Solo Point. This would reduce the temporary impacts discussed under Alternative A, which means there are no significant impacts to the transportation system as a result of Alternative B.

4.12.3 No Action Alternative

Under the No Action Alternative, the construction and operation of the proposed WWTP system would not occur. Baseline transportation resources and their conditions considered in this EA would remain unchanged. Therefore, there is no significant impact

4.12.4 Mitigation Measures

There would be standard BMPs for detours and to avoid and minimize construction impacts to transportation facilities. They could include the following:

- Detours would be set up per JBML or applicable standards where there is a lane closure or sidewalk closure.
- Fencing around open trenching to limit access to construction crews.
- Signage for the construction zone.
- Restoration of road pavement and sidewalk areas.

4.12.5 Cumulative Effects

The Proposed Action does not include any new roadways or changes to roadways, so no hazards due to design features would result. Thus, no long-term impacts to safety and design of public roads and highways are expected. With implementation of the Transportation Plan, short-term, long-term, and cumulative impacts related to road congestion and safety issues associated with construction, repair and maintenance activities would be less than significant. The project's incremental contribution to cumulative impacts with regard to temporary facilities closures is not expected to be significant, given the construction time frame of the other known proposed projects in the area. Therefore, implementation of

the Proposed Action, when combined with other actions, would not result in significant cumulative impacts to transportation resources.

4.13 CULTURAL RESOURCES

4.13.1 Alternative A – Phase I and Phase II (Preferred Alternative)

PHASE I

The construction of the new WWTP would not impact any currently listed or National Register eligible historic district, building, or structure. The proposed new WWTP is located outside the boundaries of any currently listed historic district and the closest National Register listed or eligible building is located well away from the proposed project areas. The proposed construction of the new WWTP will have no impact on the setting of any listed National Register listed historic district or building. Under Section 106 of the NHPA and the 2012 Integrated Cultural Resource Management Plan (ICRMP), all sites potentially eligible to the National Register would be protected by avoidance or the implementation of mitigation measures.

PHASE II

The demolition of the existing Solo Point WWTP does have the potential to impact historic properties. The original primary treatment plant was constructed in 1955 and is currently 56 years old. As such, it is considered a historic resource as defined in Section 106 of the NHPA and the effects of the Proposed Action upon it would need to be assessed. As such, it would need to be evaluated for potential eligibility to the National Register in consultation with the Washington Department of Archaeology and Historic Preservation (DAHP) prior to the demolition of any of the 18 structures in order to comply with Section 106 of the NHPA as well as meet the stipulations of the 2012 ICRMP for architectural resources at JBLM. No other historic buildings or structures would be impacted by the demolition of the existing Solo Point WWTP. The proposed new outfall is unlikely to impact any archaeological sites given the degree of shoreline erosion that has occurred over the last 12,000 years since the glaciers retreated Specific impacts to any archaeological sites within this project area cannot be accessed at this time as the results of the survey of the APE are currently unavailable. Under Section 106 of the NHPA and the 2012 ICRMP, all sites potentially eligible to the National Register would be protected by avoidance or the implementation of mitigation measures.

The construction of the RWDS, pump stations, and infiltration galleries would not impact any currently listed or National Register eligible district, building, or structure. Impacts to archaeological sites are unlikely given the degree of disturbance in the area, but specific impacts cannot be assessed at this time, as the results of the survey of the APE are currently unavailable. Under Section 106 of the NHPA and the 2012 ICRMP, all sites potentially eligible to the National Register would be protected by avoidance or the implementation of mitigation measures. Section 106 determinations will have to be completed when Phase II is planned.

LEWIS NORTH LINE

This pipeline (27,751 lf) and its associated facilities and galleries are not located within any listed or eligible historic district and will not impact any existing listed or eligible building or structure. All listed and eligible historic districts, buildings, and structures are located well away from the project area, and it will have no impact on the setting of any of these historic properties. Impacts to specific archaeological sites cannot be assessed at this time, but are unlikely given the degree of recent development that has occurred along the proposed ROW.

LOGISTICS CENTER LINE

This pipeline (31,899 lf) and its associated facilities and galleries will have no impact on any listed or eligible historic district, building, or structure. While portions are located within the McChord Field Historic District, the project is unlikely to impact any listed or eligible building or structure within the district. The proposed pipeline is located near three (3) listed historic properties (Captain Wilkes July 4, 1841 Celebration site, Adjutant General's Residence, and the Thornewood Estate). The burial of the pipeline below the ground surface will cause it to have no impact on the setting on these historic properties. Impacts from the proposed booster station on the setting of the listed historic district or any building or structure are unlikely to be significant. Impacts to specific archaeological sites cannot be assessed at this time, but are unlikely given the degree of recent development that has occurred along the proposed ROW.

LEWIS MAIN LINE

This pipeline (21,758lf) and optional segments (Option A: 17,664lf; Option B: 16,800lf; Option C: 20,371lf) in the southern cantonment area will have no significant impact on any listed or eligible historic district, building, or structure. While portions are located within the JBLM Garrison Historic District, the project is unlikely to impact any listed or eligible building or structure within the district. The burial of the pipeline below the ground surface will cause it to have no impact on the setting of the district or any listed or eligible building or structure within it. The listed Red Shield Inn is located nearby, but the impacts from the proposed booster station on the setting of this listed historic building are unlikely to be significant. The ground disturbance associated with the construction of the pipeline and its associated facilities and galleries may have a temporary impact on the historic landscape of the district. The impacts would be present while these facilities are being constructed and for a short period after construction while the landscape is restored. Impacts to specific archaeological sites cannot be assessed at this time, but are unlikely given the degree of recent development that has occurred along the proposed ROW.

The continued operations of the WWTP at JBLM will have no impact on any National Register listed or eligible district, building, structure, or archaeological site.

4.13.2 Alternative B – Phase I only (Construction of WWTP)

Impacts to cultural resources under this alternative would be the same as those cited above for construction of a new WWTP. The proposed new WWTP is located outside the boundaries of any currently listed historic district. The closest National Register listed or eligible building is located well away from the proposed project areas. The proposed construction of the new WWTP will have no impact on the setting of any listed National Register listed historic district or building and JBLM has received concurrence from SHPO for their determination of No Historic Properties.

4.13.3 No Action Alternative

The continued operation of the existing Solo Point WWTP would have no impact on any National Register listed or eligible cultural resources including historic districts, buildings, structures, and archaeological sites.

4.13.4 Mitigation Measures

Adverse effects to National Register listed and eligible buildings and structures would be mitigated through intensive documentation of the property (HABS/HAER). Adverse effects to archaeological sites would be mitigated through submission of a treatment plan to the Washington DAHP. The plan could include preconstruction trenching in areas where there is a high potential for buried archaeological

deposits, treatment of sites eligible for inclusion in the National Register of Historic Places (NRHP) through data recovery, a construction monitoring program, and treatment of newly discovered sites. In addition, the plan would address Native American involvement and a program for managing inadvertent discoveries under the NAGPRA. The plan would also need to address the restoration of the disturbed areas within the historic landscape of the JBLM Garrison Historic District.

During the preparation of the final AutoCAD / GIS-based engineering design, the proponent shall:

- Avoid areas containing National Register of Historic Places (NRHP)-eligible cultural resources by locating the proposed piping alignment within previously disturbed areas, or existing road or utility ROWs to the maximum extent possible.
- Field determine and flag the boundaries of all NRHP-eligible cultural resources sites within the proposed alignments or adjacent to. All such sites occurring within and adjacent to the proposed 30-foot (30') construction ROW shall be identified. These sites shall be marked on the design drawings.
- Using the above data, locate all project construction components at a minimum distance of 25-feet (25') from the edge of all NRHP-eligible cultural resources sites

This final design shall be reviewed and approved by the ED via the JBLM Garrison de-confliction review process. Any changes required by the ED shall be made.

Prior to and during construction, the proponent shall:

- Re-validate each proposed project component, prior to construction, via the JBLM deconfliction review process to ensure that conditions have not changed. Implement any changes required by the ED.
- Clearly field flag and comply with the limits of construction, in accordance with the final design and any adjustments made during the pre-project environmental review. All unavoidable cultural resources sites shall be bored under at a minimum depth of six feet (6'); boring entry and exit work locations shall be a minimum of 25-feet (25') from the edge of the field-marked resource boundary.
- In the event of an inadvertent discovery of human remains or cultural items during project construction, construction shall be suspended and the area cordoned off until the JBLM Cultural Resources Manager is contacted to properly identify and appropriately treat discovered items in accordance with applicable State and Federal law(s).
- Limit construction in historic districts to minimize short-term noise and visual intrusion within these areas. Do not conduct construction outside of normal business hours and limit the number of construction vehicles present to the absolute minimum required to accomplish the construction.
- The County Sheriff, the County Coroner, the Washington DAHP, and the authorized tribal representatives would then be contacted. Work would not resume in the area until consultation was concluded and written authorization given to resume work from the JBLM Cultural Resources Specialist (or their representative) and the Washington DAHP. These and the environmental protection measures as outlined in Section 2.5 will reduce the possible impacts to cultural resources.

4.13.5 Cumulative Effects

Cultural resources are unique and irreplaceable resources. The incremental destruction of cultural resources over time diminishes the archaeological and historical record of a local area and a region as a whole. Activities at JBLM, which can destroy cultural resources and diminish the archaeological and historical record include, but are not limited to, are:

- Training and other ground disturbing activities
- Maintenance and repair activities performed on buildings
- Adaptive reuse projects
- New construction within a historic district adjacent to a historic district, or within visual range of a historic building or district
- The demolition of a historic building
- Changes to historic landscaping
- Actions that have potential impacts on traditional historic properties. (ICRMP 2012)

Under Section 106 of the NHPA, cultural resources within a Project Area are evaluated for significance and integrity. Significant cultural resources, which possess a high degree of integrity, are protected through avoidance, and the implementation of the mitigation measures and Certificate of Approval (COAs). The protection of the significant cultural resources negates the diminishment of the archaeological and historic record as a whole. The Proposed Action has the potential to adversely affect cultural resources and incrementally diminish the archaeological and historical record of the Southern Puget Sound and the broader western Washington region. By completing the Section 106 process and adhering to the other applicable laws and regulations, the cumulative impacts of the Proposed Action on the archaeological and historical record will be reduced. Furthermore, the environmental protection measures as outline in Section 2.5 will reduce the possibility of impacts to cultural resources.

4.14 CUMULATIVE EFFECTS ANALYSIS

JBLM is growing and developing, producing various effects on the natural, cultural, and socioeconomic resources both within and around the Installation. This on-going growth and development places pressures on area infrastructure and resources. Through the NEPA process and proactive planning, JBLM has minimized adverse environmental, cultural, and socioeconomic effects to the extent possible.

The Proposed Action, under either Action Alternative, would not result in or contribute to significant adverse cumulative effects to any VEC analyzed in this EA within the Proposed Action's ROI. Under either Action Alternative, less than 202 acres of land would be affected. The total area of new ground disturbance would be minimized by implementing the environmental protection measures identified. These include, but are not limited to, locating the RWDS and "purple pipe" system to the maximum extent possible within previously designed and approved construction areas, boring several locations, and locating the "purple pipe" within previously disturbed utility and road ROWs.

Based on the data and analyses presented in Chapter 4.0 of this EA, the Proposed Action would produce no adverse impacts to the geographic setting and location of JBLM, land use, geology or topography, utilities (i.e., energy, water, wastewater, and electricity), airspace, or hazardous materials and waste. As such, the Proposed Action would not contribute any adverse cumulative effects on these VECs. Only minimal aesthetics effects would occur, and would be limited to the proposed new water tanks. These

aesthetics effects generally would be consistent with the land use of JBLM, would be similar in scale and massing as other Installation infrastructure, and would not contribute to a significant adverse cumulative effect.

During project construction, the Preferred Alternative would result in *de minimis*, short-term air quality emissions.

Noise generated by construction of the Preferred Alternative would be short-term and *de minimus*, and would be typical of other, on-going noise produced on the Installation. Over the long-term, the Proposed Action would produce no noise level greater than current operations at the WWTP. As such, no cumulative adverse noise effect is identified.

Soils effects associated with the Preferred Alternative would be short-term and controlled via the NPDES permitting process and the associated SWPPP. Long-term soils effects are not anticipated. Construction sites would be restored to pre-project conditions; proposed water tank locations and access roads would be improved and hardened, as appropriate, to prevent any long-term erosion effects. As such, no cumulative adverse soils effect is identified.

Disruptive actions on water resources, biological resources, and cultural resources from the Preferred Alternative would be minimized or avoided through the combination of sensitive design and implementation of appropriate mitigation measures. With implementation of these measures, short-term construction effects to these VECs would be avoided or substantially reduced. Over the long-term, adverse impacts to these VECs would not occur. As such, no cumulative adverse water resources, biological resources, or cultural resources effect is identified.

From a socioeconomic perspective, no adverse effects to any socioeconomic resources would occur. The Preferred Alternative, would produce positive economic effects during construction (i.e., via construction jobs and spending) and positive human health and safety effects during operation (i.e., via improved wastewater treatment on JBLM). Therefore, no cumulative adverse socioeconomic effect is identified.

The Preferred Alternative would not produce any long-term adverse effects to roads, railroads, or associated traffic. During construction of the RWDS and "purple pipe" system, traffic would be maintained through use of temporary signals, signage, and other routine traffic control measures. As such, no cumulative adverse effect to transportation or traffic is identified.

Overall, the Preferred Alternative would not consume open space, produce additional pressures on area infrastructure, or contribute to a decline in natural or cultural resources. In addition, careful planning, monitoring, and communication between involved JBLM divisions and involved agencies will ensure growth in the area is managed and cumulative adverse impacts are avoided.

Under the No Action Alternative, however, a ***significant adverse cumulative effect*** associated with the existing WWTP would continue to degrade and become inadequate to treat the quality of sewage received from the population at JBLM. Without implementation of either Action Alternative, JBLM existing facilities or those facilities planned or under construction would remain unconnected to the wastewater network. While this would not preclude the use of new or existing facilities, this would result in diminished capability and function, and the potential inability to use these facilities to their full potential. This would compromise the safety, public health, and operational efficiency of training and support activities at JBLM, a significant adverse cumulative effect.

4.15 CONCLUSIONS

The Preferred Alternative and the reduced scope Alternative (B) would result in the effects summarized in Table 4.8 overall. These effects are very similar under both Action Alternatives. Alternative B would provide a method to achieve the purpose of and need for the Proposed Action as compared to the Preferred Alternative; however all treated water being dumped into Puget Sound. Nevertheless, both Action Alternatives would achieve the purpose of and fulfill the need for action. The Preferred Alternative would achieve performance and increase the available water supply to meet the needs of make-up water, irrigation, and a variety of other purposes while not tapping into other sources of the water supply with only short-term minor environmental effects.

All effects could be readily mitigated through avoidance and careful project design, including implementation of the mitigation measures and BMPs identified in Table 4-8. Neither of the Action Alternatives would result in significant, unmitigable adverse impacts; however, mitigation measures are required for adverse effects to Water, Biological and Cultural Resources under the Preferred Alternative. Adverse effects to Soils would be mitigated through the NPDES compliance process. These mitigation measures are described in this EA.

Neither Action Alternative would contribute to a cumulative adverse effect within the Proposed Action's ROI or APE. Both Action Alternatives would result in long-term, positive cumulative water quality effects for JBLM. Specific benefits would be in the augmentation of low flows in key streams and creeks on JBLM.

The No Action Alternative would not meet the purpose of or need for the Proposed Action, and could result in long-term, ***significant adverse individual and cumulative effects*** to water quality with an impact to public health and safety on JBLM.

Implementation of Alternative A, as prescribed, including implementation of the mitigation measures presented in Table 4-8, would likely not produce any significant adverse direct, indirect, or cumulative impacts. Nevertheless, effects determination cannot be completed until subsequent NEPA, Section 106, and Section 7 consultation is completed for the RWDS and outfall construction to ensure planned activities are consistent to the programmatic assumptions that were outlined in this assessment. Implementation of Alternative B, the construction of a new WWTP would reduce identified impacts, including those significant impacts (including water quality) that were identified in the No Action Alternative to acceptable levels. This EA's analysis determines, therefore, that an EIS is unnecessary for implementation of Alternative B, and that a FNSI is appropriate.

Table 4-8 Summary of Detailed Mitigation Measures and BMPs		
VEC	**Preferred Alternative**	**Action Alternatives**
Air	• Use of efficient construction techniques and effective job site management during construction activities. Reduction in vehicle idling on the job site can reduce emissions of all NAAQS pollutants. • If available from contractor newer construction equipment can be utilized to reduce emissions. Such construction equipment outfitted with the newest pollutant control equipment can reduce air quality impacts. • Construction site fugitive emissions (particulate matter) can be mitigated by utilizing dust management practices including, but not limited to water trucks and control of job site vehicle speed.	Same for all Action Alternatives
Noise	• Construction and demolition noise could be reduced by using quieter equipment, utilizing demolition/construction practices that minimize noise, turning off equipment not in use, and requiring mufflers on construction machinery. • Work hours can also be restricted to avoid undue disruption. • Temporary shielding could be installed during periods of high noise neighborhoods.	Same for all Action Alternatives
Soils	Project-specific mitigation measures (BMPs) would be developed as part of the required temporary erosion and sediment control (TESC) plan. At a minimum, the TESC plan would include the following measures: • Maintain vegetation in areas outside designated construction clearing areas. • Place straw, mulch, or other commercially available erosion control products on slopes that require protection. • Use straw bales or silt fences to reduce runoff velocity in conjunction with collection, transport, and disposal of surface runoff generated from the construction area. • Use only clean fill material. • Provide dust control. As a BMP, JBLM would utilize the above referenced appropriate BMPs and adhere to the terms of the NPDES General Permit for Stormwater Discharges for Construction Activity for Federal Facilities in Washington (CGP) to minimize erosion and sedimentation (and consequent surface water quality) impacts during construction-phase activities. To the maximum extent possible, within existing, disturbed road or utility ROWs. This includes existing roads and trails, as well as existing electric, natural gas, and water utility corridors. When located within a utility ROW, JBLM would coordinate with the utility owner and would ensure the infrastructure is installed at least 10 feet (10') from the existing utility. CGP permit standards would be adhered to during all construction activities. The USEPA Region 10 would be responsible for reviewing and approving the JBLM's CGP Notice of Intent (NOI) application prior to construction. Stormwater runoff and erosion would be managed using BMPs, including but not limited to silt fencing, hay bales, vegetative buffers and filter strips, and spill prevention and	

Table 4-8 Summary of Detailed Mitigation Measures and BMPs		
VEC	**Preferred Alternative**	**Action Alternatives**
	management techniques, as detailed in the SWPPP. All disturbed areas would be re-vegetated and monitored to ensure success after construction is complete.	
Vegetation	• The laydown areas for new facilities would be actively managed. During construction and post-construction activities to avoid establishment of invasive or noxious plants which may spread into adjacent intact from the proposed disturbed areas. • Roadside restoration would be implemented following construction of the RWDS. • Regular landscaping and grounds maintenance, including planting and seeding desirable native plant species, mowing, weeding, and erosion control would help to minimize the establishment or spread of invasive plants to exposed soils on the site or on into adjacent undisturbed vegetation areas.	Same as all Action Alternatives, all associated components at a minimum distance of 50-feet (50') from the edge of any delineated wetland per the buffer requirements and using directional boring under all wetlands/streams/or other bodies of water.
Water Resources and Wetlands	During the preparation of the final AutoCAD / Geographic Information System (GIS)-based WWTP and RWDS engineering design, the proponent shall: • Avoid surface waters and wetlands by locating the proposed "purple piping" alignment within previously disturbed areas, existing road or utility rights-of-way (ROWs), or other existing crossings to the maximum extent possible. • Field determine, at appropriate intervals, the depths of all surface water features to be crossed by the proposed RWDS "purple piping" to establish the appropriate boring depths. Depths shall be marked on the design drawings. • Field delineate and flag the boundaries of all jurisdictional wetlands and waters of the US in portions of the alignment that have not yet been delineated. Boundaries shall be marked on the design drawings. • Field flag the boundaries of all jurisdictional wetlands and waters of the US in portions of the alignment that have been delineated. Boundaries shall be marked on the design drawings. • Using the above data, locate all project construction components at a minimum distance of 50-feet (50') from the edge of the wetland boundary (i.e., the edge of wrested vegetation). This final WWTP and RWDS design shall be reviewed and approved by the Environmental Division (ED) via the JBLM environmental review process. Any changes required by the ED shall be made by the proponent. Prior to and during construction (i.e., the proposed construction would occur over a period of time) the proponent shall: • Insure that appropriate BMPs would be in place and the Installations SWPPP would be adhered to by contractor. • In-water construction of the outfall would comply with spill containment requirements. • In the unlikely event that a construction accident or spill releases contaminants into waterways or the surrounding environment, construction BMPs (such as oil booms and absorbent pillows) would be employed to contain and minimize the spill. This would be followed by cleanup activities consistent with applicable Federal and state standards. By constructing the new WWTP, the Army will reduce the negative impacts of effluent discharges that exceed NPDES Standards. The Army will comply with 42 USC § 17094, which requires planning and design to maintain the hydrology	Same for all Action Alternatives.

Table 4-8 Summary of Detailed Mitigation Measures and BMPs		
VEC	**Preferred Alternative**	**Action Alternatives**
	of the site. • Re-validate each proposed project component, immediately prior to construction, via the JBLM Garrison de-confliction proposal review process to ensure that conditions have not changed. Implement any changes required by the ED. • Clearly field flag all wetlands and surface waters within and in the vicinity of the construction ROW, as well as the limits of the construction area. Comply with the limits of construction in accordance with the final design and any adjustments made during the immediately pre-project environmental review. All unavoidable wetlands and surface waters shall be bored under at a sufficient depth, as determined during the pre-construction analysis; boring entry and exit work locations shall be a minimum of 50 feet from the edge of the field-marked resource boundary. Following completion of construction, the proponent shall: • Restore and re-vegetate disturbed construction areas to pre-project conditions, in compliance with the NPDES permit and the SWPPP. Native species of vegetation should be used to the extent possible or on the approved list of acceptable species.	
Biological Resources	During the preparation of the final AutoCAD / GIS-based engineering design, the proponent shall: • Avoid areas supporting natural vegetation communities by locating the proposed "purple piping" alignment within previously disturbed areas, or existing road or utility ROWs to the maximum extent possible. This final design shall be reviewed and approved by the ED via the JBLM Garrison de-confliction review process. Any changes required by the ED shall be made. Prior to and during construction, the proponent shall: • Adhering to the in-water work period designated for Tidal Reference Area 3, south Puget Sound which occurs from July 16 to February 15 (USACE 2011). The construction can be phased over a two year period with the specific in-water work within the allowed work windows each year. • In addition, forage fish surveys may be conducted by WDFW (WDFW 2011) prior to in-water construction to avoid or minimize impacts to surf smelt that are known to breed in the area. • Consider additional mitigation that could be considered as part of the design process could include the removal of invasive blackberry bushes at the Solo Point boat launch and replanting the area with native species. Additionally, another area for consideration would be removal of existing old concrete that is no longer part of the functional boat ramp. Soft shore arming and placement of large woody debris (trees/root balls) would be placed at strategic points of the shoreline. • Re-validate each proposed project component, immediately prior to construction, via the JBLM Garrison de-confliction review process to ensure that conditions have not changed. Implement any changes required by the ED. • Clearly field flag and comply with the limits of construction, in	Same for all Action Alternatives

Table 4-8 Summary of Detailed Mitigation Measures and BMPs		
VEC	**Preferred Alternative**	**Action Alternatives**
	accordance with the final design and any adjustments made during the immediately pre-project environmental review. • Time construction to avoid nesting periods of migratory birds protected under the Migratory Bird Treaty Act (MBTA) during the migratory bird nesting season April through August so that nests are not disturbed. If it is not practical to conduct construction outside of this time frame, a qualified biologist shall survey the construction area in advance to ensure that no active nests are disturbed. Following completion of construction, the proponent shall: • Restore and re-vegetate disturbed construction areas to pre-project conditions, in compliance with the NPDES permit and the SWPPP. Native species of vegetation should be used to the extent possible and approved by JBLM Public Works Fish and Wildlife Staff.	
Socioeconomics	• Use of equipment that minimizes noise and dust. • Publicize construction dates and routes. • Notification of service providers on JBLM and within the City of DuPont, and appropriate school officials about the location and timing of construction activities. • Coordinate construction activities with City of DuPont officials to avoid conflicts with public events.	Same for all Action Alternatives
Public Services	• Conduct a sustainability review during WWTP system design to maximize energy usage and meet all applicable energy code requirements. • Implement energy conservation measures at the WWTP.	Same for all Action Alternatives
Hazardous Materials and Waste	• Contractors would be made aware of existing buffers in place for former training areas where UXOs could be encountered. Standard environmental protection measures and construction permit related mitigations are listed in Section 2.5	Same for all Action Alternatives
Traffic and Transportation	• Detours would be set up per JBML or applicable standards where there is a lane closure or sidewalk closures. • Fencing around open trenching to limit access to construction crews. • Signage for the construction zone. • Restoration of road pavement and sidewalk areas.	Same for all Action Alternatives
Cultural Resources	During the preparation of the final AutoCAD / GIS-based engineering design, the proponent shall: • Avoid areas containing National Register of Historic Places (NRHP)-eligible cultural resources by locating the proposed piping alignment within previously disturbed areas, or existing road or utility ROWs to the maximum extent possible. • Field determine and flag the boundaries of all NRHP-eligible cultural resources sites within the proposed alignments or adjacent to. All such sites occurring within and adjacent to the proposed 30-foot (30') construction ROW shall be identified. These sites shall be marked on the design drawings. • Using the above data, locate all project construction components at a minimum distance of 25-feet (25') from the edge of all NRHP-eligible cultural resources sites This final design shall be reviewed and approved by the ED via the JBLM	Same for all Action Alternatives

Table 4-8 Summary of Detailed Mitigation Measures and BMPs		
VEC	**Preferred Alternative**	**Action Alternatives**
	Garrison de-confliction review process. Any changes required by the ED shall be made. Prior to and during construction, the proponent shall: • Re-validate each proposed project component, prior to construction, via the JBLM Garrison de-confliction review process to ensure that conditions have not changed. Implement any changes required by the ED. • Clearly field flag and comply with the limits of construction, in accordance with the final design and any adjustments made during the pre-project environmental review. All unavoidable cultural resources sites shall be bored under at a minimum depth of six feet (6'); boring entry and exit work locations shall be a minimum of 25-feet (25') from the edge of the field-marked resource boundary. • In the event of an inadvertent discovery of human remains or cultural items during project construction, construction shall be suspended and the area cordoned off until the JBLM Cultural Resources Manager is contacted to properly identify and appropriately treat discovered items in accordance with applicable State and Federal law(s). • Limit construction in historic districts to minimize short-term noise and visual intrusion within these areas. Do not conduct construction outside of normal business hours and limit the number of construction vehicles present to the absolute minimum required to accomplish the construction.	

CHAPTER 5.0
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APPENDIX A. AIR QUALITY

Air quality impacts were estimated for the construction activities associated with the Proposed Action as listed in Chapter 2 of the Environmental Assessment for the Construction of a Wastewater Treatment Plant (WWTP) and Main Pipeline Infrastructure for Water Reuse at Joint Base Lewis-McChord, Washington. The following is a discussion of the assumptions, references, and methods used to perform the air emission estimate calculations.

Construction

Air quality impacts from proposed construction activities were estimated from (1) combustion emissions due to the use of fossil fuel-powered equipment; (2) fugitive dust emissions (PM_{10} and $PM_{2.5}$) during demolition activities, earth-moving activities, and the operation of equipment on bare soil; (3) VOC emissions from application of asphalt materials during paving operations and (4) NAAQS from construction worker POVs.

Factors needed to derive the construction source emission rates were obtained from *Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling* (USEPA 2004); *Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling—Compression-Ignition* (USEPA 2004); *Nonroad Engine and Vehicle Emission Study—Report* (USEPA 1991); *Conversion Factors for Hydrocarbon Emission Components* (USEPA 2005); *Comparison of Asphalt Paving Emission Factors* (CARB 2005); *WRAP Fugitive Dust Handbook* (WRAP 2006); *Analysis of the Fine Fraction of Particulate Matter in Fugitive Dust* (MRI 2005) and *Mobile 6.2.03* (EPA 2003).

The analysis assumed that all construction equipment was manufactured before 2000. This approach is based on the well-known longevity of diesel engines, although use of 100% Tier 0 equipment may be somewhat conservative. The analysis also inherently reduced PM_{10} fugitive dust emissions from earth-moving activities by 50 percent as this control level is included in the emission factor itself (based on the estimated control effectiveness of watering).

Construction for the WWTP was estimated for the entirety of the WWTP, then split based on the number of months of anticipated construction within the calendar year.

Off-Road Equipment Emissions. The NONROAD model (USEPA 2008) is an USEPA standard method for preparing emission inventories for mobile sources that are not classified as being related to on-road traffic, railroads, air traffic, or water-going vessels. As such, it is a starting place for quantifying emissions from construction-related equipment. The NONROAD model uses the following general equation to estimate emissions separately for CO, NOx, PM (essentially all of which is $PM_{2.5}$ from construction sources), and total hydrocarbons (THC), nearly all of which are NMHC (non-methane hydrocarbons):

EMS = EF * HP * LF * Act * DF

Where:
EMS = estimated emissions
EF = emissions factor in grams per horsepower hours
HP = peak horsepower
LF = load factor (assumed percentage of peak horsepower)
Act = activity in hours of operation per period of operation
DF = deterioration factor

The emissions factor is specific to the equipment type, engine size, and technology type. The technology type for diesel equipment can be "base" (before 1988), "tier 0" (1988 to 1999), or "tier 1" (2000 to 2005). Tier 2 emissions factors could be applied to equipment that satisfies 2006 national standards (or slightly earlier California standards). The technology type for two-stroke gasoline equipment can be "base" (before 1997), "phase 1" (1997 to 2001), or "phase 2" (2002 to 2007). Equipment for phases 1 and 2 can have catalytic converters. For this study, all diesel equipment was assumed to be either tier 0 or tier 1 and all two-stroke diesel equipment was assumed to be phase 1 without catalytic converters.

The load factor is specific to the equipment type in the NONROAD model regardless of engine size or technology type, and it represents the average fraction of peak horsepower at which the engine is assumed to operate. NONROAD model default values were used in all cases. Because Tier 0 equipment was conservatively used throughout the analysis period, deterioration factors were not used to estimate increased emissions due to engine age. Based on the methodology described, it is possible to make a conservative estimate of emissions from off-road equipment if the types of equipment and durations of use are known.

Construction calculations were performed for the estimated years of construction.

Fugitive Dust. Emission rates for fugitive dust were estimated using guidelines outlined in the Western Regional Air Partnership (WRAP) fugitive dust handbook (WRAP 2006). Although these guidelines were developed for use in western states, they assume standard dust mitigation best practices activities of 50 percent from wetting; therefore, they were deemed applicable but conservative for all of the sites evaluated for the Proposed Action. The WRAP handbook offers several options for selecting factors for PM_{10} (coarse PM) depending on what information is known. After PM_{10} is estimated, the fraction of fugitive dust emitted as $PM_{2.5}$ is estimated, the most recent WRAP study (MRI 2005) recommends the use of a fractional factor of 0.10 to estimate the $PM_{2.5}$ portion of the PM_{10}.

For site preparation activities, the emission factor was obtained from Table 3-2 of the WRAP Fugitive Dust Handbook. The areas of disturbance and approximate durations were used in conjunction with the large scale of land-disturbing activities occurring, resulting in the selection of the first factor with worst-case conditions for use in the analysis.

PM_{10}, $PM_{2.5}$, and Mobile Sources. Diesel exhaust is a primary, well-documented source of $PM_{2.5}$ emissions. The vast majority of PM emissions in diesel exhaust is $PM_{2.5}$. Therefore, all calculated PM is assumed to be $PM_{2.5}$. A corollary result of this is that the PM_{10} fraction of diesel exhaust is estimated very conservatively as only a small fraction of PM_{10} is present in the exhaust. However, ratios of PM_{10} to $PM_{2.5}$ in diesel exhaust are not yet published and therefore for the purposes of the EIS calculations, all PM emissions are equally distributed as PM_{10} and $PM_{2.5}$.

VOC Emissions from Paving. VOC emissions from the application of hot mix asphalt were calculated for the construction. The estimates used estimated asphalt volumes, and used the published CARB hot mix asphalt emission factor.

Mobile Source Emissions. Mobile source emissions are associated with the temporary traffic increase during the construction periods at each location. For the purposes of estimating mobile source emissions from personally-owned vehicles (POVs), it was assumed that each construction worker drove a car and during the day drove an average of 5 miles in the vicinity (lunch and breaks). Emission factors were derived from the USEPA Mobile 6.2.03 emissions model for the years when construction would occur.

Image A-1 Air Quality Vicinity Map (Page 1 of 8)

Alternative A

Action	VOC (tons/yr)	CO (tons/yr)	Nox (tons/yr)	SO2 (tons/yr)	PM (tons/yr)
2013					
Construction of WWTP and Outfall (12% of total construction)	0.62	2.98	5.23	0.62	8.37
Significant Impact Threshold	25	100	250	250	250
Exceed Threshold (Significant Impact)	No	No	No	No	No
2014					
Construction of WWTP and Outfall (50% of total construction)	2.59	12.42	21.80	2.57	34.88
Significant Impact Threshold	25	100	250	250	250
Exceed Threshold (Significant Impact)	No	No	No	No	No
2015					
Construction of WWTP and Outfall (38% of total construction)	1.97	9.44	16.57	1.95	26.51
Significant Impact Threshold	25	100	250	250	250
Exceed Threshold (Significant Impact)	No	No	No	No	No
2016					
Demolition of WWTP	0.71	3.91	5.52	0.65	18.88
Significant Impact Threshold	25	100	250	250	250
Exceed Threshold (Significant Impact)	No	No	No	No	No
2018					
Construct RWDS	12.60	54.88	142.14	15.71	175.27
Significant Impact Threshold	25	100	250	250	250
Exceed Threshold (Significant Impact)	No	No	No	No	No

Alternative B

Action	VOC (tons/yr)	CO (tons/yr)	Nox (tons/yr)	SO2 (tons/yr)	PM (tons/yr)
2013					
Construction of WWTP and Outfall (12% of total construction)	0.62	2.98	5.23	0.62	8.37
Significant Impact Threshold	25	100	250	250	250
Exceed Threshold (Significant Impact)	No	No	No	No	No
2014					
Construction of WWTP and Outfall (50% of total construction)	2.59	12.42	21.80	2.57	34.88
Significant Impact Threshold	25	100	250	250	250
Exceed Threshold (Significant Impact)	No	No	No	No	No
2015					
Construction of WWTP and Outfall (38% of total construction)	1.97	9.44	16.57	1.95	26.51
Significant Impact Threshold	25	100	250	250	250
Exceed Threshold (Significant Impact)	No	No	No	No	No

Image A-2 Air Quality Vicinity Map (Page 2 of 8)

Total Construction of WWTP 24 Months **Approximately 480 construction days**

10 **Total Footprint (acres)**

CLEARING

Clearing (F) 10.00 **Acres** 48,400 SY 1133 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Chain saw	3	10	60	5	0.7	120.08	351.02	1.82	NA	7.7	1,668	4,875	25	N/A	107
Backhoe/loader	2	10	60	98	0.21	0.99	3.49	6.9	0.85	0.722	54	190	376	46	39
Skid/steer Loader	1	10	60	168	0.59	0.68	2.7	8.38	0.93	0.402	89	354	1,099	122	53
Dozer	1	10	60	299	0.58	0.68	2.7	8.38	0.93	0.402	156	619	1,922	213	92
Dump truck (12 CY)	4	2	60	275	0.21	0.68	2.7	8.38	0.89	0.402	42	165	512	54	25
											1.00	3.10	1.97	0.22	0.16

G - Site Prep - Excavate/Fill (CY)

Excavation 145,200 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Skid steer loader	4	10	60	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	43	193	457	76	39
Dump truck (12 CY)	16	1	60	710	0.59	0.68	2.7	8.38	0.89	0.402	603	2,394	7,430	789	356
Backhoe/loader	4	10	60	98	0.21	0.99	3.49	6.9	0.85	0.722	108	380	751	93	79
Excavator	2	10	60	513	0.59	0.68	2.7	8.38	0.93	0.402	544	2,162	6,710	745	322
Dozer	4	10	60	620	0.59	0.68	2.7	8.38	0.93	0.402	1,316	5,226	16,219	1,800	778
Small diesel engines	8	10	60	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	35	187	238	42	20
											1.32	5.27	15.90	1.77	0.80

J - Trenching

500 LF 56 **CY**

Trenching

Equipment	*Number*	*Hr/day*	*days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Backhoe/loader	2	10	10	98	0.21	0.99	3.49	6.9	0.85	0.722	9	32	63	8	7
Dump truck (9 CY)	10	1	10	275	0.21	0.68	2.7	8.38	0.89	0.402	9	34	107	11	5
Delivery truck	1	10	14	180	0.21	0.68	2.7	8.38	0.89	0.402	8	32	98	10	5
Small diesel engines	6	10	14	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	6	33	42	7	4
Trencher (500 LF/Day)	1	10	10	100	0.21	0.99	3.49	6.9	0.85	0.722	5	16	32	4	3
											0.018	0.073	0.170	0.020	0.012

K - Building Construction- Structure

Building Construction 140,000 SF 240/year on-site 2593.111 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb

Image A-3 Air Quality Vicinity Map (Page 3 of 8)

Skid steer loader	3	10	480	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	255	1,157	2,739	455	231
Concrete truck (9 CY)	4	10	300	250	0.21	0.68	2.7	8.38	0.89	0.402	944	3,750	11,639	1,236	558
Dump truck	2	1	480	275	0.21	0.68	2.7	8.38	0.89	0.402	83	330	1,024	109	49
Delivery truck	4	1	120	180	0.21	0.68	2.7	8.38	0.89	0.402	27	108	335	36	16
Backhoe/loader	4	10	480	98	0.21	0.99	3.49	6.9	0.86	0.722	862	3,040	6,011	740	629
Small diesel engines	15	10	480	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	521	2,807	3,570	635	305
Crane	2	10	240	120	0.43	0.3384	0.8667	5.8523	0.93	0.2799	185	473	3,086	508	153
											1,439	5,833	14,202	1,859	971

L - Grading

Grading 15,000 SY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Dozer	1	10	60	90	0.59	0.99	3.49	6.9	0.93	0.722	70	245	485	65	51
Skid steer loader	2	10	120	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	43	193	457	76	39
Backhoe/loader	2	10	90	98	0.21	0.99	3.49	6.9	0.86	0.722	81	285	564	69	59
Small diesel engines	5	10	124	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	45	242	307	55	26
Dump truck (12 CY)	6	1	60	275	0.21	0.68	2.7	8.38	0.89	0.402	31	124	384	41	18
											0.134	0.544	1.098	0.153	0.096

M - Gravel Work

Gravel Work 7,500 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	2	10	60	135	0.58	0.68	2.7	8.38	0.93	0.402	141	559	1,736	193	83
Skid steer loader	6	10	60	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	64	289	685	114	58
Small diesel engines	4	10	64	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	19	100	127	23	11
Dump truck (12 CY)	30	1	60	275	0.21	0.68	2.7	8.38	0.89	0.402	156	619	1,920	204	92
											0.189	0.784	2.234	0.266	0.122

O + N Concrete Work

Concrete Work 10,000 CY
20,000 CY
Total 30,000 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Skid steer loader	1	10	240	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	43	193	457	76	39
Concrete truck (9 CY)	30	2	240	250	0.21	0.68	2.7	8.38	0.89	0.402	1,133	4,500	13,967	1,483	670
Dump truck (12 CY)	2	1	120	275	0.21	0.68	2.7	8.38	0.89	0.402	21	83	256	27	12
Delivery truck	2	1	120	180	0.21	0.68	2.7	8.38	0.89	0.402	14	54	168	18	8
Backhoe/loader	1	10	120	98	0.21	0.99	3.49	6.9	0.86	0.722	54	190	376	46	39
											0.632	2.510	7.611	0.825	0.384

P - Paving Surface and Q - Paving HMA

Image A-4 Air Quality Vicinity Map (Page 4 of 8)

Paving 200,000 SF 2467 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	1	10	7	150	0.59	0.68	2.7	8.38	0.93	0.402	9	37	114	13	5
Roller	2	10	7	30	0.59	1.8	5	6.9	1	0.8	10	27	38	5	4
Paver	1	10	7	107	0.59	0.68	2.7	8.38	0.93	0.402	7	26	82	9	4
Delivery truck	2	2	3.5	180	0.21	0.68	2.7	8.38	0.89	0.402	1	3	10	1	0
											0.013	0.047	0.122	0.014	0.007

Volume of hot mix asphalt 66600 ft^3
Average density of HMA 145 lb/ft^3
CARB EF for HMA 0.04 lb/ton
VOC emissions from HMA paving 193 lb

Sources
[1]USEPA Nonroad Model

Fugitive Dust Emissions

	PM_{10} tons/acre/month[1]	acres	days of disturbance	PM_{10} Total	$PM_{2.5}/PM_{10}$ Ratio	$PM_{2.5}$ Total
Total Construction	0.42	10.00	480	67.20	0.1	6.720

Sources:
[1]Emission Factors from *Western Governor's Association WRAP Fugitive Dust Handbook, Page 3-3*

POV Emissions from Construction Workers
Assume 25 miles per day per vehicle (one vehicle per worker)

Year	# vehicles	# days	mi/day	[1]VOCs lb/mi	[1]CO lb/mi	[1]NOx lb/mi	[1]SO_2 lb/mi	[1]PM lb/mi	VOCs lb	CO lb	NOx lb	SO_2 lb	PM lb
2016	40	480	25	1.37E-03	2.79E-02	1.19E-03	1.81E-05	5.48E-05	657	13371	570	9	26

[1]USEPA Mobile 6.2

Totals	VOCs tons/year	CO tons/year	NOx tons/year	SO_2 tons/year	PM tons/year	$PM_{2.5}$ tons/year
2013	0.62	2.98	5.23	0.62	8.37	≤ 8
2014	2.59	12.42	21.80	2.57	34.88	≤ 34
2015	1.97	9.44	16.57	1.95	26.51	≤ 26
Total Tons	5.18	24.85	43.59	5.13	69.76	≤ 69

Image A-5 Air Quality Vicinity Map (Page 5 of 8)

Demolition of existing Solo Point WWTP

Demo Bldgs (SF)

					9,053	Tons debris									
Building demolition			119,117	SF	696	Truckloads									
						VOC[1]	CO[1]	NOx[1]	SO_2[1]	PM[1]	VOC	CO	NOx	SO2	PM
Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	lb	lb	lb	lb	lb
Dozer	4	10	60	90	0.59	0.99	3.49	6.9	0.93	0.722	278	981	1,939	261	203
Skid steer loader	4	10	60	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	43	193	457	76	39
Crane	2	5	60	120	0.43	0.3384	0.8667	5.6573	0.93	0.2799	23	59	386	63	19
Small diesel engines	8	10	60	25	0.43	1.7	5	8.5	0.93	0.9	193	569	967	106	102
										Total tons/yr	0.27	0.90	1.87	0.25	0.18
Bldg demo debris removal															
						VOC[1]	CO[1]	NOx[1]	SO_2[1]	PM[1]	VOC	CO	NOx	SO2	PM
Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	lb	lb	lb	lb	lb
Backhoe/loader	4	10	50	98	0.21	0.99	3.49	6.9	0.85	0.722	90	317	626	77	66
Skid steer loader	4	10	50	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	35	161	380	63	32
Dump truck (20 CY)	10	10	50	275	0.21	0.68	2.7	8.38	0.89	0.402	433	1,719	5,335	567	256
Small diesel engines	8	10	50	25	0.43	1.7	5	8.5	0.93	0.9	161	474	806	88	85
											0.360	1.335	3.573	0.398	0.219

Sources:
[1]USEPA Nonroad Model

Fugitive Dust Emissions

	PM_{10} tons/acre/month[1]	acres	days of disturbance	PM_{10} Total	$PM_{2.5}/PM_{10}$ Ratio	$PM_{2.5}$ Total
2016	0.42	11.00	120	18.48	0.1	1.848

Sources:
[1]Emission Factors from *Western Governor's Association WRAP Fugitive Dust Handbook, Page 3-3*

POV Emissions from Construction Workers

Assume 25 miles per day per vehicle (one vehicle per worker)

Year	# vehicles	# days	mi/day	[1]VOCs lb/mi	[1]CO lb/mi	[1]NOx lb/mi	[1]SO_2 lb/mi	[1]PM lb/mi	VOCs lb	CO lb	NOx lb	SO_2 lb	PM lb
2016	40	120	25	1.33E-03	2.79E-02	1.19E-03	1.81E-05	5.48E-05	164	3343	143	2	7

[1]USEPA Mobile 6.2

Totals	VOCs tons/year	CO tons/year	NOx tons/year	SO_2 tons/year	PM tons/year	$PM_{2.5}$ tons/year
2016	0.71	3.91	5.52	0.65	18.88	≤ 18.8

Image A-6 Air Quality Vicinity Map (Page 6 of 8)

Total Construction of RWDS | 12 Months | Approximately 240 construction days

25 **Total Footprint (acres)**

CLEARING

Clearing (F) 2.00 Acres 9,680 SY 227 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Chain saw	3	10	15	5	0.7	120.06	351.02	1.82	NA	7.7	417	1,219	6	N/A	27
Backhoe/loader	2	10	15	98	0.21	0.99	3.49	6.9	0.85	0.722	13	48	94	12	10
Skid/steer Loader	1	10	15	168	0.59	0.68	2.7	8.38	0.93	0.402	22	89	275	30	13
Dozer	1	10	15	299	0.58	0.68	2.7	8.38	0.93	0.402	39	155	481	53	23
Dump truck (12 CY)	4	2	15	275	0.21	0.68	2.7	8.38	0.89	0.402	10	41	128	14	6
											0.25	0.78	0.49	0.05	0.04

G - Site Prep - Excavate/Fill (CY)

Excavation 582,966 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Skid steer loader	4	10	240	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	170	771	1,826	303	154
Dump truck (12 CY)	30	1	240	710	0.59	0.68	2.7	8.38	0.89	0.402	4,576	18,170	56,396	5,989	2,705
Backhoe/loader	4	10	240	98	0.21	0.99	3.49	6.9	0.85	0.722	431	1,520	3,005	370	314
Excavator	2	10	240	513	0.59	0.68	2.7	8.38	0.93	0.402	2,178	8,648	26,841	2,979	1,288
Dozer	4	10	240	620	0.59	0.68	2.7	8.38	0.93	0.402	5,265	20,903	64,878	7,200	3,112
Small diesel engines	8	10	240	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	139	749	952	169	81
											6.38	25.38	76.95	8.51	3.83

J - Trenching

110,000 LF 12222 **CY**

Trenching

Equipment	*Number*	*Hr/day*	*days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Backhoe/loader	2	10	110	98	0.21	0.99	3.49	6.9	0.85	0.722	99	348	689	85	72
Dump truck (8 CY)	8	1	220	275	0.21	0.68	2.7	8.38	0.89	0.402	152	605	1,878	199	90
Water truck	8	10	220	275	0.21	0.68	2.7	8.38	0.89	0.402	1,524	6,050	18,778	1,994	901
Delivery truck	4	10	220	180	0.21	0.68	2.7	8.38	0.89	0.402	498	1,980	6,145	653	295
Small diesel engines	4	10	220	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	64	343	436	78	37
Trencher (500 LF/Day)	1	10	220	100	0.21	0.99	3.49	6.9	0.85	0.722	101	355	703	87	74
Jack and Bore Machine	1	10	20	100	0.21	0.99	3.49	6.9	0.85	0.722	9	32	64	8	7
											1.224	4.857	14.346	1.552	0.738

K - Building Construction- Structure

Building Construction 140,000 SF 240/year on-site 2593.111 CY

						VOC[1]	CO[1]	NOx[1]	SO_2[1]	PM[1]	VOC	CO	NOx	SO2	PM

Image A-7 Air Quality Vicinity Map (Page 7 of 8)

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	lb	lb	lb	lb	lb
Skid steer loader	3	10	240	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	128	579	1,370	227	116
Concrete truck (9 CY)	4	10	240	250	0.21	0.68	2.7	8.38	0.89	0.402	756	3,000	9,311	989	447
Dump truck	2	1	240	275	0.21	0.68	2.7	8.38	0.89	0.402	42	165	512	54	25
Delivery truck	4	1	240	180	0.21	0.68	2.7	8.38	0.89	0.402	54	216	670	71	32
Backhoe/loader	4	10	240	98	0.21	0.99	3.49	6.9	0.85	0.722	431	1,520	3,005	370	314
Small diesel engines	15	10	240	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	260	1,404	1,785	317	153
Crane	2	5	240	120	0.43	0.3384	0.8667	5.6523	0.93	0.2799	92	237	1,543	254	76
											0.881	3.560	9.098	1.142	0.581

L - Grading

Grading 15,000 SY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Dozer	1	10	120	90	0.59	0.99	3.49	6.9	0.93	0.722	139	490	969	131	101
Skid steer loader	2	10	120	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	43	193	457	76	39
Backhoe/loader	2	10	120	98	0.21	0.99	3.49	6.9	0.85	0.722	108	380	751	93	79
Small diesel engines	5	10	120	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	43	234	297	53	25
Dump truck (12 CY)	6	1	120	275	0.21	0.68	2.7	8.38	0.89	0.402	62	248	768	82	37
											0.198	0.772	1.621	0.217	0.140

M - Gravel Work

Gravel Work 7,500 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	2	10	60	135	0.58	0.68	2.7	8.38	0.93	0.402	141	559	1,736	193	83
Skid steer loader	6	10	60	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	64	289	685	114	58
Small diesel engines	4	10	64	10	0.43	0.7628	4.1127	5.2298	0.93	0.4474	19	100	127	23	11
Dump truck (12 CY)	30	1	60	275	0.21	0.68	2.7	8.38	0.89	0.402	156	619	1,920	204	92
											0.188	0.784	2.234	0.266	0.122

O + N Concrete Work

Concrete Work 10,000 CY
20,000 CY
Total 30,000 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Skid steer loader	1	10	240	67	0.23	0.5213	2.3655	5.5988	0.93	0.473	43	193	457	76	39
Concrete truck (9 CY)	30	10	240	250	0.21	0.68	2.7	8.38	0.89	0.402	5,667	22,500	69,835	7,417	3,350
Dump truck (12 CY)	2	1	120	275	0.21	0.68	2.7	8.38	0.89	0.402	21	83	256	27	12
Delivery truck	2	10	120	180	0.21	0.68	2.7	8.38	0.89	0.402	136	540	1,676	178	80
Backhoe/loader	1	10	120	98	0.21	0.99	3.49	6.9	0.85	0.722	54	190	376	46	39
											2.960	11.753	36.300	3.872	1.760

P - Paving Surface and Q - Paving HMA

Image A-8 Air Quality Vicinity Map (Page 8 of 8)

Paving 200,000 SF 2467 CY

Equipment	*Number*	*Hr/day*	*# days*	*Hp*	*LF*	VOC[1] g/hp-hr	CO[1] g/hp-hr	NOx[1] g/hp-hr	SO_2[1] g/hp-hr	PM[1] g/hp-hr	VOC lb	CO lb	NOx lb	SO2 lb	PM lb
Grader	1	10	45	150	0.59	0.68	2.7	8.38	0.93	0.402	60	237	736	82	35
Roller	2	10	45	30	0.59	1.8	5	6.9	1	0.8	63	176	242	35	28
Paver	1	10	45	107	0.59	0.68	2.7	8.38	0.93	0.402	43	169	525	58	25
Delivery truck	2	2	45	180	0.21	0.68	2.7	8.38	0.89	0.402	10	41	126	13	6
											0.088	0.311	0.814	0.094	0.047

Volume of hot mix asphalt 66600 ft^3
Average density of HMA 145 lb/ft^3
CARB EF for HMA 0.04 lb/ton
VOC emissions from HMA paving 193 lb

Sources
[1]USEPA Nonroad Model

Fugitive Dust Emissions

	PM_{10} tons/acre/mo mth[1]	acres	days of disturbance	PM_{10} total	$PM_{2.5}/PM_{10}$ Ratio	$PM_{2.5}$ total
Total Construction	0.42	25.00	480	168.00	0.1	16.800

Sources:
[1]Emission Factors from *Western Governor's Association WRAP Fugitive Dust Handbook, Page 3-3*

POV Emissions from Construction Workers

Assume 25 miles per day per vehicle (one vehicle per worker)

Year	# vehicles	# days	mi/day	[1]VOCs lb/mi	[1]CO lb/mi	[1]NOx lb/mi	[1]SO_2 lb/mi	[1]PM lb/mi	VOCs lb	CO lb	NOx lb	SO_2 lb	PM lb
2018	40	240	50	1.37E 03	2.79E 02	1.19E 03	1.81E 05	5.48E 05	657	13371	570	9	26

[1]USEPA Mobile 6.2

Totals	VOCs tons/year	CO tons/year	NOx tons/year	SO_2 tons/year	PM tons/year	$PM_{2.5}$ tons/year
2016	12.60	54.88	142.14	15.71	175.27	≤ 171

APPENDIX B. JBLM FUTURE PROJECTS

FY	Prop	PN	Project Description
2013	IMCOM	75165	WWTP
2013	FORSCOM	64285	BCT Complex Phase 4
2013	FORSCOM	67066	BCT Complex Phase 5
2013	IMCOM	64456	BCT Complex Phase 3
2013	IMCOM	67091	Enlisted Unaccompanied Personnel Housing
2013	USAR	67715	Army Reserve Center
2013	FORSCOM	67545	Convoy Live Fire Training Course, YTC
2014	FORSCOM	76776	Aviation Unit Complex Phase 2A
2014	FORSCOM	76777	Aviation Unit Complex Phase 2B
2014	FORSCOM	78196	Aviation Unit Complex Phase 2C
2018	IMCOM	78533	WWTP Phase 2
2016	FORSCOM	59633	ORTC Bn 1, Phase 2
2016	FORSCOM	59634	ORTC Bn 1, Phase 3
2016	FORSCOM	54106	Multipurpose Machine Gun Range, YTC
2016	FORSCOM	71718	Combined Arms Collective Training Facility, YTC
2017	FORSCOM	70420	Corps Headquarters
2017	FORSCOM	54203	BCTC Upgrade
2017	FORSCOM	63311	Digital Air/Ground Integration Range (DAGIR) YTC

APPENDIX C. ACRONYMS, TERMS, AND ABBREVIATIONS

Acronym	Spelled Out
ACP	Access Control Points
ACHP	Advisory Council on Historic Preservation
ADP	Area Development Plan
AHPA	Archaeological and Historic Preservation Act
AIRFA	American Indian Religious Freedom Act of 1978
APE	Area of Potential Effect
AQCR	Area Quality Control Region
AQRV	Area Quality Relative Value
ARPA	Archaeological Resources Protection Act
ASL	Average Sea Level
AUL	Authorized Use Lists
BP	Before Present
BGEPA	Bald and Golden Eagle Protection Act
BMP	Best Management Practices
BOD	Biological Oxygen Demand
BRAC	Base Alignment and Closure
CAA	Clean Air Act
CAB	Combat Aviation Brigade
CDNL	C-weighted day-night sound level
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CGP	Construction General Permit (EPA Permit)
COA	Certificate of Approval
CO	Carbon monoxide
CFR	Code of Federal Regulations
CWA	Clean Water Act
DAHP	Department of Archaeology and Historic Preservation
dB	Decibel
dBA	A-weighted decibel
DoD	Department of Defense

DERP	Defense Environmental Restoration Program
DPS	Distinct Population Segment
EA	Environmental Assessment
ED	Environmental Division
EDNA	Environmental Designation for Noise Abatement
EFH	Essential Fish Habitat
EFMP	Exceptional Family Member Program
EIS	Environmental Impact Statement
ENMP	Environmental Noise Management Program
EPCRA	Emergency Planning and Community Right-to-Know Act
EO	Executive Order
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
FEIS	Final Environmental Impact Statement
FMP	Federal Fishery Management Plans
FMC	Fishery Management Councils
FNSI	Finding of No Significant Impact
GA	Gallon
GCR	General Conformity Rule
GDRP	Global Defense Posture Realignment
GIS	Geographic Information System (Mapping)
GTA EIS	Growth the Army Environmental Impact Statement
GTA	Grow the Army
HBC	Hudson Bay Company
HMMP	Hazardous Material Management Plan
HPA	Hydraulic Project Approval
HAP	Hazardous air pollutants
HVAC	Heating Ventilation and Air Conditioning systems
Hz	Hertz
ICRMP	Integrated Cultural Resource Master Plan
IONMP	Installation Operational Noise Management Plan
INRMP	Integrated Natural Resources Management Plan

IRP	Installation Restoration Program
JBLM	Joint Base Lewis-McChord
KG	Kilogallon
kVA	Kilovolt-Ampere
LEED	Leadership in Energy and Environmental Design
LDN	Day-night levels
LF	Linear feet (lf)
LSR	Late Successional Reserves
LUPZ	Land Use Planning Zone
MAMC	Madigan Army Medical Center
MBR	Membrane Bioreactor
MBTA	Migratory Bird Treaty Act
MG	Million Gallons
MGD	Million Gallons per Day
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery and Conservation and Management Act
MSL	Mean Sea Level
mVA	Megavolt-Ampere
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NEC	Network Enterprise Center
NHPA	National Historic Preservation Act of 1966
NMFS	National Marine Fisheries Service
NOI	Notice of Intent
NO_2	Nitrogen Dioxide
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRHP	National Register of Historic Properties
OSHA	Occupational Safety and Health Administration,

$PM_{2.5}$	Particulate matter less than 2.5 microns in diameter
PM_{10}	Particulate matter less than 10 microns in diameter
POL	Petroleum, Oils and Lubricants
PPM	Parts Per Million
PSCA	Puget Sound Agricultural Company
PSAQCR	Puget Sound Air Quality Control Region
PSCAA	Puget Sound Clean Air Agency
PSD	Prevention of Significant Deterioration (air quality measurement)
POV	Personally-Owned Vehicles (construction worker vehicles)
PVC	Polyvinyl Chloride
RCRA	Resources Conservation and Recovery Act
RWDS	Reclaimed water distribution system
ROD	Record of Decision
ROI	Region of Influence
ROW	Right-of-Way
RUL	Restricted Use List
SARA	Superfund Amendments Reauthorization Act
SBCT	Stryker Brigade Combat Team
SEPA	Washington State Environmental Policy Act
SF	Square Foot/Feet
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SME	Subject Matter Expert
SPCC	Spill Prevention Control and Countermeasure Plan
SO_2	Sulfur dioxide
SRKW	Southern Resident Killer Whale
SWPPP	Storm Water Pollution Prevention Plan
TA	Training Areas
TCP	Traditional Cultural Properties
TESC	Temporary erosion and sediment control
TMDL	Total Maximum Daily Load
TSCA	Toxic Substances Control Act

U.S.	United States
USC	United States Code
USACE	US Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventative Medicine
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UXO	Unexploded Ordinance
VEC	Valued Environmental Component
VOC	Volatile Organic Compounds
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WDOE	Washington State Department of Ecology
WHPA	Wellhead Protection Areas
WRIA	Water Resource Inventory Areas
WSDOT	Washington State Department of Transportation
WWTP	Waste Water Treatment Plant

APPENDIX D. DISTRIBUTION LIST

Federal Agencies

U.S. Army Corps of Engineers
Dena Thompson-Savannah District
100 W. Oglethorpe Avenue
Savannah, GA 31402

U.S. Army Environmental Command
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Environmental Planning Branch
2450 Connell Road
Building 2264, Room 104
Fort Sam Houston, TX 78234

USACE - Seattle District Regulatory Program
4735 E. Marginal Way South
Seattle, WA 98124

Thomas Bucci
Office of Counsel
2450 Connell Road
Building 2264, room 102-004
Fort Sam Houston, TX 78234

U.S. Department of Transportation
Federal Highway Administration
Suite 501 Evergreen Plaza
711 South Capital Way
Olympia, WA 98501-1284

U.S. Department of the Interior
US Fish & Wildlife Service
510 Desmond Drive SE, Suite 102
Lacey, WA 98503-1263

U.S. Department of Commerce
NOAA-National Marine Fisheries Services
510 Desmond Drive SE, Suite 103
Lacey, WA 98503

U.S. Environmental Protection Agency – Region 10
Office of Ecosystems, Tribal and Public Affairs
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

Nisqually National Wildlife Refuge
100 Brown Farm Road
Olympia, WA 98516

62nd Air Mobility Command
Building 100 McChord Field
JBLM, Washington 98433

Tribal Governments

Chair, Nisqually Indian Tribe
4820 She-Nah-Num Drive SE
Olympia, Washington 98513

Chair, Puyallup Tribal Council
3009 East Portland Avenue
Tacoma, Washington 98404

Chair, Squaxin Island Tribe
SE 10 Squaxin Lane
Shelton, Washington 98584

State Agencies

Washington Department of Natural Resources
PO Box 47000
1111 Washington Street SE
Olympia, WA 98504-7000

Washington State Military Department
Environmental Program
Bldg 36 Quartermaster Rd
Camp Murray, WA 98430

Washington Department of Ecology
SEPA / Environmental Review Unit
P.O. Box 47703
Olympia, Washington 98504-7703

Washington Department of Ecology
Southwest Region
300 Desmond Drive SE
Lacey, WA 98503

Washington Department of Fish and Wildlife
Regional Director
48 Devonshire Road
Montesano, Washington 98563

Washington Department of Fish and Wildlife
Area Habitat Biologist
48 Devonshire Road
Montesano, Washington 98563

Washington State Department of Transportation
P.O. Box 47300
Olympia Washington 98504-7300

Washington Natural Heritage Program
Department of Natural Resources
Environmental Review Coordinator
P.O. Box 47014
Olympia, Washington 98504-7014

Washington Office of Archaeology and Historic Preservation
State Historic Preservation Officer
P.O. Box 48343
Olympia, Washington 98504-8343

Counties

Tacoma-Pierce County Health Department
3629 South D Street
Tacoma, WA 98418-6813

Pierce County Public Works and Utilities
9850 64th Street West
University Place, WA 98467

Pierce County Planning and Land Services
2401 S. 35th Street
Tacoma, Washington 98409

Cities and Towns

City of Lakewood
Community Development
6000 Main Street SW
Lakewood, WA 98499-5027

City of University Place
Planning and Development Services
3715 Bridgeport Way West
University Place, WA 98466

City of Fircrest
Planning and Building Department
115 Ramsdell Street
Fircrest, WA 98466

Tacoma Planning Commission
747 Market St, Room 1036
Tacoma, WA 98402-3793

City of DuPont
Planning Department
1700 Civic Drive
DuPont, Washington 98327

Town of Steilacoom
1030 Roe Street
Steilacoom, Washington 98388

Regional Authorities

Olympic Region Clean Air Agency
2940 Limited Lane, Suite B
Olympia, WA 98502

Puget Sound Regional Council
1011 Western Ave, Suite 500
Seattle, WA 98104

Thurston Regional Planning Council
2424 Heritage Court SW, Suite A
Olympia, Washington 98502

Puget Sound Clean Air Agency
1904 Third Avenue, Suite 105
Seattle, Washington 98101

School Districts

Clover Park School District
10903 Gravelly Lake Drive Southwest
Lakewood, WA 98499-1341

Steilacoom School District
510 Chambers Street
Steilacoom, WA 98388

Libraries

Pierce County Library System
Processing and Administrative Center
3005 112th Street East
Tacoma, Washington 98446-2215
(For Steilacoom and Lakewood Libraries)

Others

BNSF Railway Company
Dalen E. Wintermute, Manager, Land Revenue Management
2500 Lou Menk Drive, AOB-3
Ft. Worth, TX 76131-2828

CALPORTLAND
DuPont RM Plant & Pioneer Aggregates Plant
4301 Pioneer Way
DuPont, WA 98327

LOTT Clean Water Alliance
Regional Services Center and WET Center
500 Adams Street NE
Olympia, WA 98501

The Alliance for Puget Sound Shorelines
1011 Western Ave, Suite 605
Seattle, WA 98104

Puget Sound Partnership
1111 Washington St. SE
Olympia, WA 98501

Tacoma-Pierce County Chamber of Commerce
950 Pacific Ave Suite 300
Tacoma, WA 98402

Tahoma Audubon Society
2917 Morrison Road West
University Place, WA 98466
The Nature Conservancy
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APPENDIX F. BIOLOGICAL EVALUATION